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Suatu jurnal ilmiah bidang pertanian dalam arti luas yang mempublikasikan hasil penelitian atau kajian *review* pada semua aspek agroekoteknologi, agribisnis, sosial dan budaya pertanian (baik yang menyangkut fisik maupun metafisik), baik secara alami maupun terkontrol dengan memanfaatkan teknologi yang ramah lingkungan /organik.

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ANALYSIS OF THE INCOME OF CARROT TRADERS AT PASAR BARU KEFAMENANU

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Abstract

This study aims to determine the income and business feasibility of carrot traders at Pasar Baru Kefamenanu, located in the Timor Tengah Utara Regency, East Nusa Tenggara Province. Carrots are one of the horticultural agricultural commodities that are quite popular among the public. The role of traditional markets as transaction centers makes Pasar Baru Kefamenanu an important place in the distribution and trade of carrots. However, information regarding the income and business feasibility of these traders is still limited. This research uses a descriptive quantitative approach. A total of 30 carrot traders were randomly selected as samples from 120 active traders in the market. Data were collected through observation, interviews, and the distribution of questionnaires to the traders. Data analysis was carried out by calculating costs, revenue, income, and business feasibility using Break Even Point (BEP) analysis and the Revenue/Cost (R/C) ratio.The results show that most carrot traders at Pasar Baru Kefamenanu are in productive age, majority female, and have more than 10 years of trading experience. The analysis revealed that the average daily revenue of carrot traders is Rp 1,010,833, with an average total cost of Rp 649,168, resulting in an average net income of Rp 361,655 per day. Business feasibility was analyzed using BEP and R/C ratio. The results indicate that the BEP for production is 29.9 kg per day, while the average sales volume is 40.4 kg per day, which means the business operates above the break-even point. The BEP price is Rp 288,918, which is lower than the average selling price. Meanwhile, the R/C ratio of 1.55 indicates that the carrot trading business is profitable and financially feasible.

Keywords: *Income, Business Feasibility, Break Even Point, R/C Ratio, Carrot Traders, Pasar Baru Kefamenanu*

INTRODUCTION

Indonesia is a country rich in agriculture, and agriculture is a sector that plays a very important role in the Indonesian economy (Fitria, 2018). This means that most Indonesians earn their income from the agricultural sector. This is because most regions of Indonesia have mountainous topography, which is very suitable for cultivating various types of crops, one of which is horticultural commodities (particularly vegetables) (Suryani, 2018).

Carrots are vegetables that belong to the horticultural sub-sector of agricultural crops. Carrots contain nutrients that are beneficial for human health. The vegetable, scientifically known as Daucus carota L., contains biotin, potassium, vitamin A from beta-carotene, vitamin K1, and vitamin B6. Based on its nutrient composition, carrots contain a large amount of beta-carotene; the higher the beta-carotene content, the deeper the carrot color, ranging from deep yellow to reddish (Styawan et al., 2019).

Information regarding carrot productivity in Kefamenanu is still relatively low compared to the national productivity level as well as that of several other countries. In Indonesia, carrot production in 2021 reached 720,090 tons, and in 2022 production increased to 737,965 tons. However, in 2023 production decreased to 668,046 tons. Moreover, carrot imports in Indonesia have continued to rise since 2017, amounting to 34.68 tons, and then surged in 2020 to 203.19 tons, further increasing in 2021 to 255.58 tons (BPS, 2021).

The main factors causing the decline in carrot production include climatic conditions, particularly unpredictable rainfall, which affects the size of

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cultivated areas, harvested areas, and overall production. To ensure stable carrot production, it must be supported by factors such as the availability of production facilities, farming activities including processing and distribution. In addition, farmers need to evaluate cash flow and their ability to face business challenges. Field realities show that there are several obstacles faced by carrot farmers in TTU, including unpredictable rainfall, limited farmer capital, unstable carrot prices, and rising input costs.

The problems commonly faced by traders generally occur in relation to income, costs incurred for expenses and the purchase of carrots, as well as the purchase volume from farmers (kg), which in turn affects sales and revenue. This is due to relatively high marketing costs and price changes at the consumer level, which are not always immediately transmitted to farmers. In addition, these conditions cause differences in the expenses incurred, thereby affecting the income earned by traders and potentially influencing both prices and profits. Based on the above background, this study seeks to examine: How much income do carrot traders earn at the Kefamenanu New Market, and whether or not carrot trading at Kefamenanu New Market is a feasible business.

Materials and Methods

This research was conducted in June 2025 at Pasar Baru Kefamenanu, Kota Kefamenanu District, Timor Tengah Utara Regency. The sample was taken using random sampling. According to Arikunto (2017), if the population is less than 100 people, then the entire population is taken as the sample, but if the population is more than 100, a sample of 10–15% or 20–25% can be taken. Based on this opinion, since the population exceeded 100 respondents, the researcher took 25% of the total 120 carrot traders, resulting in 30 respondents.

The data used consisted of primary data obtained through field observation and direct interviews, and secondary data sourced from related institutions such as the Department of Agriculture, Market Management Agency, Central Bureau of Statistics (BPS), and journals. Data collection techniques included interviews, documentation, and observation.

The data analysis methods used were as follows:

1. **Income Analysis**
   To answer the first research objective, namely determining the income of carrot traders at Pasar Baru Kefamenanu, income analysis was applied using the following formula (Suratiyah, 2015):

$$\pi = TR - TC$$

Where:

π = total income
TR = total revenue (Rp)
TC = total cost (Rp)

Revenue is calculated by multiplying the production obtained by the selling price (Sadono Sukirno, 2013):

$$TR = Q \times P$$

Where:

TR = total revenue of carrot traders
Q = quantity of products obtained by traders (kg)
P = carrot selling price (Rp/kg)

Total cost (TC) consists of fixed cost (TFC) and variable cost (TVC):

$$TC=TFC+TVC$$

2. **Business Feasibility Analysis**
   To answer the second research objective, namely to determine the feasibility of carrot trading businesses at Pasar Baru Kefamenanu, Break Even Point (BEP) and Revenue/Cost Ratio (R/C) analysis were applied.

   - **BEP Analysis**
     - BEP (unit) = Fixed Cost / (Price per unit – Variable Cost per unit)
     - BEP (revenue) = Fixed Cost / (1 – Variable Cost per unit / Selling Price)
   - **R/C Ratio**

$$R/C=TR/TC$$

Criteria:

- If R/C < 1 → the business is not feasible
- If R/C = 1 → the business breaks even (no profit or loss)
- If R/C > 1 → the business is profitable and feasible to continue

A G R I M E T A
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RESULTS AND DISCUSSION

General Overview of the Location

Pasar Baru Kefamenanu is one of the centers of community economic activity located in Benpasi Village, Kota Kefamenanu District, Timor Tengah Utara Regency, East Nusa Tenggara Province (NTT). This market serves as the main venue for community trading activities, particularly for agricultural commodities, basic necessities, and other local products.

The market functions as a traditional trade hub that caters not only to residents of Kota Kefamenanu but also to communities from surrounding villages, such as Insana, Bikomi, and Miomaffo districts. Market activities take place daily, but they usually peak on designated market days, which are marked by an increase in the number of traders and buyers. Its strategic location in the city center makes Pasar Baru Kefamenanu easily accessible from various directions. Public facilities such as paved roads, a city transportation terminal, as well as clean water and electricity infrastructure support smooth trading activities in this market.

This market plays an important role in improving community income, especially for small traders. The main commodities traded in this market include vegetables (such as carrots, cabbages, and tomatoes), basic necessities, clothing, and daily household goods.

Timor Tengah Utara Regency

The total area of Timor Tengah Utara Regency is approximately 2,669.70 km², or about 5.6% of the total land area of East Nusa Tenggara Province. Geographically, the regency is located between 9°01'06"–9°39'41" South Latitude and 124°05'36"–124°51'14" East Longitude.

Topography

From a topographical perspective, around 177.60 km² (6.63%) has an elevation of less than 100 meters above sea level; 1,449.45 km² (56.17%) lies between 100–500 meters above sea level, and the remaining 993.19 km² (37.20%) lies above 500 meters. Based on topographic data, 2,065.19 km² or 77.4% of the land area has a slope of less than 40°, while the remaining 604.51 km² (22.6%) has a slope greater than 40°. Most of the land with slopes below 40° is at an elevation of less than 500 meters above sea level, covering 1,676.51 km² (62.8%).

Of the 174 villages/urban wards, 9 are categorized as coastal villages—namely Oepuah (Biboki Selatan), Humusu C and Oesoko (Insana Utara), as well as Nonotbatan, Maukabatan, Tuamese, Oemanu, Motadik, and Ponu (Biboki Anleu). The remaining 165 villages are located in 24 non-coastal sub-districts.

Hydrology

Areas rich in springs are found in the northern part of Timor Tengah Utara Regency, directly bordering Ambenu District in Timor Leste. These springs are located on elevated terrain, which is advantageous because the water can flow to lower areas. However, the water discharge is relatively small, limiting use to nearby areas.

In addition to springs, many rivers flow throughout the year, although their discharge decreases drastically during the dry season. These rivers include Noeltoko, Nabesi, Taisola, Noel Muti, Haekto, Naen, Maubesi, Mena/Kaubele, Ponu, and several tributaries. Areas with moderate groundwater potential are found sporadically along the northern coast and central parts of the regency, while deeper groundwater reserves exist in the north. Shallow groundwater is generally found in weathered areas. Broader groundwater reserves are found in the southern and eastern parts of the regency, near the Belu Regency border, with yields exceeding 5 liters/second in some areas.

Geology

Based on soil types, Timor Tengah Utara Regency consists of three main soil classes: lithosols, complex soils, and grumusols. Lithosols cover 1,666.96 km² (62.4%), complex soils cover 479.48 km² (18.0%), and grumusols cover 522.26 km² (19.6%).

Effective soil depth distribution is as follows:

- Less than 30 cm: 35,316 ha (13.2%)
- 30–60 cm: 73,201 ha (27.4%)

AGRIMETA
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Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

- 60–90 cm: 16,354 ha (6.1%)
- Greater than 90 cm: 142,099 ha (53.2%)

Erosion-prone soils cover 105,226 ha (39.4%), while the remaining 161,744 ha (60.6%) have relatively stable soil structure. Unstable erosion-prone soils are concentrated in three sub-districts: Miomaffo Barat (37,921 ha), Biboki Selatan (28,538 ha), and Biboki Utara (28,538 ha).

Climate

Timor Tengah Utara Regency has a tropical savanna climate (Aw), characterized by a very short rainy season and a prolonged dry season (>7 months). With an altitude of approximately 600 meters above sea level, the annual average temperature ranges between 22°C–26°C.
The rainy season usually occurs from December to March with average monthly rainfall above 150 mm, while the dry season extends from early April to October with average rainfall below 100 mm/month. Annual rainfall ranges between 900–1,600 mm with fewer than 140 rainy days, making the region relatively dry.

