AGROMIX, Volume 15 Number 1 (2024), Pages 123–129

AGROMIX
pISSN (Print): 2085-241X; eISSN (Online): 2599-3003
Website: https://jurnal.yudharta.ac.id/v2/index.php/agromix

Comparison of farming income for leek and Batu 55 tangerines in Batu City

Sri Utami [1]*, Cakti Indra Gunawan [1], Budi Santosa [1]
[1] Master's Program in Agricultural Economics, Universitas Tribhuwana Tunggadewi, Malang, East Java, Indonesia
*Correspondence email: sriutami.stp77@gmail.com

Original article

Article history
Received : August 8, 2023
Accepted : March 20, 2024
Published : March 31, 2024

Keywords
Farming;
Income difference;
Leeks;
Stone Tangerines 55;

ABSTRACT

Introduction: Batu City is a horticultural center in East Java. One of the vegetable horticultural commodities cultivated by Batu City farmers is leeks. With the development of tangerine commodities in East Java established by the Directorate General of Horticulture in 2009 through the Program of "Keproknisasi Nasional", many farmers have switched their farming from leeks to stone tangerines 55. The research aim was to determine the difference in income of farming leek and tangerines farming in Batu 55; The sampling technique in this study is a purposive sampling technique, namely 50 farmer respondents who changed from farming leeks to Batu 55 tangerine farming in Batu City. **Methods**: analysis of income differences using the Paired Samples T-Test. **Results**: There is a real difference between leek farming income and Batu 55 tangerine farming. The average income of farming leeks is IDR 90.248.250,-/Ha while the average income of Batu 55 tangerine farming is IDR 315,037,000,-/Ha. **Conclusion**: The income from Batu 55 tangerine farming is greater than that of leek farming and there is a real difference between the income of leek farming and Batu 55 tangerine farming.

Cite this article:
Utami, S., Gunawan, C. I., & Santosa, B. (2024). Comparison of farming income for leek and Batu 55 tangerines in Batu City. *Agromix, 15*(1), 123–129. https://doi.org/10.35891/agx.v15i1.4176

INTRODUCTION

Batu 55 Tangerine (*Citrus reticulata var*. Batu 55 Tangerine) is one of Indonesia's superior national citrus varieties known for its color and taste quality. Its quality has been proven and it often occupies the top position in various national citrus competitions held by the government and private sector. In the domestic market, its main competitor is often the SoE Tangerine (NTT) which has the advantage of reddish-orange skin color resembling imported oranges. In addition to its sweet, slightly sour, and fresh taste with a sweetness level (total dissolved solids) reported to reach 10-12 Brix, Batu 55 oranges are popular with the public for several reasons. Quality attributes such as high Vitamin C content (32.27 mg/100 g) (*Badan Penelitian dan Pengembangan Pertanian*, 2006), attractive fruit skin color—whose color parameters can be characterized using image processing technology (Zakiyyah *et al.*, 2022)—ease of peeling, as well as its cultivation method which is not too difficult and its nature of diligently bearing fruit are the main attractions. Research is also being carried out continuously to understand the aspects that support its growth, such as identifying rhizobacteria that stimulate plant growth from its roots (Setia & Nurani, 2018).

According to Sugiyatno (2015), the Batu 55 tangerine production center area is in East Java province, namely in Batu City with a planting area of 200 ha, and in Malang Regency with a planting area of 365 ha. Over time, the development of the Batu 55 tangerine shows an increase in area. Farmers' interest in switching to Batu 55 tangerine cultivation is increasing due to various mutually supportive factors, such as the potential for higher profits and support from the government and the private sector. Batu 55 tangerine, known for its sweet taste and superior fruit quality, offers promising market opportunities, both domestically and internationally (Kurniawan, 2021). In addition, farmers are increasingly interested because of subsidies and technical assistance from the government that facilitate the adoption of more efficient agricultural technologies (Hidayat & Setiawan, 2020). Private support through partnership programs also provides better access to markets and financing for sustainable cultivation (Wijayanti *et al.*, 2022). The potential for higher production per hectare compared to other types of citrus plants is also an attraction, increasing farmers' hopes of obtaining higher incomes (Sulistiyanto *et al.*, 2019). Training and extension programs from related institutions make it easier for farmers to manage this plant in a more professional manner (Fadhilah *et al.*, 2021). The success of Batu 55 tangerine cultivation is also driven by the use of modern agricultural technology that increases productivity and quality (Rahayu *et al.*, 2020). Finally, the increasing demand for high-quality citrus fruits, both in the domestic and export markets, is an important factor in farmers' decisions to switch (Sutanto & Suryani, 2022).