Kota Kefamenanu District

Geographically, Kota Kefamenanu District is located in the center of Timor Tengah Utara Regency, with the following boundaries:

- To the north: Miomaffo Timur District
- To the south: Bikomi Selatan District
- To the east: Insana Barat and Insana Tengah Districts
- To the west: Bikomi Tengah and Bikomi Selatan Districts

Kota Kefamenanu District is a land area covering 2.77% of the total land area of Timor Tengah Utara Regency, situated at an altitude of about 700 meters above sea level. From a topographical perspective, the district is not a coastal area. The total area of Kota Kefamenanu District is 74.00 km², or 2.77% of Timor Tengah Utara Regency. Among its nine urban villages (kelurahan), Tubuhue and Kefamenanu Utara are the largest, each covering 12.00 km² (about 16.22% of the district's area). The smallest is Maubeli, with an area of 4.00 km² (about 5.40% of the district's area).

The climate in Kota Kefamenanu District is generally similar to that of Timor Tengah Utara Regency, which has a tropical climate with two main seasons: the rainy season and the dry season. In 2013, the district experienced moderate rainfall. Based on data from the Meteorology, Climatology, and Geophysics Agency (BMKG), Lasiana Climatology Station, Kupang, the rainfall in Kota Kefamenanu District in 2013 was 508 mm, with a total of 28 rainy days. The highest rainfall occurred in January, with 11 rainy days recorded.

Benpasi Village

Benpasi Village is part of Kota Kefamenanu District, Timor Tengah Utara Regency. It covers an area of 6 km² and, in 2020, was home to 5,675 people, with a population density of 946 people/km² (Source: Benpasi Village Profile, 2020). The administrative boundaries are as follows:

Table 1. Geographic Boundaries of Benpasi Village, Kota Kefamenanu District

Boundary	Village	District
North	Kefamenanu Utara	Kota Kefamenanu
South	Kefamenanu Selatan	Kota Kefamenanu
East	Bansone	Kota Kefamenanu
West	Aplasi	Kota Kefamenanu

(Source: Benpasi Village Profile, 2020)

The topography of Benpasi Village is generally lowland, flat, and slightly undulating, and it is not located in a coastal area. In general, the village lies at an elevation of 30 meters above sea level, with mostly flat terrain, making it suitable for agricultural use and settlement (Source: Benpasi Village Profile, 2020)

The climate in Benpasi Village is generally the same as in other areas of Timor Island, with two main seasons: the dry season and the rainy season. The dry season usually lasts from June to November, while the rainy season occurs from December to March. Transitional seasons occur twice a year, in

A G R I M E T A
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http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

April–May and October–November (Source: Benpasi Village Profile, 2020).

Based on data from Benpasi Village, the total population in 2020 was 5,675 people, consisting of 3,175 males (60%) and 2,500 females (40%). This composition shows a male-dominated sex ratio, reflecting a tendency for higher male participation in economic activities in the area, such as trade and services around Pasar Baru Kefamenanu (Source: Benpasi Village Profile, 2020).

Respondents' Characteristics

The characteristics of respondents in this study are presented descriptively based on the data obtained during the research. The data were collected directly from respondents through questionnaires prepared by the researcher. Each respondent provided different answers to the research instruments, requiring classification to generally identify attributes such as gender, age, education level, and number of family dependents. In this study, a total of 30 respondents participated.

Age

Age is one of the respondent characteristics that greatly influences traders' performance in running their businesses. Younger traders generally have greater physical capacity to perform activities required in market trading, such as loading, unloading, and arranging goods, which demand significant physical strength and are ideally carried out by younger individuals.

In addition, younger traders tend to adopt new technologies more quickly, such as using social media for promotion or digital applications for financial recording, compared to older traders. According to the Central Statistics Agency (BPS), the productive age group falls between 15 and 64 years. The characteristics of carrot traders at Pasar Baru Kefamenanu based on age are shown in the table 2 below:

Based on Table 2, out of 30 respondents, the majority of carrot traders (24 people or 80%) were within the productive age range of 15–64 years. This group is considered capable of handling trading activities and more receptive to adopting innovations. Meanwhile, 6 respondents (20%) were above 65 years old, who typically have physical limitations in carrying out activities requiring high mobility and tend to be less responsive to innovations.

Table 2. Characteristics of Respondents by Age

No	Age (years)	Number of Respondents (people)	Percentage (%)
1	<15	0	0
2	15–64	24	80
3	>65	6	20
	Total	**30**	**100**

(*Source: Processed Primary Data, 2025)*

This finding aligns with Umbu Maramba (2018), who stated that older entrepreneurs (>65 years) tend to be slower in adopting new knowledge or innovations and prefer to continue using traditional methods familiar within their community. Therefore, although most carrot traders at Pasar Baru Kefamenanu are at an age conducive to optimizing business operations, the role and contributions of older traders remain important, especially in terms of experience and proven trading strategies.

Gender

Gender refers to a person's identity based on sex as stated in their birth certificate. The results of this study showed that the majority of carrot traders were female, with 28 respondents. Male traders accounted for only 2 respondents. This indicates that men were less involved in trading activities compared to women.

This tendency is consistent with research by Arumsari & Sumaryanto (2020), which found that women play a significant role in trading activities in traditional markets, especially in the agricultural sector. Similarly, Nurjanah (2017) highlighted that women's dominance in agricultural trade in markets is due to flexible time management, social interaction skills, and practical abilities in managing sales transactions in traditional markets.

Education Level

The education level of traders refers to the formal education attained by carrot traders at Pasar Baru Kefamenanu. The higher the level of education, the more ideas and creativity traders tend to have in increasing their income. The

AGRIMETA
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http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

following are the characteristics of respondents based on their education level.

Table 3. Characteristics of Respondents Based on Education Level

No	Education Level	Number of Respondents (people)	Percentage (%)
1	Elementary School (SD)	13	43.3
2	Junior High School (SMP)	4	13.4
3	Senior High School (SMA)	13	43.3
	Total	**30**	**100.0**

(Source: Processed Primary Data, 2025)

Based on Table 3, the majority of respondents had an education level at the elementary school (SD) level, with 13 respondents (43.3%). Four respondents (13.3%) had junior high school (SMP) education, and 13 respondents (43.3%) had senior high school (SMA) education. This indicates that the education level of traders in Pasar Baru Kefamenanu is relatively low, dominated by elementary and high school graduates.

Gusti et al. (2021) stated that traders with higher education levels generally have a more open mindset in adopting innovations and are quicker in applying new technologies, which can improve and advance agricultural outcomes. This is in line with Soekartawi (2006), who emphasized that education influences farmers' mindset in accepting innovations and implementing new ideas. However, this contrasts with the findings in the study area, where carrot traders at Pasar Baru Kefamenanu generally had low levels of education, with most respondents being only elementary and high school graduates.

Trading Experience

Trading experience is one of the important factors that influence a trader's success in managing their business. The longer the experience, the more knowledge and skills a trader possesses, especially in facing market challenges and making appropriate decisions. Experience also helps traders recognize market demand patterns, manage stock, and apply more efficient sales strategies to increase income. In addition, experienced traders are usually wiser in adopting new technologies and management strategies suited to market and trade conditions (Komendangi et al., 2024).

The length of trading refers to how long a carrot trader has been running their business, thus gaining more experience in the trade sector. In this study, the length of trading was not found to significantly affect income levels.

Table 4. Characteristics of Respondents Based on Trading Experience at Pasar Baru Kefamenanu

No	Trading Experience (Years)	Number of Respondents (people)	Percentage (%)
1	<5	4	13.3
2	5–10	11	36.7
3	>10	15	50.0
	Total	**30**	**100.0**

(Source: Processed Primary Data, 2025)

Based on Table 4, the majority of respondents (50%) had more than 10 years of trading experience, showing that most traders are experienced. Only a small number of respondents had less than 10 years of experience. Soehardjo (2007) classified trading experience into three categories: less experienced (<5 years), moderately experienced (5–10 years), and experienced (>10 years). From the data, most respondents at Pasar Baru Kefamenanu fall into the "experienced" category, with 15 traders (50%) having more than 10 years of trading experience.

Family Dependents

According to Sari et al. (2022), the number of family dependents refers to the number of individuals financially supported by a respondent to meet their daily needs. Family dependents can be categorized into three groups (BPS, 2017): small (1–3 dependents), medium (4–6 dependents), and large (more than 6 dependents).

Based on Table 5, most respondents had 1–3 dependents, totaling 15 respondents (50%). Eleven respondents (37%) had 4–6 dependents, and four respondents (13%) had more than 6 dependents. This indicates that the majority of carrot traders in the study area had a small number of family dependents.

A G R I M E T A
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http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

Table 5 Characteristics of Respondents Based on Number of Family Dependents

No	Number of Dependents	Number of Respondents (people)	Percentage (%)
1	1–3	15	50
2	4–6	11	37
3	>6	4	13
	Total	**30**	**100**

(Source: Processed Primary Data, 2025)

Hana et al. (2023) stated that the number of dependents does not always directly increase income but can motivate traders, since more dependents mean greater daily needs to fulfill. Taralandu and Saragih (2024) noted that family members are not only dependents but can also serve as a source of labor, helping in trade activities such as selling carrots, thus supporting business continuity and improving traders' productivity.

Traders' Income Analysis

Income analysis among carrot traders is needed to determine the difference between the revenue earned and the expenses incurred during trading. Through this analysis, traders can develop better business management strategies. To analyze traders' income, all components of production costs and revenues must first be identified.

Cost Analysis

Business costs for carrot traders consist of total expenditures made to generate profits. These can be divided into fixed costs, which are not affected by production volume, and variable costs, which vary with production levels (Suratiyah, 2011).

Fixed Costs

Fixed costs are expenses incurred by carrot traders that remain constant regardless of production levels. At Pasar Baru Kefamenanu, fixed costs mainly included depreciation of equipment and market fees.

Based on Table 6, the fixed cost components for carrot traders at Pasar Baru Kefamenanu consist of equipment depreciation, namely scales (*dacing*) and tarpaulins used by traders in their activities. The data show that the fixed costs borne by carrot traders at Pasar Baru Kefamenanu include two components: depreciation costs and market fees or tax levies. The depreciation component includes scales with a total cost of Rp. 3,290, averaging Rp. 110 per respondent, and tarpaulins with a cost of Rp. 4,762, averaging Rp. 159 per respondent. Meanwhile, market fees or taxes amounted to Rp. 60,000, averaging Rp. 2,000 per respondent. Thus, the total fixed costs incurred reached Rp. 68,682, with an average of Rp. 2,268 per respondent.

Table 6 Average Fixed Costs of Carrot Traders at Pasar Baru Kefamenanu

No	Fixed Cost Component	Total (Rp)	Average (Rp)
1	Depreciation:		
	- Scale	3,290	110
	- Tarpaulin	4,762	159
2	Market fee (ticket)	60,000	2,000
	Total	**68,682**	**2,268**

(Source: Processed Primary Data, 2025)

Variable Costs

In addition to fixed costs, there are also variable costs incurred by carrot traders at Pasar Baru Kefamenanu. These include carrot purchase costs, transportation costs, and packaging costs (plastic bags). Variable costs are expenses that are not fixed but instead depend on production levels. The average variable costs of carrot traders at Pasar Baru Kefamenanu can be seen in Table 4.7 below:

Table 7. Average Variable Costs of Carrot Traders at Pasar Baru Kefamenanu

No	Variable Cost Component	Total (Rp)	Average (Rp)
1	Transportation	1,620,000	54,000
2	Carrot purchase	17,520,000	548,000
3	Plastic bags	267,000	8,900
	Total	**19,407,000**	**610,900**

(Source: Processed Primary Data, 2025)

Based on Table 7, the data present the components of variable costs incurred by carrot traders in running their businesses at Pasar Baru Kefamenanu. Variable costs are expenses that change depending on the production volume or sales of carrots. These include transportation costs, carrot purchase costs, and plastic bag costs. The data were collected from 30 respondents, providing an average picture of the traders' conditions at Pasar Baru Kefamenanu.

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Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

The transportation cost amounted to a total of Rp. 1,620,000, with an average of Rp. 54,000 per trader, used to transport carrots from the purchase location to the market. The cost of purchasing carrots, with a total production volume of 1,213 kg, averaged 40 kg per trader, at a purchase price of Rp. 15,000 per kilogram, leading to a total purchase cost of Rp. 17,520,000 (for all 30 traders), or an average of Rp. 584,000 per respondent. Meanwhile, the cost of plastic bags amounted to 89 units in total, averaging 3 units per trader, with a price of Rp. 3,000 per unit. This resulted in a total plastic bag cost of Rp. 267,000, averaging Rp. 8,900 per trader. Thus, the total variable costs reached Rp. 19,407,000, with an average of Rp. 610,900 per respondent.

Revenue of Carrot Traders at Pasar Baru Kefamenanu

Revenue is the total value of production obtained from an activity at the prevailing price. In the context of carrot trading, revenue refers to the total sales value of carrots within a certain period, expressed in monetary terms. Revenue is calculated by multiplying the volume of carrots sold by the selling price per unit.

This serves as a key indicator for measuring the financial performance of carrot trading businesses. If revenue is greater than total costs, traders earn a profit. Conversely, if revenue is less than costs, traders incur a loss. Therefore, the amount of revenue is strongly influenced by sales volume and price fluctuations in the market.

Table 8. Average Revenue of Carrot Traders at Pasar Baru Kefamenanu

Description	Production (Kg)	Price (Rp)	Revenue (Rp)
Total	1,213 Kg	25,000	30,325,000
Average	40.4 Kg	25,000	1,010,833

(Source: Processed Primary Data, 2025)

Based on Table 8, the data present the components of variable costs incurred by carrot traders in running their businesses at Pasar Baru Kefamenanu. Variable costs are expenses that change depending on the production volume or sales of carrots. These include transportation costs, carrot purchase costs, and plastic bag costs. The data were collected from 30 respondents, providing an average picture of the traders' conditions at Pasar Baru Kefamenanu.

The transportation cost amounted to a total of Rp. 1,620,000, with an average of Rp. 54,000 per trader, used to transport carrots from the purchase location to the market. The cost of purchasing carrots, with a total production volume of 1,213 kg, averaged 40 kg per trader, at a purchase price of Rp. 15,000 per kilogram, leading to a total purchase cost of Rp. 17,520,000 (for all 30 traders), or an average of Rp. 584,000 per respondent. Meanwhile, the cost of plastic bags amounted to 89 units in total, averaging 3 units per trader, with a price of Rp. 3,000 per unit. This resulted in a total plastic bag cost of Rp. 267,000, averaging Rp. 8,900 per trader. Thus, the total variable costs reached Rp. 19,407,000, with an average of Rp. 610,900 per respondent.

Income of Carrot Traders at Pasar Baru Kefamenanu

Revenue is the total value of production obtained from an activity at the prevailing price. In the context of carrot trading, revenue refers to the total sales value of carrots within a certain period, expressed in monetary terms. Revenue is calculated by multiplying the volume of carrots sold by the selling price per unit.

This serves as a key indicator for measuring the financial performance of carrot trading businesses. If revenue is greater than total costs, traders earn a profit. Conversely, if revenue is less than costs, traders incur a loss. Therefore, the amount of revenue is strongly influenced by sales volume and price fluctuations in the market.

Table 9. Average Income of Carrot Traders at Pasar Baru Kefamenanu

No	Description	Total Cost (Rp)	Average (Rp)/Respondent
1	Revenue (TR)	30,325,000	1,010,833
2	Costs (TC)	19,475,051	649,168
	Income (π)	**10,849,949**	**361,655**

(Source: Processed Primary Data, 2025)

Based on Table 9, the data show the total and average revenue, total costs, and income of carrot traders at Pasar Baru Kefamenanu. The total

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

revenue earned by traders from carrot sales amounted to Rp. 30,325,000, with an average revenue of Rp. 1,010,833 per respondent. Meanwhile, the total costs incurred by traders for trading expenses reached Rp. 19,475,051, with an average cost of Rp. 649,168.

The income received by traders was calculated as the difference between total revenue and total costs. Thus, the total net income earned by respondents was Rp. 10,849,949, with an average income of Rp. 361,655 per respondent. The results of this study indicate differences in income compared to the study conducted by Saragih et al. (2022). In that study, the income per respondent was smaller, at only Rp. 649,168 of the total income.

Feasibility Analysis of Traders' Businesses

The purpose of feasibility analysis is to assess whether a business activity is viable to operate from financial, technical, market, and management perspectives. The feasibility of carrot traders' businesses was analyzed from an economic-financial standpoint, focusing on efficiency and profitability indicators, namely the Break-Even Point (BEP) and the Revenue-Cost (R/C) Ratio.

***Break-Even Point* (BEP)**

The Break-Even Point (BEP) represents the point at which carrot traders neither gain profit nor incur a loss, meaning total revenue equals total costs. BEP is divided into production break-even and price break-even.

Table 10. Break-Even Point of Carrot Traders at Pasar Baru Kefamenanu

No	Description	Value (Rp)
1	BEP Production (Kg) = FC / (P – VC)	29.9 Kg
2	BEP Price (Rp/Kg) = FC / (1 – VC/P)	288,918.133

(Source: Processed Primary Data, 2025)

Based on Table 10, the BEP production value of 29.9 kg is smaller than the average production of 40.4 kg, indicating that carrot trading is profitable and feasible. Carrot traders have also surpassed the break-even point in terms of price, with a minimum revenue of Rp. 288,918.133. This shows that traders bear relatively high cost structures, which make the BEP appear large. Nevertheless, carrot trading remains profitable and feasible. In contrast, previous studies showed BEP production and BEP price values that were closer to the target production and set prices.

R/C Ratio

In business feasibility analysis, the Revenue-Cost (R/C) Ratio is one of the most common indicators used to evaluate efficiency and profitability. The R/C Ratio shows the comparison between total revenue and total operating costs.

The criteria for interpreting the R/C Ratio are as follows:

- If R/C > 1, the business is profitable and feasible.
- If R/C = 1, the business is at break-even (no profit, no loss).
- If R/C < 1, the business is not feasible and operates at a loss.

The R/C Ratio analysis provides an overview of the sustainability of carrot trading. If the R/C Ratio value is greater than 1, carrot trading is considered feasible. The R/C Ratio is calculated by dividing the total revenue by the total costs incurred by traders. By increasing total revenue and reducing total production costs, carrot traders can achieve higher R/C Ratio values.

Table 11. Feasibility of Carrot Traders at Pasar Baru Kefamenanu

No	Description	Value (Rp)
1	Avg. Revenue (TR)	1,010,833
2	Avg. Costs (TC)	649,168
	R/C Ratio (TR/TC)	**1.55**

(Source: Processed Primary Data, 2025)

Based on Table 11, it can be seen that carrot traders at Pasar Baru Kefamenanu are financially feasible. The average total revenue was Rp. 1,010,833, while the average total cost was Rp. 649,168, resulting in a revenue-to-cost ratio of 1.55. Since the R/C Ratio is greater than 1, carrot trading at Pasar Baru Kefamenanu is feasible to operate.

In previous studies reviewed (Marhawati et al., Ismail et al., and Amiruddin et al.), the R/C Ratio ranged from 1.13 to 2.15, which also indicated that carrot trading was feasible, though with relatively small profit margins. Meanwhile, in this study at Pasar Baru Kefamenanu, the R/C Ratio was 1.55, which is well above the feasibility threshold (>1). Thus, carrot trading at Pasar Baru Kefamenanu is financially feasible and profitable.

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 52-62 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

CONCLUSION AND RECOMMENDATION

Based on the analysis and discussion, the following conclusions can be drawn:

1. The income of carrot traders at Pasar Baru Kefamenanu is profitable. The average net income obtained from carrot sales was Rp. 361,655 per day, with an average total revenue of Rp. 1,010,833 and an average total cost of Rp. 649,168 per trader.
2. Carrot trading at Pasar Baru Kefamenanu is financially feasible. Based on the Break-Even Point (BEP) analysis, traders have exceeded the production break-even point (29.9 kg) with an average production of 40.4 kg. Meanwhile, the R/C Ratio analysis showed a value of 1.55, meaning that for every Rp. 1 of cost incurred, traders earned Rp. 1.55 in revenue, or a surplus of 25%. Therefore, this business is feasible to continue and develop

1. **For Traders**
   - It is recommended to continue developing business strategies to increase income, such as expanding marketing networks and maintaining the quality of products sold.
   - Utilize simple technology, such as digital financial recording, to manage income and expenses more efficiently.
2. **For the Government**
   - Entrepreneurship training, financial management workshops, and access to capital should be provided to market traders, especially those with lower education levels.
   - Provide supporting facilities in markets, such as proper storage areas and transportation subsidies, to reduce distribution costs.
3. **For Future Researchers**
   - Future studies should expand the scope, for example, by comparing carrot traders with other commodity traders or other traditional markets in the TTU region.
   - Additional variables such as price fluctuations, planting seasons, or the impact of government policies on traders' income could also be included.