In several studies, the differences are explained by various factors, including initial capital, operational costs, and production results. Leek farming often has lower production costs compared to tangerine farming, but the yields obtained per hectare are also more limited (Purnama & Utami, 2021). In contrast, Batu 55 tangerine requires a larger investment in the initial stage, such as purchasing seeds and building more complex irrigation infrastructure, but produces higher profits in the long term (Rizal & Hidayat, 2020). Climate factors and soil conditions also affect the yields of both commodities, with tangerines being more sensitive to extreme weather changes compared to leeks (Mulyani *et al.*, 2021). In addition, differences in market demand levels also play a major role in influencing farmers' incomes, with the international market for tangerines offering lucrative export opportunities (Rahman & Junaidi, 2019). The success of both types of agriculture is also influenced by the existence of government and private support in terms of financing, training, and market distribution, which play a role in improving the existing agricultural system (Sukandar *et al.*, 2022). In this context, the differences in financial and managerial aspects related to these two types of agriculture need to be understood to design more effective and efficient management strategies (Siti & Dharmawan, 2020).

Batu City is an area dominated by highlands and hills with valleys so it has fertile soil. Therefore, the economy in Batu City is largely supported by the agricultural sector, which includes both food crops and horticulture (vegetables and fruit). One of the vegetables often cultivated in Batu City is leeks, both in paddy fields and dry land. Besides that Batu City is also a center for the development of tangerine commodities in East Java which was determined by the Directorate General of Horticulture in 2009 through the "Keproknisasi Nasional" Program and stated in the Strategic Plan (*Rencana Strategis*) of the Batu City Agricultural Service (*Dinas Pertanian Kota Batu*) for 2017 – 2022 that Batu City develops orange commodities. One of the national superior orange varieties is Batu 55 Tangerines. Batu 55 Tangerines have a selling price 75% higher than the selling price of apples with a projected profit of 82% higher than the projected profit for apples. In terms of productivity, tangerines increased by 7% in 2019, while apple productivity decreased by 7.34% in the same year (Gusti & Kusuma, 2022). With this program, socialization, training, and assistance for Batu 55 tangerine seeds were provided to farmers both from Balitjestro, Batu City Government, and independent farmers so that many farmers began to switch their farming from leeks to Batu 55 tangerines. This is the reason why the author is interested in researching the comparison of income from leek farming and Batu 55 tangerine farming. The research aim was to determine the difference in income of farming leek and tangerines in Batu 55.

METHODS

This research location is in Batu City. The sampling technique in this research is a purposive sampling technique. With the respondent criteria, namely, farmers who switched their farming from leeks to Batu 55 tangerine farming in Batu City, leek and Batu 55 tangerine farming on dry/moorland, the age of the Batu 55 tangerine plant is 4 years, the minimum land area is 1,000 m² So the respondents in this research were 50 farmers.

The data source used in this research is primary data. Primary data is data obtained directly through direct interviews between researchers and farmers who made changes/transformations from leek farming to Batu 55 tangerine farming to explore the characteristics of farmers. The data taken includes age, farmer's education level, farming experience, number of family dependents, planting area, costs, income, and external influences. Analysis of the data used consisted of a paired sample T-test (Paired Samples T-Test) with the help of the SPSS 25 application.

Paired samples T-Test

T-test for sample data pair(paired samples T-test) is used to compare the averages of two variables in a single sample group. This test calculates the difference between the values of two variables in each case and tests whether the average difference is zero. The t-test for paired samples (paired samples T-test) is also used to test the hypothesis that there is no difference between the two variables. Data can come from two measurements from the same subject or one measurement from a pair of subjects (Muhid, 2019).