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SOCIAL MEDIA MARKETING INFLUENCE ON CONSUMER PURCHASE INTENTION AT KOPISAA

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Abstract

Technological developments in Indonesia show that *digital marketing* and *social media marketing* have developed rapidly in Indonesia, but in Kopisaa only around 20% - 30% of social media followers often interact so it is not possible to know specifically the increase in purchasing intention that occurred. Therefore, this research seeks to identify the impact of *social media marketing* based on *the aspects of Context, Communication, Collaboration, and Connection* on the purchasing intention of Kopisaa consumers. This study is quantitative and applies *purposive sampling* as a *non-probability sampling* method so that it uses data from 93 respondents with certain criteria obtained through a questionnaire. *Structural Equation Modeling* (SEM) was employed for data analysis model test to analyze one or more variables simultaneously. The results showed that 59.4% of the Purchasing intention variables were influenced by the aspects of *Context* (X1), *Communication* (X2), *Collaboration* (X3), and *Connection* (X4). The hypothesis test conducted that *the Context* and *Connection* aspects had a positive and significant influence on the purchasing intention of Kopisaa consumers, while *the Communication* and *Collaboration* aspects had a positive but insignificant influence. These results confirm that marketing through social media has a positive influence on consumer purchasing intention.

Keywords: *Consumer, Digital, Marketing, Purchase Intention, Social Media*.

Introduction

The development of technology in Indonesia has experienced rapid progress, resulting in a significant increase in internet users. At the beginning of 2024, the number of internet users in Indonesia was estimated at 185.3 million, of which 139 million were social media users. The comparison between the total number of internet users and Indonesia's total population of 278.7 million shows a relatively high proportion of internet penetration, reaching 66.5% in early 2024 (we are social & Meltwater, 2024)

The advancement of internet usage has brought connectivity and transparency into various aspects of life, enabling a shift where exclusivity becomes inclusivity, information dissemination moves from vertical to horizontal, and consumer behavior transitions from individualistic to more social. With the growth of social media that overcomes geographical and demographic barriers, markets have become more inclusive, allowing the general public and companies to innovate through collaboration. Consumers tend to be more horizontally oriented as they rely more on information from friends, family, fans, and followers rather than on a brand's marketing campaigns. Furthermore, consumers have become more socially driven, paying attention to social trends when making decisions (Kotler et al., 2019)

Internet usage is driven by several reasons, not only for seeking information and connecting with friends or family. Searching for product and brand information has become the primary reason for 46.1% of internet users in Indonesia. Moreover, 81% of Indonesian internet users frequently visit shopping, auction, or similar websites and applications. Data also indicates that within a week, Indonesian internet users engage in online shopping activities, with around 59.3% purchasing goods or services online, 34.4% purchasing groceries, and 10.8% purchasing second-hand goods online (we are social & Meltwater, 2024)

The promotion of a brand through the internet and digital technologies is known as digital marketing. It has become a widely adopted marketing strategy among companies. Social media is the most frequently used option when entering the digital marketing landscape, as it provides an effective means of reaching the target market (Poltak et al., 2021)

Social media marketing is considered capable of influencing consumers' purchase intention toward a

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 63-69 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

brand's products or services. Purchase intention refers to consumers' behavioral tendency to buy certain products or services, which can be stimulated by supporting information about the existence of those products or services (Fauzy & Soebiagdo, 2024)

Social media marketing is not merely about posting on social platforms. According to Chris Heuer in Solis (2011) social media use involves four dimensions that influence marketing activities, namely Context, Communication, Collaboration, and Connection. Empirical evidence from Meirani (2022) and Reniawati et al., (2024) indicates a positive and significant relationship between social media marketing and purchase decisions.

Since 2019, to increase consumers' purchase intention, the Kopisaa team has adopted social media marketing strategies. Furthermore, Kopisaa's business activities, which fall under the downstream agribusiness subsystem by marketing processed agricultural products in the form of food and beverages, have developed into a consumer community by utilizing social media accounts as a medium to stay connected with their customers. Through various posts, Kopisaa has managed to reach 1,232 followers, who are also its consumers (*@kopisaa*, 2025). Based on pre-survey data obtained by the author from the Kopisaa team, only about 20%–30% of social media followers frequently communicate via Direct Message and interact through post comments. Thus, the increase in purchase intention cannot be specifically identified.

Based on the aforementioned phenomenon, Consumer purchase intention at Kopisaa is analyzed in relation to social media marketing aspects, namely Context, Communication, Collaboration, and Connection.

Materials and Methods

This study took place at Kopisaa, a café located on Jl. Sukarno, Kota Lama District, Kupang City. The research period took place from March 2025 until completion. Kopisaa was selected as the research site based on the consideration that it is a downstream agribusiness enterprise actively engaged in marketing through social media.

A questionnaire employing a Likert scale was used to collect the data. The sample was determined using purposive sampling, and 10% margin of error was applied in calculating the sample size using the Slovin formula, considering the population as Kopisaa consumers who demonstrate purchase intention influenced by social media marketing conducted via @Kopisaa. Therefore, the total of 1,232 Instagram followers of Kopisaa was designated as the population. The formula is as follows:

$$n = \frac{N}{Ne^2 + 1}$$

Where:
n = sample size
N = known population size
e = margin of error

By applying the formula:

$$n = \frac{1{,}232}{1{,}232(0.1)^2 + 1} = \frac{1{,}232}{13.32} = 92.49 \approx 93$$

Thus, a total of 93 respondents were included in this study based on the following criteria:

a. Following the Instagram account Kopisaa
b. Aged 18 years and above
c. Active social media user

This research applies a quantitative methodology with data analysis conducted using SEM-PLS via SmartPLS software. Harahap (2020), defines SEM as a multivariate analytical approach capable of testing one or more variables concurrently. The SEM modeling process consists of:

1. Measurement Model (Outer Model): used to assess the validity and reliability of variables. According to Statistikian (2021), the outer model is evaluated based on:
   a. *Convergent Validity,* fulfilled if outer loading ≥ 0.7
   b. *Construct Reliability,* measured using *Composite Reliability* and *Cronbach's Alpha*, both of which must be ≥ 0.7
   c. *Discriminant Validity,* achieved when the square root of AVE exceeds the correlations between variables
   d. *Avarage Variance Extracted* (*AVE*), is considered acceptable when its value exceeds 0.5
2. Structural Model (Inner Model): used to describe hypothesized relationships through various statistical tests.

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 63-69 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

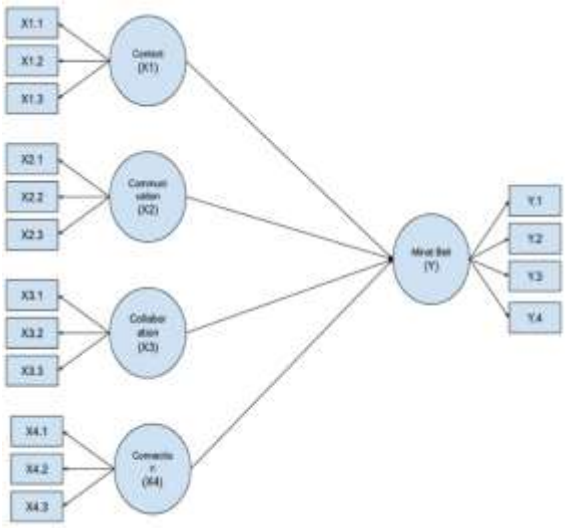

Figure 1. Basic Conceptual Model

Where:
X1, ..., X4 = Exogenous latent variables
X1.1, ..., X4.3 = Manifest variables
Y = Endogenous latent variable
Y.1, ..., Y.4 = Manifest variables

To address the research problem on a provisional basis, this study formulates the following hypotheses:

H_1 = The context dimension of social media marketing has a positive and significant effect on purchase intention.

H_2 = The communication dimension of social media marketing has a positive and significant effect on purchase intention.

H_3 = The collaboration dimension of social media marketing has a positive and significant effect on purchase intention.

H_4 = The connection dimension of social media marketing has a positive and significant effect on purchase intention.

Results and Discussion

Respondent Characteristics

The characteristics of respondent describe the condition of Kopisaa's customers who participated in this study. The respondents interviewed have the following characteristics:

Age

The majority of respondents fall within the younger age group, specifically between 18–28 years old, accounting for 65.65% of the total respondents. This age group represents the productive generation that is highly active in using the internet and social media in their daily lives, and tends to have a strong interest in ongoing trends. The dominance of this age group indicates that Kopisaa's primary customers are young individuals who are highly responsive to digital approaches, particularly social media marketing.

Educational Level

The respondents generally have relatively high educational attainment. Most of them hold a bachelor's degree (52.52%), followed by high school graduates (36.36%), diploma holders (5.05%), master's degree graduates (3.03%), and professional program graduates (1.01%). This level of education suggests that the majority of Kopisaa's consumers possess good information literacy, enabling them to critically evaluate and interpret content delivered through social media. Such a condition supports the effectiveness of Kopisaa's information-based marketing strategies, including educational content, brand storytelling, and value-added messaging.

Social Media Usage

All respondents are social media users, indicating that Kopisaa's customers can be effectively reached and engaged through social media platforms. Their habitual interaction on social media enhances the potential for building strong relationships between Kopisaa and its consumers, both through shared content and direct engagement features such as comments and direct messages.

Following Kopisaa's Social Media Accounts

The majority of respondents, 94 out of 99 in total, follow Kopisaa's social media accounts. This demonstrates that Kopisaa's accounts play a key role in disseminating information while reaching a diverse customer audience regarding its products and activities. With such a significant proportion of active followers, there is a greater opportunity to build long-term relationships through consistent and interactive content.

In addition, six respondents were excluded from the analysis due to not meeting the required criteria. The final analysis was conducted with 93 qualified respondents.

SEM-PLS Model Evaluation

The evaluation of the SEM-PLS model involves several steps. The first step is assessing the measurement model results. Each variable must meet specific criteria, and once these are satisfied, the structural model is evaluated (Hair et al., 2019)

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 63-69 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

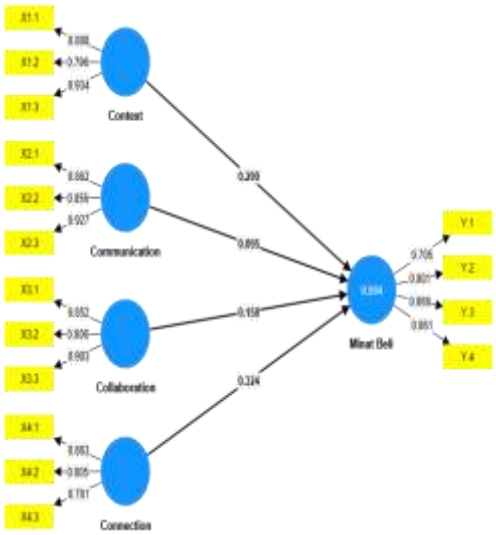

Figure 2. Path Diagram

The SEM-PLS measurement model is utilized to ensure the validity and reliability of the research variables. Convergent validity, AVE, and discriminant validity are employed to assess validity, while construct reliability is used to measure reliability.