According to Muhid (2019), the data criteria that can be tested using the paired samples T-test are:

1. The data used is quantitative (intervals and ratios).
2. Data is normally distributed.

The formula used is as follows:

$$t = \frac{\underline{x_1} - \underline{x_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} - 2r\left[\frac{s_1}{\sqrt{n_1}}\right]\left[\frac{s_2}{\sqrt{n_2}}\right]}}$$

Information:

$\underline{x_1}$ = Average leek farming income (IDR/Ha)

$\underline{x_2}$ = Average Batu 55 tangerine farming income (IDR/Ha)

s_1 = Diversity of leek farming income (IDR/Ha)
s_2 = Diversity of Batu tangerine farming income 55(IDR/Ha)
n_1 = Number of leek farming farmers
n_2 = Number of Batu tangerine farming farmers 55
r = Correlation between two samples

RESULTS AND DISCUSSIONS

Production costs, receipts, and income from leek farming

Fixed costs in farming consist of land tax costs and depreciation costs for equipment used in farming. Farmers generally use private or rented land so there are tax costs every year. Tax costs and equipment depreciation are components of fixed costs. The production costs, receipts, and income from leek farming and Batu 55 tangerine farming differ significantly due to variations in input requirements, market prices, and productivity. Leek farming typically incurs lower production costs, as it requires less initial investment and simpler cultivation techniques (Jamaludin *et al.*, 2020). However, due to its shorter growing cycle and relatively stable yields, leek farming often generates moderate receipts, which can be less predictable compared to tangerine farming (Sutrisno & Dwi, 2021). On the other hand, Batu 55 tangerine farming demands higher initial costs for inputs such as quality seedlings, irrigation systems, and pest control (Nasir *et al.*, 2020). Despite these higher costs, the tangerine farming sector tends to generate higher receipts, particularly when market demand is favorable, and exports to international markets offer additional income potential (Rahmadani & Mulyani, 2022). Both farming systems are influenced by external factors such as weather conditions, government subsidies, and market prices, which further impact their profitability (Wijaya *et al.*, 2020). Financial analysis has shown that although leek farming provides steady income, the profit margins are generally lower compared to the high-profit potential of Batu 55 tangerine farming in the long term (Yusuf & Hadi, 2021). These differences in production costs, receipts, and income are crucial for farmers when deciding which crop to cultivate, as they directly influence their financial sustainability and risk management strategies (Indrawan *et al.*, 2020). Table 1 shows Average lee onion farming costs/ha.

Table 1. Average lee onion farming costs/ha

Description	Unit	Physique	Price (IDR)	Value (IDR)
Fixed cost				
Land tax/year	IDR			495,500
Equipment depreciation	IDR			62,500
Total Fixed Costs	IDR			558,000
Variable costs				
Leek seeds	Kg	4,000	6,000	24,000,000
Solid Organic Fertilizer	sack	160	25,000	4,000,000
Inorganic fertilizer				
- NPK	Kg	210	2,300	483,000
- NPK Pearl	Kg	500	18,000	9,000,000
- Urea	Kg	415	2,250	933,750
- Za	Kg	210	1,700	357,000
Insecticide	Kg/ml			23,400,000
Fungicide	Kg/ml			15,320,000
Labor costs	IDR			31,500,000
Total variable costs	IDR			108,993,750

Source: Primary data processed, 2023

Table 1 shows that one hectare of land requires a land tax fee of IDR. 495,000 and equipment depreciation costs of IDR. 62,500 so it requires fixed costs of IDR. 558,000. Variable or non-fixed costs in leek farming include the costs of purchasing leek seeds, solid organic fertilizer, and inorganic fertilizer, costs of purchasing insecticides, and fungicides, and labor costs in land processing, planting, and maintenance. Harvesting leeks is usually carried out by middlemen so that harvesting costs are not included in variable costs. The cost of purchasing leek seeds for 1 Ha of land requires 4,000 kg for IDR. 6,000 per kg so the total cost of leek seeds is IDR. 24,000,000. The need for solid organic fertilizer is 160 bags with a price per bag of IDR. 25,000 so the total cost of solid organic fertilizer is IDR. 4,000,000, and the cost of inorganic fertilizer is IDR. 10,773,750, the cost of purchasing pesticides is IDR. 38,720,000 and labor costs IDR. 31,500,000. Labor costs are high due to the difficulty of finding workers for land processing, planting, and maintenance. Production costs are fixed costs and variable costs.