Convergent Validity

Convergent validity is evaluated through outer loadings that represent the degree of association between indicators and the underlying constructs. A recommended threshold is ≥ 0.7 (Hair et al., 2019).

All indicators presented in the path model (Figure 2) meet the validity standard, as evidenced by outer loading values exceeding 0.7.

Average Variance Extracted (AVE)

The extent to which indicators explain variance in each variable is assessed through AVE to determine convergent validity. An AVE value ≥ 0.5 is considered acceptable, as it means more than half of the indicators' variance is explained by the variable (Hair et al., 2019)

Table 1. Average Variance Extracted

Variabel	AVE	√AVE
X1	0.720	0.849
X2	0.778	0.882
X3	0.731	0.885
X4	0.668	0.817
Y	0.668	0.811

Table 1 presents the AVE values for each variable, all of which exceed 0.5, confirming their validity in measure the data distribution for each indicator.

Discriminant Validity

Discriminant validity tests whether a latent variable is distinct from others. The Fornell–Larcker criterion is applied by comparing the square root of AVE values with the correlations between variables. A construct is valid when √AVE > inter-variable correlation (Statistikian, 2021)

Table 2. Fornell-Larcker Criterion

	X1	X2	X3	X4	Y
X1	**0.849**				
X2	0.585	**0.882**			
X3	0.667	0.715	**0.855**		
X4	0.678	0.753	0.805	**0.817**	
Y	0.671	0.622	0.680	0.719	**0.811**

Table 2 demonstrates that all variables (X1, X2, X3, X4, Y) have √AVE values greater than their correlations, indicating uniqueness and the ability to explain the studied phenomena.

Construct Reliability

Construct reliability refers to the degree of consistency and dependability of indicators in measuring the variables. This reliability is assessed using composite reliability and Cronbach's alpha, where composite reliability (rho_a) is viewed as a more reliable measure with a minimum threshold of 0.7 (Hair et al., 2019)

Table 3. Construct Reliability

Variabel	Cronbach's Alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
X1	0.805	0.868	0.885
X2	0.857	0.868	0.913
X3	0.816	0.834	0.890
X4	0.752	0.764	0.857
Y	0.826	0.845	0.884

Table 3 shows that all variables meet this criterion, proving that the indicators are reliable in measuring their respective constructs.

The R-square value is used to test the structural model, which reflects the relationships among variables in the research framework.

R-square

The R-square value indicates how much of the variance in an endogenous variable is explained by exogenous variables. Thresholds are 0.75 (substantial), 0.50 (moderate), and 0.25 (weak) (Hair et al., 2019)

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 63-69 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

Table 4. R-square

Variabel	R-square
Purchase Intention (Y)	0.594

Table 4 shows that Purchase Intention (Y) has an R-square of 0.594, meaning 59.4% of its variance is explained by Context (X1), Communication (X2), Collaboration (X3), and Connection (X4). The remaining 40.6% is explained by other variables not included in this study.

Hypothesis Testing

Hypothesis testing was conducted using the Bootstrapping method in SmartPLS, based on T-statistics and P-values at a 5% significance level (α = 0.05). A hypothesis is accepted if T-statistics > T-table and P-value < 0.05.

Table 5. Hypothesis Testing Results

Variabel	Original Sample	T statistics	P Value	Description
X1 → Y	0.290	2.708	0.007	Positive and Significant
X2 → Y	0.095	0.791	0.429	Positive but Insignificant
X3 → Y	0.158	1.150	0.250	Positive but Insignificant
X4 → Y	0.324	2.276	0.023	Positive and Significant

Based on Table 5, the value of *original sample, P value, T-statistics,* and *T-table* for 5% significance level with df = 87 are 1,987. The result can be explained as follow:

1. **The context dimension of social media marketing has a positive and significant effect on purchase intention.**

   The original sample value of 0.290 shows that increasing Context by one unit results in a positive change of 0.290 in Purchase Intention. With T-statistics = 2.708 > T-table and P-value = 0.007 < 0.05, the effect is significant. Thus, H1 is supported.

2. **The communication dimension of social media marketing has a positive and significant effect on purchase intention.**

   The original sample value of 0.095 indicates a positive relationship, but T-statistics = 0.791 < T-table and P-value = 0.429 > 0.05 show insignificance. Thus, H2 is rejected.

3. **The collaboration dimension of social media marketing has a positive and significant effect on purchase intention.**

   The original sample value of 0.158 indicates a positive relationship, but T-statistics = 1.150 < T-table and P-value = 0.250 > 0.05 show insignificance. Thus, H3 is rejected.

4. **The connection dimension of social media marketing has a positive and significant effect on purchase intention.**

   The original sample value of 0.324 indicates that an increase of one unit in Connection positively influences Purchase Intention by 0.324. With T-statistics = 2.276 > T-table and P-value = 0.023 < 0.05, the effect is significant. Thus, H4 is supported.

The Effect of Context on Purchase Intention

The research findings demonstrate that context in social media marketing has a positive and significant effect on consumers' purchase intention at Kopisaa. This means that the better the context presented in Kopisaa's social media marketing, the more consumers are able to understand, process, and respond to the information provided, which ultimately stimulates their purchase intention. Conversely, when the context is poor, consumers find it difficult to interpret and respond to the information, thereby reducing their intention to purchase.

The results indicate that indicators such as relevance, informativeness, and attractiveness all have strong relationships with the context variable. Posts that are informative, engaging, and relevant to consumers' needs tend to receive greater engagement, such as likes, comments, and shares. This shows that consumers appreciate content that is both relevant and meaningful, thereby reinforcing their purchase intention.

Consistent results were also reported in the research by Othysalonika et al., (2022) which revealed that context in social media marketing significantly influences purchase intention. Similarly, Firdaus & Jumhur (2021) found that the context of social media marketing had a significant effect on purchase decisions among Tokopedia users.

The Effect of Communication on Purchase Intention

Findings reveal a positive yet statistically insignificant influence of social media marketing communication on consumers' purchase intention at Kopisaa. This suggests that although responsiveness, clarity, and ease of communication are valued by consumers, the level of communication implemented by Kopisaa is still not optimal, and therefore its effect on purchase intention is not significant.

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 63-69 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

This finding differs from those of prior researches, including Othysalonika et al., (2022) as well as Firdaus & Jumhur (2021) which showed that purchase intention was significantly influenced by communication in social media marketing. The results of this research imply that in order for communication to have a significant impact, Kopisaa needs to strengthen its communication strategies, for example by being more responsive to consumer inquiries, providing clearer information, and actively engaging in two-way interactions.

The Effect of Collaboration on Purchase Intention

Findings indicate a positive yet statistically insignificant influence of social media marketing collaboration on consumers' purchase intention at Kopisaa. It indicates that while collaborative activities such as partnerships, joint promotions, or customer engagement can potentially enhance consumer interest, the current level of collaboration carried out by Kopisaa has not been sufficient to significantly influence purchase intention.

This result contrasts with the findings of Firdaus & Jumhur (2021) who reported that collaboration in social media marketing significantly influenced purchase decisions. Based on this, it can be concluded that in order to make collaboration more impactful, Kopisaa should intensify and optimize collaborative activities with influencers, other brands, or customers themselves, so that consumers feel more engaged and motivated to purchase.

The Effect of Connection on Purchase Intention

The findings of this study show that connection in social media marketing has a positive and significant effect on consumers' purchase intention at Kopisaa. This indicates that interpersonal relationships, consumer involvement, and emotional attachment fostered via Kopisaa's social media positively enhance consumers' purchase intention.

This is in line with the research of Othysalonika dkk. (2022) as well as Firdaus & Jumhur (2021) which both concluded that consumers' purchase intentions are strongly influenced by connection within social media marketing. Maintaining long-term relationships with consumers, providing personalized experiences, and creating meaningful interactions are crucial for building loyalty and driving purchase intentions.

Conclusion and Recommendation

This study concludes that the influence of social media marketing on purchase intention at Kopisaa is shaped by the dimensions of **Context, Communication, Collaboration,** and **Connection**. Consumers' purchase intention is positively and significantly influenced by the **Context** and **Connection** dimensions. This indicates that relevant messages and well-established relationships between SMEs and consumers are able to increase consumers' interest in making purchases. Meanwhile, the aspects of **Communication** and **Collaboration** show a positive but insignificant influence on consumers' purchase intention. This suggests that although communication and collaboration on social media can strengthen interactions and expand marketing reach, their impact on purchase intention remains weak when the quality of interaction and engagement is still low.

Based on these findings, The following recommendations are proposed for improving social media marketing practices at Kopisaa and for future research:

1. For Business Practioners
   Social media marketing implemented by Kopisaa shows a positive but not yet significant effect in terms of communication and collaboration. Therefore, this study is expected to serve as a reference for improvements in future social media marketing practices, such as appointing dedicated social media administrators who can provide responsive and interactive engagement with consumers.
2. For Future Reseachers
   The author acknowledges that the results of this study are not without limitations. Hence, future researchers who use this study as a reference are encouraged to explore different aspects as exogenous variables and to consider incorporating mediating or moderating variables in their research models.

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Callus Induction Of Phalaenopsis Stem (Phalaenopsis sp.) With NAA And TDZ Growth Regulatory In Vitro

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ABSTRACT

Orchid is an ornamental plant that is much favored by the wider community. Orchid flowers have a variety of interesting colors, shapes, and flower patterns. Cultivation is relatively long and requires special treatment. The purpose of this study was to determine the effectiveness of the explant sterilization method using fungicides and fungicides + HgCl2 to determine the response to explants by analyzing data using SPSS version.26 with ANOVA p-value <0.05, followed by Duncan's test to distinguish the average between treatments. o it requires propagation by tissue in vitro. The research design used in this study was RAL by tissue culture or in vitro using a flower stalk sample of the moon orchid (Phalaenopsis sp.) with K0 treatment, TN (TDZ 0.5 ppm, 1 ppm, 3 ppm + NAA 5 mg/L) and T (TDZ 0,5 ppm, 1 ppm, 3 ppm) and with fungicide explant sterilization method 35 replicates and fungicide explant sterilization method + HgCl2 35 replicates. The results of tissue culture research on the response of explants with the fungicide sterilization method (p>0.05), while the results of the fungicide + HgCl2 response did not produce a bubble response because the explants were contaminated and browning. The results of the effectiveness of contamination in sterilization using fungicides (p<0.05), while fungicides + HgCl2 (p>0.05). The results of the effectiveness of browning on sterilization using fungicides and a combination of fungicides + HgCl2 (p>0.05).

Keywords: *Propagation, orchids, tissue culture, hormone*.

INTRODUCTION

Phalaenopsis sp. is one of the ornamental plants that has many species in the world. In addition to natural species, the Phalaenopsis sp. It has many hybrids that make these orchids diverse in color and shape of flowers. The beauty and beauty of its flowers make this plant called the "queen of flowers", so it continues to be in demand, especially by orchid hobbyists. The market demand for orchids tends to continue to increase every year, so that the selling value remains high in the market (Putra et al., 2016).

Phalaenopsis flower stalks grow from stems that come from the axils of leaves and generally carry three to six dormant books and buds, as well as three to twenty-five or more florets

After the first flowers wilt and fall off, the bud eyes on the stalk of the Phalaenopsis flower have the potential to break and grow into keiki or new flower panicles. However, the growth of bud eyes into keiki or flower panicles is only tempted by the environmental temperature and nutritional status of the plant. So orchid stalks must be propagated in facilities that contain a lot of nutrients and the appropriate concentration of ZPT. One alternative that can be done is to propagate orchids together with tissue culture or in vitro methods (Kurniasih et al., 2017).

Figure 2.1 Moon Orchid (Phalaenopsis sp.)
Source : (Miftakhur, 2019)

According to Mubarok (2012) stated that one of the commonly used growth regulators is thidiazuron (TDZ) as a synthetic cytokinin which is the best for the regeneration of several plant species.

Cytokinin is a substance in plants that together with auxins in determining the direction of occurrence is determined by cells. The effectiveness of cytokinins is too varied, among which is determined by the dosage used, age and part of the plant used. The type of cytokinin to multiply calluses, and TDZ is the best compared to other cytokinins (Swandra, 2012).

Usually auxins are used in tissue cultures to stimulate the development of calluses, cell suspensions, and organs. Auxins are useful for the formation of roots and side buds within a certain concentration. The auxin group added in the means to this study is Naphtalene Acetic Acid (NAA) (Mahadi and Imam, 2016).

The development of orchid production in Indonesia is still relatively long. This is because orchid cultivation requires a relatively long time and special treatment, so orchids have high economic value when compared to other ornamental plants. Orchid propagation can be done through various methods, including conventional and in vitro propagation or culture (Kurniasih et al., 2017).

The advantage of the tissue culture method is that it is able to produce plants in large quantities, similar saplings together with their mothers, it takes a shorter time and superior and disease-free results (Zahara, 2017). The obstacle comes from the tissue culture method, namely the occurrence of contamination that can cause damaged treatment facilities and dead plantlets, caused by fungi and bacteria due to the lack of sterilization of planting tools, plantlets, and rooms. In addition, browning occurs in explants (Saepudin et al., 2020).

Based on research by Fauzan (2017), there are several types of sterilization commonly used for explant sterilization. The selection of sterilizers is influenced by the type of plant, the part of the plant to be used and the age of the plant. Sterilants commonly used in tissue culture include 70% alcohol with a soaking time of 0.5-1 minutes, sublimate (HgCl2) with a concentration of 0.01-0.05% and a soaking time of 10-20 minutes.

Fungicides are pesticides that specifically kill or inhibit the growth and development of fungi. In general, fungicides are grouped into the group of dithiocarbabate and belong to selective fungicides (fungicides that kill certain types of fungi) and non-selective fungicides. In addition, fungicides can also be grouped into contact (systemic) fungicides (Surya et al., 2021).

Antracol (Fungicide) is a type of pesticide that contains toxic chemical compounds and can be used to eradicate and prevent fungi/fungi (Sidauruk et al., 2017). Based on the research of Fauzan (2017), there are several types of sterilization that are commonly used for explant sterilization. The selection of sterilizers is influenced by the type of plant, the part of the plant to be used and the age of the plant. Sterilants commonly used in tissue culture include 70% alcohol with a soaking time of 0.5-1 minutes, sublimate (HgCl2) with a concentration of 0.01-0.05% and a soaking time of 10-20 minutes.

Orchid flower stalks can be developed using tissue culture methods with a high success rate. Plants produced through tissue culture are called plantlets (Sandra, 2003). The good growth and development of orchids is greatly influenced by proper sterilization methods, media and ZPT (Wibawati et al., 2010). Therefore, it is necessary to conduct research related to the effectiveness of sterilization methods using fungicides and the combination of fungicides with HgCl2 so as to minimize the occurrence of contamination of the explants and produce a response to the explants of the moon orchid stalk.

RESEARCH METHODS

The treatment design used in this study is a complete random design (RAL) with two factors. The first factor of concentration level was NAA 5mg/L with the addition of each concentration of TDZ1 0.5 ppm, TDZ2 1.0 ppm, TDZ3 3 ppm and without the addition of ZPT NAA with a concentration of TDZ1 0.5 ppm, TDZ2 1.0 ppm, TDZ3 3 ppm concentration using MS media (Murashige and skoog). While the second factor is to find out the comparison of sterilization methods using fungicide and fungicide + HgCl2. And each treatment is repeated 10 times with one type of explant, namely orchid flower stalks planted in each medium as many treatments so that the total number of repetitions is 70 repeats or 70 bottles.

Research Materials

The ingredients used include MS media (Murashige and skoog) explants of moon orchid flower stalks, aquades, 70% alcohol (brataco), jelly (swallow), NAA, TDZ, disinfectant (Lysol 100), liquid detergent (sunlight), bleach (bayclin), fungicide (Anthracol), HgCl2, sugar, coconut water, generic vitamin c, citric acid.

Research Instruments

The instruments used in this study were Laminar airflow, culture bottles, petri dishes, beaker cups, tweezers, scalpels, aluminum foil, ovens, autoclaves, analytical scales, bunsen lamps, erlenmeyers, measuring cups, drip pipettes, spatulas, pots, gas stoves, pH meters, plastic wrap, mortars, books, pencils, rulers, pens, pencils and label paper.

Sterilization Tools

Clean the culture bottles, tweezers, scalpels, scissors and petri dishes with disinfectant and liquid detergent (sunlight) then rinse with clean water and soak for 30 minutes using bleach (bayclin) rinsed using running water in an autoclave at 120 at 15 psi for 3 hours.

Manufacturing Stock Solution
Weigh ZPT NAA and TDZ as much as 0.01 g and dilute ZPT NAA into 100 ml aquades so that the concentration according to the treatment is obtained at 0.5 ppm, 1.0 ppm, 3 ppm, respectively. After that, it is stored in the refrigerator.

Creation of MS Culture Media
This study used MS (Murashige and skoog) media which was added with growth regulators according to the treatment. By adding 20 g/L sugar, 50 ml/L of coconut water, 250 mg of antibiotics (chloramphenicol) 1 capsule/L each for each treatment. After that, pour 1000 ml of aquades into each medium and then stir, then the pH is measured to 5.6-5.8. Next, pour the media into a pot and then put in 7 g/L of gelatin. Make sure the bottle is tightly sealed and then autoclaved for 1 hour at 120 at a pressure of 15 psi. Once finished stored in a room with a temperature of 23-28

Sterilization of Moon Orchid Stalks Explants Using Fungicides
The explant of the moon orchid stalk is washed thoroughly with running water then washed with sunlight and then rinsed with running water 3 times. After that, the explant of the moon orchid stalk is cut 1.5 cm. Wash again with sunlight and then rinse with running water 2 times. Furthermore, the explants of the moon orchid stalks were soaked with a fungicide (Anthracol) 2 g/L for 10 minutes at a dose of 2 g/100 ml aquades and then washed with sterile aquades. After that, soak the explant with a solution of generic vitamin C and citric acid 100 mg/100ml The explant of the stalk of the moon orchid is soaked with 10% bayclin. Soaked with 5% bayclin for 10 minutes at a dose of 5 ml/100 ml of sterile aquades then rinsed with sterile aquades. The explant of the moon orchid stalk is put into a beaker containing 70% alcohol and then put into the laminar airflow and UV irradiated for 30 minutes.

Sterilization of Moon Orchid Stalks Explants Using Fungicide+HgCl2
The explant of the moon orchid stalk is washed thoroughly with running water then washed with sunlight and then rinsed with running water 3 times. After that, the explant of the moon orchid stalk is cut 1.5 cm. Wash again with sunlight and then rinse with running water 2 times. Furthermore, the explants of the moon orchid stalks were soaked with fungicide (Anthracol) 2 g/L + HgCl2 300 mg/L for 5 minutes. After that, soak the explant with a solution of vitamin C and citric acid 100 mg/ 100ml The explant of the stalk of the moon orchid is soaked with 10% bayclin. Soaked with 5% bayclin for 10 minutes at a dose of 5 ml/100 ml of sterile aquades then rinsed with sterile aquades. The explant of the moon orchid stalk is put into a beaker containing 70% alcohol and then put into the laminar airflow and UV irradiated for 30 minutes.

Planting Room Preparation
Before planting, the laminar air flow is sterilized with a UV lamp for 30 minutes and the laminar air flow is sprayed with 70% alcohol.

Preparation of Plants and Planting
The explants of the moon orchid stalks that have been sterilized with 70% alcohol, are taken using sterile tweezers, then rinsed with aquades, then the explants are put in a sterile petri dish. Insert a culture bottle containing the media into the laminar air flow. The mouth of the culture bottle is sterilized with bunsen fire. Next, the stalk is cut which is done aseptically using a scalpel in the laminar air flow until it becomes 4 parts, then planted in the media with the help of tweezers (1 explant 1 bottle) after which the bottle is tightly closed then in plastic wrap, then the bottle containing the explant is stored in the incubation room at a temperature of 28.

Treatment
The treatment in this study was the addition of ZPT with a TDZ concentration of 0.5 ppm, 1 ppm, 3 ppm and for the addition of a combination of TDZ+ NAA, namely TDZ 0.5 ppm, 1 ppm, 3 ppm from each treatment 5 ppm NAA was added (Handini, 2017).
Observation

The observations made in this study were to observe the occurrence of explant response, contamination time and browning time visually once every 1 week, and to calculate the number of contamination and browning in the explant.

RESULTS AND DISCUSSION

Research on the Induction of Lunar Orchid Stalk Explant Callus (*Phalaenopsis sp)* with growth regulators NAA (*Naphthaleneacetic Acid*) and TDZ (*Thidiazuron*) in *vitro* which was carried out from February – May 2021 at the UPT Horticultural Food Plant Seed Center Bali, it was found that each treatment had insignificant results after statistical analysis with the ANOVA test. This observation was made 4 times for 4 weeks or 1 month. The following statistical analysis results are presented in table 1 the average result of moon orchid stalk tissue culture in the sterilization method using fungicide and table 2 the average result of moon orchid stalk tissue culture in the sterilization method using fungicide + HgCl2.