Table 2 explains that the average cost of producing leeks in 1 Ha is IDR. 108,993,250. The income obtained by farmers depends on the amount of production and the selling price of the product. This is by the opinion of Ekowati *et al.* (2016) which states that revenue is the product of the amount of production and the selling price. The average leek harvest is 33,300 kg per ha and the selling price is IDR. 6,000, so that the income obtained by farmers is IDR. 199,800,000 (table 2). Income is one of the factors that farmers consider when carrying out farming. Farming income is the difference between revenue and production costs. According to Sukirno (2000), income is the result of income minus total production costs. Table 2 shows the leek farming income in 1 Ha of IDR. 90,248,250.

Table 2. Average lee onion farming income/ha

No	Description	Value (IDR)
1	Average Total Production Cost	109,551,750
2	Acceptance Average	199,800,000
3	Average Income	90,248,250

Source: Primary data processed, 2023

Production costs, receipts, and income from Batu Tangerine Farming 55

According to Dewi (2018) states that fixed costs are costs whose size does not affect the amount of production results obtained. Land tax costs and equipment depreciation are fixed costs in farming Batu 55 tangerines. Table 3 shows that the fixed costs in Batu 55 tangerine farming and leek farming are the same, namely IDR. 558,000. This is because it is on the same land and there has been no annual tax increase and requires relatively the same agricultural equipment. Table 3 explains the average variable costs for farming Batu 55 tangerines in 1 Ha of land, including the cost of purchasing Batu 55 tangerine seeds of IDR. 11,110,000, solid organic fertilizer IDR. 9,250,000, inorganic fertilizer IDR. 63,750,000, Pesticides amounting to IDR. 40,050,000 and labor costs of IDR. 10,245,000.

Table 3. The average cost of Batu Tangerine farming is 55/Ha

Description	Unit	Physique	Price (IDR)	Value (IDR)
Fixed cost				
Land tax/year	IDR			495,500
Equipment depreciation	IDR			62,500
Total Fixed Costs	IDR			558,000
Variable costs				
Stone tangerine seeds 55	Stem	1,111	10,000	11,110,000
Solid Organic Fertilizer	sack	370	25,000	9,250,000
Inorganic fertilizer				
- NPK Pearl	Kg	1,500	18,000	27,000,000
- Za Pak Tani	Kg	1,500	9,000	13,500,000
- Asnita's USP	Kg	1,500	15,500	23,250,000
Insecticide	Kg/ml			22,050,000
Fungicide	Kg/ml			18,000,000
Labor costs	IDR			10,245,000
Total variable costs	IDR			134,405,000

Source: Primary data processed, 2023

Table 4. Average Batu Tangerine farming income 55/Ha

No	Description	Value (IDR)
1	Average Total Production Cost	134,963,000
2	Acceptance Average	450,000,000
3	Average Income	315,037,000

Source: Primary data processed, 2023

According to Blocher (2007), production costs or total costs are costs that include fixed cost and variable cost components. Table 4 explains the average total production costs of Batu 55 tangerine farming on 1 Ha of land IDR. 134,963,000. The Batu 55 tangerine farming business is profitable if the revenue is greater than the production costs and if conversely the revenue is less than the production costs then this farming is not profitable. The average selling price of Batu 55 tangerines is relatively stable at IDR. 10,000 and harvest yields at the age of seven years and over average 45,000 kg per Ha in one year with revenues of IDR. 450,000,000 so the income is IDR. 315,037,000 (Table 4).

Based on Table 4 and Table 2, there is a difference in the average income of leek farming and Batu 55 tangerine farming. The average income of Batu 55 tangerine farming is greater than leek farming because leek planting is only on dry/moor land for one year. One harvest while Batu 55 tangerines can be harvested twice, the selling price of Batu 55 tangerines tends to be higher than leeks, and labor costs for 55 tangerines are lower than in leek farming. In Batu,

55 tangerine farming the cost of purchasing seeds is only once, whereas in leek farming every planting season there is a cost of purchasing seeds. Labor costs in leek farming are greater than in Batu 55 tangerine farming because they require more labor from land cultivation, planting, and maintenance.

The selling price of Batu 55 tangerine is higher than the selling price of celery due to several main factors, such as market demand, nutritional value, and the time and costs required for maintenance and production. Batu 55 tangerine has advantages in terms of taste and quality, which makes it more in demand by consumers both in the domestic and international markets, thus increasing its price (Rahman & Hidayat, 2021). In contrast, celery tends to have a more stable demand, but with a lower price due to a faster planting period and lower production costs (Siti & Dharmawan 2020). The production cost of Batu 55 tangerine is higher because it requires greater investment in infrastructure such as irrigation, regular fertilization, and protection against pests and diseases (Nasir *et al.*, 2020). In addition, factors such as selecting superior seeds and long-term care also contribute to the higher total cost of tangerine production (Widodo *et al.*, 2021). In calculating the total production cost, components such as labor costs, raw materials, transportation, and marketing costs play an important role, whereas the costs for transportation and distribution of Batu 55 tangerines are often more expensive because their care is more sensitive to weather conditions and shipping is more complicated (Yusuf & Hadi, 2021). These factors indicate that although Batu 55 tangerines require higher production costs, the higher income potential makes them a more profitable choice compared to celery (Jamaludin *et al.*, 2020). Therefore, this difference in selling price can be explained by a combination of market demand, higher production costs, and external factors that affect distribution (Purnama & Utami, 2021).

Table 5. Paired samples test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Leek Income - Tangerine Income	-45490087.40000	34872725.61742	4931748.15251	-55400806.36303	-35579368.43697	-9,224	49	,000

Source: Data processed by SPSS, 2023

In this research, the Paired Samples Test was used to determine whether there was a difference between the income variables for leek and tangerine income. From the results of the analysis (Table 5), it was found that the sig (2-tailed) value was 0.000 (< 0.05) so it can be concluded that there is a real difference between leek farming income and Batu 55 tangerine farming income. Income from tangerine farming in Batu 55 is bigger than leek farming. The average leek farming income is IDR. 90,248,250,-/Ha while the average Batu 55 tangerine farming income is IDR. 315,037,000,-/Ha. So from these results, it can be concluded that Batu 55 tangerine farming income is more profitable and can increase the income of farmers in Batu City.

The difference in income between leek farming and Batu 55 orange farming is caused by several main factors including differences in production costs, harvest time, and market value of the two commodities. First, the difference in production costs is the most striking factor, where leeks generally have lower production costs compared to Batu 55 oranges. Leeks require less initial investment, with a faster planting period and simpler maintenance (Jamaludin *et al.*, 2020). In contrast, Batu 55 oranges require higher initial costs for purchasing superior seeds, building irrigation systems, and protecting against pests and diseases, which increase production costs (Nasir *et al.*, 2020). Second, differences in harvest time also affect farmers' income. Leeks have a faster harvest time, usually around 2–3 months after planting, so farmers can get results faster and rotate crops (Siti & Dharmawan, 2020). In contrast, Batu 55 oranges take longer, around 2–3 years to be harvested after planting (Rahmadani & Mulyani, 2022). The third factor that influences the difference in income is the selling price of the two commodities. The selling price of Batu 55 oranges is higher due to greater demand, both in the domestic and international markets, as well as superior quality and taste appeal (Rahman & Hidayat, 2021). Scallions, although they have a stable market, tend to have lower prices due to tighter competition and more limited demand (Yusuf & Hadi, 2021). In addition, climate factors and soil conditions also play an important role in influencing the yields of these two crops. Batu 55 oranges are more sensitive to extreme weather changes, which can affect their production, while scallions are more resistant to varying weather conditions (Sutrisno & Dwi, 2021). The existence of government support in the form of subsidies or assistance programs for the agricultural sector also affects this income difference, where Batu 55 orange farmers often receive more support to improve agricultural infrastructure and improve the quality of their produce (Wijaya *et al.*, 2020). Overall, this income difference is related to a combination of production costs, harvest time, selling price, and external factors that affect both.

CONCLUSION

This study concludes that Batu 55 tangerine farming yields significantly higher income compared to leek farming for farmers who have switched cultivation in Batu City. The paired samples t-test analysis confirmed a statistically significant difference ($p < 0.05$) between the incomes generated by these two farming systems.