Table 1. Average results of moon orchid stem tissue culture in sterilization method using fungicide

Treat-ment	Respo nse Time	Numb er of Respo nses	Conta minati on Time	Numb er of Conta minati on	Brown ing Time	Brown ing Sum
K0	0a	0a	2from	1 [b]	0 [a]	0 [a]
TN1	1a	1a	1 [a]	1 [a]	1a	1 [a]
TN2	0a	0a	1 [a]	1 [a]	0 [a]	0 [a]
TN3	1a	1a	1 [a]	1 [a]	0 [a]	0 [a]
T1	1a	1a	2 [from]	1 [b]	0a	0 [a]
T2	0a	0a	3b	1 [b]	0 [a]	0 [a]
T3	0a	0a	1 [from]	1b	0a	0 [a]

Description: K0 = Control, TN1 = TDZ+ NAA concentration 0.5 ppm, TN2 = TDZ+ NAA concentration 1 ppm, TN3 = TDZ+ NAA concentration 3 ppm, T1 = TDZ 0.5 ppm, T2 = TDZ 1 ppm, T3 = TDZ 3 ppm, TDZ = Thidiazuron, NAA = Naphtalene Acetic Acid, The numbers in one column followed by the same letter did not differ significantly at the level of 5% according to the Duncan double spacing test.

Table 2. The average result of moon orchid stem tissue culture in the sterilization method using fungicide + HgCl2.

Treat ment	Res ponse Time	Numb er of Respo nses	Conta minati on Time	Number of Contami nation	Brown ing Time	Brow-ning Sum
K0	-	-	2a	1a	1 [a]	1 [a]
TN1	-	-	1 [a]	1 [a]	1 [a]	1 [a]
TN2	-	-	2 [a]	1 [a]	1 [a]	1 [a]
TN3	-	-	2 [a]	1 [a]	1 [a]	1a
T1	-	-	2 [a]	1 [a]	1 [a]	1 [a]
T2	-	-	2 [a]	1 [a]	2 [a]	1 [a]
T3	-	-	1 [a]	1 [a]	1 [a]	1 [a]

Remarks: K0 = Control, TN1 = TDZ+ NAA concentration 0.5 ppm, TN2 = TDZ+ NAA concentration 1 ppm, TN3 = TDZ+ NAA concentration 3 ppm, T1 = TDZ 0.5 ppm, T2 = TDZ 1 ppm, T3 = TDZ 3 ppm, TDZ= Thidiazuron, NAA = Naphtalene Acetic Acid, - = no result. The numbers on a single column followed by the same letter do not differ significantly at the level of 5% according to Duncan's double spacing test. The results showed that the average variable response time of explants to sterilization of explants using fungicides, namely explants in T1 treatment (TDZ 0.5 ppm) experienced a response in the third week in TN1 treatment (TDZ + NAA 0.5 ppm), experienced a response in the fourth week and in TN3 treatment (TDZ + NAA 3 ppm) experienced a response in the fourth week. Treatment of T1 and TN1 balanced cytokinin ratios of 0.5 ppm and the addition of 5 ppm explant auxin can produce a bubble response in the ankle stroke.

According to (Collin and Edward 2004; Lestari, et al. 2020) auxins and cytokinin concentrations from 0 mg/L to 5 mg/L can produce optimal callus growth.

According to Davies (2004) the interaction between auxins and cytokinins in culture *Vitro* able to make the cells in plant tissues undergo a process of division and enlargement, while in the medium without the addition of NAA, auxin at this stage has begun to form a plantletAccording to Ajijah et al., (2010) said that the bubble response in explants is the initial stage of callus formation which indicates the presence of cell activity in the explant. This bubble response occurs at different times where the treatment that gives the fastest response time is the single treatment of 0.5 ppm while the long response in the double treatment is 3 ppm. Compared to the variable response time of the explant in the sterilization method using fungicide + HgCl2, there were no results of the response time because the explant experienced death due to contamination and *browning* on the explant

The next response that occurred during observation was a change in color on the explant to yellowish green or brownish-green. But not all explants undergo such changes. Based on the research of Ariani et al., (2016) the change of stalk explants *in vitro* to yellowish-green and brownish-green shows that the explants are damaged, the green explants slow down the death of the explant. The change in the color of the plant is influenced by the size of the explant used in the study which is not large enough to distinguish the given growth regulator. In addition, the age of the explant also affects the response. The results of table 1 can be seen the treatment of TN1, namely 1a, TN3, 1a, T1, 1a. TDZ+ NAA treatment was better able to keep the explant alive compared to the single and control treatment.

This is because the reaction between the two regulatory substances grows to the interaction of the explant in the medium compared to a single control and treatment. Callus induction in this study was able to provide a bubble response aimed at the formation of callus. The bubble indicates that the state of the cell tissue against the explant is inflated or enlarged. But it does not reach cell division which will later undergo the formation of calluses. After the occurrence of the explant bubble, it will produce calluses (Lizawati et al., 2012). The bubble that occurs is an initial process of nutrient entry from ZPT and media. The next process occurs excessive cell proliferation and development that functions to close the wound (Isra'Aulia and Noriah, 2020).

Table 1 The results of the analysis of contamination time variables in the sterilization method using fungicides show the highest results in T2 treatment. Table 1 shows the amount of contamination using fungicide ingredients in explant sterilization, namely from each treatment having the same effect even though the concentration is different with a significant result, namely 0.00 < p-value.

Table 2 The amount of contamination in the sterilization method using fungicide + HgCl2 had an insignificant result, namely 0.59 > p-value. Sterilization on the immersion of both HgCl2 and Fungicide sterile materials for 5 minutes resulted in a low contamination rate for 1 week. However, the explant completely dies at 2 weeks. Soaking using a single sterilizer of fungicide for 5 minutes showed higher contamination, but with a lower mortality rate. The result is that the addition of HgCl2 300 mg/L has high toxicity to the explant of the moon orchid. The death of the explant that occurs after immersion in a 300 mg/L HgCl2 solution is caused by the bleaching action of two chloride atoms and ions that are strongly bonded to proteins that cause the death of the organism (Admojo, 2016; Himabindu et al., 2012). The results of observations for four weeks after inoculation showed that the contamination that occurred came from explants and culture media. Each contaminant, both bacterial and fungal, consists of several types, some are white, red, and blackish-brown (Handayani et al., 2014).

Contamination that occurs due to bacteria not only in the explant but also in the explant tissue is generally shown 2 times in 24 hours of contamination. Contamination caused by internal infection is the discovery of microorganisms or living bacteria in the explant tissue so that it cannot inhibit the growth of microorganisms by means of external sterilization (Dewi et al., 2016).

The occurrence of contamination in explants *browning* problems in explants is found in this study, where *browning* is a process of physiological deterioration of an explant that is often found in *in vitro* cultures. In *vitro cultures,* browning *events are often found* which ultimately inhibit the development of an explant The use of sterile materials in addition to inhibiting the development of relatively young plant material microorganisms. The *browning* process will inhibit the growth of explants and reduce the physiological function of the explant until the explant dies (Wulandari et al., 2014)

Browning indications arise from the base of the explant exposed to the media, and spread to all parts of the explant. *Browning*) is a symptom of the appearance of brown color on the explant so that it will inhibit the growth of the explant. In the explant, the enzyme polyphenol oxidase is formed which results in the oxidation of phenol compounds into quinones that produce brown pigments when the tissue is injured (Shonhaji et al., 2014).

Table 1 results show the average *browning time* in the sterilization method using fungicides, namely in the TN1 treatment, which is 2 weeks after planting, on the other hand, in the K0, TN2, TN3, T1, T2, T3 treatment there is no *browning.* Based on the results obtained from the fungicide sterilization procedure, the best results from the fungicide sterilization method + HgCl2.Table 5.1 *browning* that occurred in the sterilization method using fungicide materials, namely at the concentration of TN1 (TDZ+ NAA 0.5 ppm) 1 bottle and the treatment of K0, TN2, TN3, T1, T2, T3 did not occur browning and produced a significant result, namely 0, 44 < p- value.

In table 2, the results show that the average *browning* time in the sterilization method using fungicide + HgCl2 is the fastest in the control treatment and the ZPT TDZ+ NAA treatment is 2 or 3 weeks after planting and while in the single treatment is 3 or 4 weeks after planting. Table 2 *Browning* explant in the sterilization method using fungicide + HgCl2 *browning* occurs in each treatment, including K0 there are 2 bottles, TN1 1 bottle, TN2 1 bottle, TN3 2 bottles, T1 2 bottles, T2 3 bottles, T3 1 bottle and does not produce a significant result, namely 0.84 p-value. The use of sterile materials, in addition to inhibiting the development of contaminant microorganisms, can also cause the explants to brown, especially in relatively young plant materials. The *browning* process will inhibit the growth of explants and reduce the physiological function of the explant until the explant dies (Handayani et al., 2014).

Increased concentrations of mercury chloride (HgCl2) did not provide a good response to changes in shoot growth time, bud growth percentage and bud count. High concentrations of mercury chloride cause long-cultivated explants to sprout. This is because the concentration of mercury chloride given has not reached a suitable concentration for sterilization of moon orchid stalks explants. Mercury chloride is able to eliminate the source of contaminants but makes it difficult for the explants to regenerate and form new shoots. The use of HgCl2 in high concentrations affects the damage to plant tissues (Fauzan et al., 2017).

CONCLUSIONS AND SUGGESTIONS

The results of tissue culture research on the variables of explant response time, explant response, contamination time, amount of contamination, and browning time of moon orchid stalks explant can be concluded

1. The results of the study on the explant response of moon orchid stalks can be concluded that the use of fungicides in the sterilization of T1, TN1 and TN3 treatment explants experiences a response to ankle scratches. The use of HgCl2 + fugicide did not experience a response to the explant.
2. The response time of moon orchid explants to fungicide sterilization showed the fastest results in the T1 treatment, which was 3 weeks after planting, while in the TN1 and TN3 treatment, which was 4 weeks after planting. At the time of the response of the explant sterilization

method of fungicide + HgCl2 there were no results due to the contamination of the explant so that the explant did not experience a response.

3. The amount of contamination in fungicide sterilization was more than compared to the explant sterilization method using fungicide +HgCl2 and the contamination time occurred 1 week after planting.
4. The amount of browning in fungicide sterilization was less compared to the explant sterilization method using fungicide + HgCl2 and the browning time occurred 1 week after planting.

SUGGESTION

The suggestion in this study is that at the stage or method of sterilization of explants in the use of HgCl2 + fungicides, soaking is carried out with a period of 3 minutes - 5 minutes so that the explants do not die. Further research needs to be conducted using sterilization methods with other materials other than HgCl2 because it causes no response.