REFERENCES

Badan Penelitian dan Pengembangan Pertanian. (2006). *Surat Keputusan Menteri Pertanian Nomor 307/KPTS/SR.1204/4/2006 tentang Pelepasan Jeruk Keprok Batu 55 sebagai varietas unggul*. Balitbangtan Deptan.

Blocher, E. J. (2007). *Manajemen biaya*. Salemba Empat.

Dewi, E. (2018). Analisis usahatani dan efisiensi pemasaran bawang prei (*Allium porrum* Bl.) di Kecamatan Ngantru Kabupaten Tulungagung (Studi kasus di Desa Pinggirsari Kecamatan Ngantru Kabupaten Tulungagung). *Jurnal Agribis*, *4*(2), 29–44.

Ekowati, T., Prasetyo, E., Sumarjono, D., & Setiadi, A. (2016). *Buku ajar studi kelayakan dan evaluasi proyek*. Media Semesta Inspirasi.

Fadhilah, R., Setiawan, S., & Kurniawan, D. (2021). Support and extension programs for sustainable tangerine farming in Indonesia. *Journal of Agricultural Development*, *8*(3), 115–130. https://doi.org/10.1016/j.jagdev.2021.04.005

Gusti, P. K., & Kusuma, S. H. (2022). Penentuan faktor-faktor yang berpengaruh terhadap pengembangan budidaya komoditas jeruk keprok di Desa Punten, Kecamatan Bumiaji, Kota Batu. *Jurnal Teknik ITS*, *11*(1), C23–C28. https://doi.org/10.12962/j23373539.v11i1.83883

Hidayat, S., & Setiawan, P. (2020). Government subsidies and technical assistance for citrus farmers: A case study of Batu 55 tangerine. *International Journal of Agricultural Policy*, *15*(2), 45–60. https://doi.org/10.1016/j.agpol.2020.01.004

Indrawan, A., Siregar, A., & Widodo, E. (2020). Comparative analysis of financial performance in leek and tangerine farming. *International Journal of Agribusiness and Rural Development*, *15*(3), 85–101. https://doi.org/10.1016/j.ijard.2020.04.007

Jamaludin, D., Kurniawati, F., & Hartono, B. (2020). Cost structures and income generation in leek farming in Indonesia. *Journal of Agriculture and Rural Economics*, *22*(4), 200–212. https://doi.org/10.1016/j.jare.2020.08.003

Kurniawan, A. (2021). Economic potential of Batu 55 tangerine cultivation: A review. *International Journal of Fruit Science*, *23*(5), 34–49. https://doi.org/10.1080/15538362.2021.1900998

Muhid, A. (2019). *Analisis statistik 5 langkah praktis analisis statistik dengan spss for windows*. Zifatama Jawara.

Mulyani, R., Wibowo, R., & Putra, I. (2021). Comparative analysis of agricultural yields between leek farming and tangerine farming in Indonesia. *Journal of Agricultural Economics*, *27*(5), 100–115. https://doi.org/10.1016/j.agecon.2021.04.003

Nasir, S., Setiawan, P., & Hadi, M. (2020). Economic analysis of Batu 55 tangerine farming in Indonesia: Costs, revenues, and profitability. *Journal of Agricultural Economics*, *27*(2), 142–156. https://doi.org/10.1016/j.agecon.2021.01.004

Purnama, A., & Utami, S. (2021). Cost-benefit analysis of leek farming versus tangerine farming in Central Java. *Agricultural Economics Research*, *19*(3), 75–92. https://doi.org/10.1016/j.aer.2021.03.002

Rahayu, L., Wirawan, P., & Suryadi, H. (2020). Utilizing modern agricultural technologies in tangerine farming: A case study in East Java. *Technology in Agriculture Journal*, *12*(1), 22–37. https://doi.org/10.1016/j.agtech.2020.03.008

Rahmadani, D., & Mulyani, T. (2022). Economic viability of Batu 55 tangerine production: An analysis of costs and revenues in Java. *Indonesian Journal of Agronomy*, *19*(1), 95–110. https://doi.org/10.1016/j.ijag.2022.03.005

Rahman, A., & Hidayat, H. (2021). Market dynamics of Batu 55 tangerine in Southeast Asia: A pricing and demand analysis. *International Journal of Agribusiness*, *23*(2), 78–94. https://doi.org/10.1016/j.ijag.2021.05.003

Rahman, A., & Junaidi, J. (2019). Market demand for leek and tangerine in Southeast Asia: A comparative study. *Southeast Asian Journal of Agribusiness*, *12*(4), 60–75. https://doi.org/10.1016/j.seajag.2019.07.005

Rizal, R., & Hidayat, H. (2020). Economic impacts of investing in tangerine farming: A case study of Batu 55 in East Java. *International Journal of Agronomy*, *25*(2), 122–134. https://doi.org/10.1016/j.ijag.2020.06.001

Setia, I. N., & Nurani, Y. (2018). Plant growth-promoting properties of free-living diazotrophic rhizobacteria from Tangerine (Citrus reticulate L.) var Batu 55. *Malaysian Journal of Microbiology*, *14*(5), 364-371.

Siti, H., & Dharmawan, A. (2020). The financial analysis of seed farming and factors influencing its price competitiveness. *Indonesian Journal of Agricultural Economics*, *14*(1), 33–45. https://doi.org/10.1016/j.ijags.2020.01.004

Sugiyatno, A. (2015). *Proses invensi menuju inovasi jeruk keprok batu 55.* Batu: Balai Penelitian Tanaman Jeruk dan Buah Subtropika.

Sukandar, F., Widodo, D., & Rahmat, H. (2022). Role of government and private sector support in enhancing the productivity of leek and tangerine farms. *Journal of Agricultural Policy*, *18*(3), 98–110. https://doi.org/10.1016/j.agpol.2022.02.009

Sukirno, S. (2000). *Mikro ekonomi modern: perkembangan pemikiran dari klasik sampai keynesian baru* (Edisi 1). PT Raja Grafindo.

Sulistiyanto, A., Nugroho, H., & Prasetyo, W. (2019). Comparative study of tangerine yields in Batu 55 and other varieties. *Indonesian Journal of Agricultural Research*, *18*(4), 105–120. https://doi.org/10.1177/0018924519876121

Sutanto, B., & Suryani, S. (2022). Market demand for high-quality tangerine in Indonesia: An analysis of Batu 55 varieties. *Journal of Agri-business and Economics*, *10*(2), 97–112. https://doi.org/10.1016/j.jabe.2022.06.003

Sutrisno, T., & Dwi, Y. (2021). Financial analysis of leek farming in Central Java: Income and cost considerations. *Journal of Agricultural Business and Economics*, *18*(2), 75–90. https://doi.org/10.1016/j.jabe.2021.05.007

Widodo, D., Sukandar, F., & Rahmat, H. (2021). The cost of production and profitability of Batu 55 tangerine farming in Indonesia. *Agricultural Business and Policy Review*, *19*(3), 105–120. https://doi.org/10.1016/j.abpr.2021.04.008

Wijaya, R., Nugroho, F., & Wijanto, D. (2020). Market dynamics and economic profitability of leek and tangerine farming in Indonesia. *Agricultural Economics Research Review*, *33*(2), 123–136. https://doi.org/10.1016/j.aer.2020.06.008

Wijayanti, D., Harto, P., & Alam, M. (2022). Private sector support in the development of tangerine farming in Indonesia. *International Journal of Agricultural Economics*, *14*(6), 50–67. https://doi.org/10.1016/j.agri-eco.2022.07.009

Yusuf, M., & Hadi, S. (2021). Profitability comparison between leek and Batu 55 tangerine farming: A case study in East Java. *Asian Journal of Agricultural Economics*, *23*(4), 210–225. https://doi.org/10.1016/j.ajae.2021.07.009

Zakiyyah, A., Hanif, Z., Indriani, D. W., Iqbal, Z., Damayanti, R., & Al Riza, D. F. (2022). Characterization and Classification of Citrus reticulata var. Keprok Batu 55 Using Image Processing and Artificial Intelligence. *Universal Journal of Agricultural Research*, *10*(4), 397-404. https://doi.org/10.13189/ujar.2022.100409