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"Journal of Agriculture Based on Ecosystem Balance"
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DEVELOPMENT STRATEGY OF SUBAK BULUH AS AN AGRO-TOURISM DESTINATION IN BATURITI VILLAGE, KERAMBITAN DISTRICT, TABANAN REGENCY

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ABSTRACT

This study aims to formulate development strategies for Subak Buluh as an agro-tourism destination in Baturiti Village, Kerambitan District, Tabanan Regency. Subak, as a traditional Balinese irrigation institution with strong socio-cultural values, plays a vital role in water management and agricultural sustainability. In response to contemporary challenges, subak must be developed not only as an agricultural institution but also as an alternative tourism attraction. Data were collected using purposive sampling from 78 respondents, consisting of 39 internal respondents (farmers and subak members) and 39 external respondents (tourists and local residents). Respondents exhibited diverse characteristics in terms of education level and occupation. SWOT analysis was employed to identify internal strengths and weaknesses as well as external opportunities and threats in the development of Subak Buluh agro-tourism. The results indicate that Subak Buluh's main strengths include its natural landscape, cultural traditions and ceremonies, and fertile agricultural land. However, limitations such as insufficient internal funding and limited promotional activities remain key challenges. Promising development opportunities arise from village tourism programs and the growing global trend toward alternative tourism, while threats include tourist congestion and infrastructure degradation. This study provides strategic recommendations to support the sustainable development of Subak Buluh as an agro-tourism destination, contributing to local community welfare while preserving environmental and cultural sustainability.

Keywords : Subak Buluh, Agrotourism, SWOT Analysis.

INTRODUCTION

The agricultural sector plays a vital role and must always be sustained, as it provides food, clothing, and shelter for society. This role has become increasingly important since the government launched the Food Security Program. Law No. 7 of 1996 on Food defines food security as the fulfillment of food needs for every household, reflected in the availability of sufficient food in terms of both quantity and quality, that is safe, evenly distributed, and affordable (Anonymous, 2011).

In Bali, agricultural land is managed by farmers who are organized in a traditional institution known as subak. According to Windia (2008), subak in Bali has existed for more than ten centuries and continues to function by providing services to its members. This demonstrates that subak has been able to sustainably operate as an irrigation system with strong socio-cultural characteristics. The subak in Baturiti Village is known as Subak Buluh, covering an area of approximately 87 hectares and led by a subak leader (pekaseh), I Wayan Sadia.

According to Windia (2008), subak currently faces numerous challenges and is experiencing a process of marginalization. Limited land ownership in this sector has resulted in low farmer incomes. This situation is further exacerbated by increasing living costs and rising land taxes, which place a heavy burden on farmers and lead many of them to sell their agricultural land. The reduction in rice fields will ultimately have a negative impact on Bali's tourism sector. Therefore, the existence of subak is crucial for tourism development, as Bali's tourism would lose its identity without it. The agricultural and tourism sectors can be described as having a symbiotic, mutually beneficial relationship. However, creating synergy between these two sectors

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 76-83 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

is not an easy task and requires careful planning and appropriate strategies to ensure mutual benefits. For this reason, research on subak development strategies deserves further investigation.

Agro-tourism is a form of tourism that utilizes agricultural activities as its main attraction (Pramusita & Sarinastiti, 2018). The primary objectives of agro-tourism are to enhance knowledge, broaden perspectives, and provide recreational experiences, while simultaneously fostering business relationships within the agricultural tourism sector (Lubis et al., 2020). The growing popularity of agriculture-based tourism has created new opportunities in the agricultural industry and can serve as an effective medium for disseminating innovation and technology, particularly in agriculture. In addition to serving as a recreational destination during holidays, agro-tourism also provides opportunities for relaxation and refreshment (Mayasari & Ramdhan, 2013).

Agro-tourism development strategies require top-level management decisions to support business development and have long-term implications, typically spanning at least five years. Therefore, such strategies are inherently future-oriented. Development strategies also play a crucial role in formulating organizational direction by considering both internal and external factors faced by the organization (David, 2004).

Subak is a traditional agricultural irrigation institution in Bali that has existed since ancient times. Based on Bali Provincial Regulation No. 9 of 2012, subak is defined as a traditional organization involved in water management and/or cropping systems at the farm level within Balinese indigenous communities, characterized by socio-agrarian, religious, and economic values that have historically continued to grow and develop. According to Wardha (1989) and Arfian (1989), as cited in Windia (2006), SWOT is an acronym for strengths, weaknesses, opportunities, and threats derived from both internal and external environments. Abdillah and Jogiyanto (2015) explain that SWOT analysis is used to assess organizational strengths and weaknesses, as well as external opportunities and challenges. Furthermore, Fahmi (2012) emphasizes that a comprehensive SWOT analysis requires careful consideration of both internal and external factors.

RESEARCH METHODS

This research was conducted at Subak Buluh, located in Baturiti Kaje Hamlet, Baturiti Village, Kerambitan District, Tabanan Regency. The research location was selected using a purposive method, in which the site was deliberately chosen based on several considerations: (1) the location is strategically situated, and (2) there have been few or no previous studies that specifically examine this site. The study was carried out over a two-month period, from August to September 2024.

The data sources used in this study consisted of primary and secondary data. According to Hasnan (2012), primary data are data obtained directly from the field. In this study, primary data included information collected from respondents, as well as data on the strengths, weaknesses, opportunities, and threats of Subak Buluh. Secondary data are data obtained indirectly from respondents and are derived from existing sources. The secondary data used in this study were obtained from village profile documents, Central Bureau of Statistics (BPS) data, and records from the Kerambitan District Office.

Both qualitative and quantitative data were used in this study. Qualitative data included information on the organizational structure and ideas for developing Subak Buluh as an agro-tourism destination. Quantitative data included the total land area and the number of subak members.

A total of 78 respondents were involved in this study and were selected using purposive sampling, in which respondents were chosen based on specific criteria. These respondents consisted of 39 internal respondents (village heads, pekaseh, and subak members) and 39 external respondents (local residents and tourists visiting Subak Buluh).

Data analysis was conducted using Internal Factor Analysis Summary (IFAS), External Factor Analysis Summary (EFAS), the Internal–External (IE) matrix, and the SWOT matrix to identify alternative development strategies. According to Rangkuti (2018), IFAS was used to identify internal factors, namely strengths and weaknesses, of Subak Buluh, while EFAS was used to analyze external factors, including opportunities and threats. After completing the IFAS and EFAS analyses, the IE matrix was applied to determine the most appropriate strategy for developing Subak Buluh as an agro-tourism destination.

The collected data were processed and analyzed using SWOT analysis to formulate development strategies for Subak Buluh as an agro-tourism destination.

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 76-83 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

INTERNAL / EXTERNAL	***STRENGTHS* (S)** Determine 5-10 internal strength factors	***WEAKNESSES* (W)** Determine 5-10 internal weakness factors
***OPPORTUNIES* (O)** Determine 5-10 external opportunity factors	**Strategi S-O** Create strategies that use strengths to take advantage of opportunities	**Strategi W-O** Create a strategy that uses weaknesses to exploit opportunities
***TREATHS* (Y)** Determine 5-10 external threat factors	**Strategi S-T** Create a strategy that uses strengths to overcome threats.n	**Strategi W-T** Create strategies that minimize weaknesses and avoid threats

RESULTS AND DISCUSSION

Internal Factor Analysis Matrix Summary (IFAS)

The internal strategy matrix from the research results on Subak Buluh's development strategy as an agrotourism can be seen in Table 1 below:

Table 1. Internal Strategy Matrix of Factor Analysis System (IFAS)

INTERNAL FACTORS (STENGTHS & WEAKNESSES)				
No	**Strength**	**Weight**	**Rating**	**Score**
1	The natural beauty of Subak	0.21	4	0.84
2	tracking lines along the Subak	0.14	4	0.56
3	Fertility of rice fields	0.06	3	0.18
4	Subak culture and ceremonies	0.09	4	0.36
5	Cleanliness of the Subak environment	0.07	4	0.28
Amount		**0.57**		**2.22**
No	**Weakness**	**Weight**	**Rating**	**Score**
1	Subak's internal funding sources	0.09	4	0.36
2	Tourist attractions are not yet developed	0.08	3	0.24
3	Promotional activities for tourist villages are still limited	0.10	4	0.4
4	No public transportation is operating	0.09	3	0.27
5	There has been no outreach regarding Subak tourism	0.07	4	0.28
Amount		**0.43**		**1.55**
Total		**1**		**3.77**

Source: Primary Data Analysis 2024

Table 1 shows that the internal factors of the 5 strengths and 5 weaknesses from the calculation results obtained a total IFAS score for Subak Buluh of 3.77, which means it has a good ability to anticipate weaknesses. The highest score for strength is 0.84, namely the natural beauty of the Subak, and the lowest score for weakness is 0.18, Subak land fertility. Meanwhile, the highest score for weakness is 0.36, Subak's internal funding sources, and the lowest score for weakness is 0.24, tourist attractions are not yet developed.

External Matrix Factor Analysis Summary (EFAS)

The external strategy matrix from the research results on Subak Buluh's development strategy as an agro-tourism can be seen in the following table 2:

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 76-83 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

Table 2. External Strategy Matrix of System Analysis Factors (EFAS)

EXTERNAL FACTORS (OPPORTUNITIES & THREATS)				
No	**Opportunity**	**Weight**	**Rating**	**Score**
1	Tourist visits to Tabanan Regency	0.17	4	0.68
2	The existence of a Tourism Village Program in Baturiti Village	0.10	4	0.4
3	The shift in global tourism trends from mass tourism to alternative tourism	0.05	3	0.15
4	Located in the agrotourism development area	0.09	4	0.36
5	Support from local communities	0.19	4	0.76
Amount		**0.6**		**2.35**
No	**Threat**	**Weight**	**Rating**	**Score**
1	No accommodation available	0.10	4	0.4
2	Lack of government support in the Subak development process	0.05	3	0.15
3	The occurrence of tourist density	0.09	4	0.36
4	Road damage occurred	0.09	4	0.36
5	The occurrence of environmental pollution	0.07	4	0.28
Amount		**0.4**		**1.55**
Total		**1**		**3.9**

Source: Primary Data Analysis 2024

Table 2 shows that external factors include 5 opportunities and 5 threats in Subak Buluh. The highest score for opportunities is 0.76 support from the local community and the lowest score for opportunities is 0.15 Shifting global tourism trends from mass tourism to alternative tourism. While the highest score for threats is 0.36 road damage and the lowest score for threats is 0.15 Lack of government support in the Subak development process External factors of opportunities and threats are arranged based on weight with the most important impact so that a total score of 3.9 is obtained. This shows that the external factors of Subak Buluh are able to take advantage of opportunities and avoid threats.

Internal and External Matrix

After obtaining the IFAS score for strengths and weaknesses and the EFAS score for opportunities and threats, the Internal and External matrix can be seen in Figure 1.

Figure 1 shows that Subak Buluh's position is at coordinates (3.77 and 3.6) in quadrant I, indicating that Subak Buluh has strengths and opportunities, allowing it to capitalize on existing opportunities using its strengths. Therefore, it is suitable for using the SO (Strength) strategy. Opportunities to develop the Buluh Subak and supported by an aggressive development strategy or Growth Oriented Strategy .

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 76-83 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

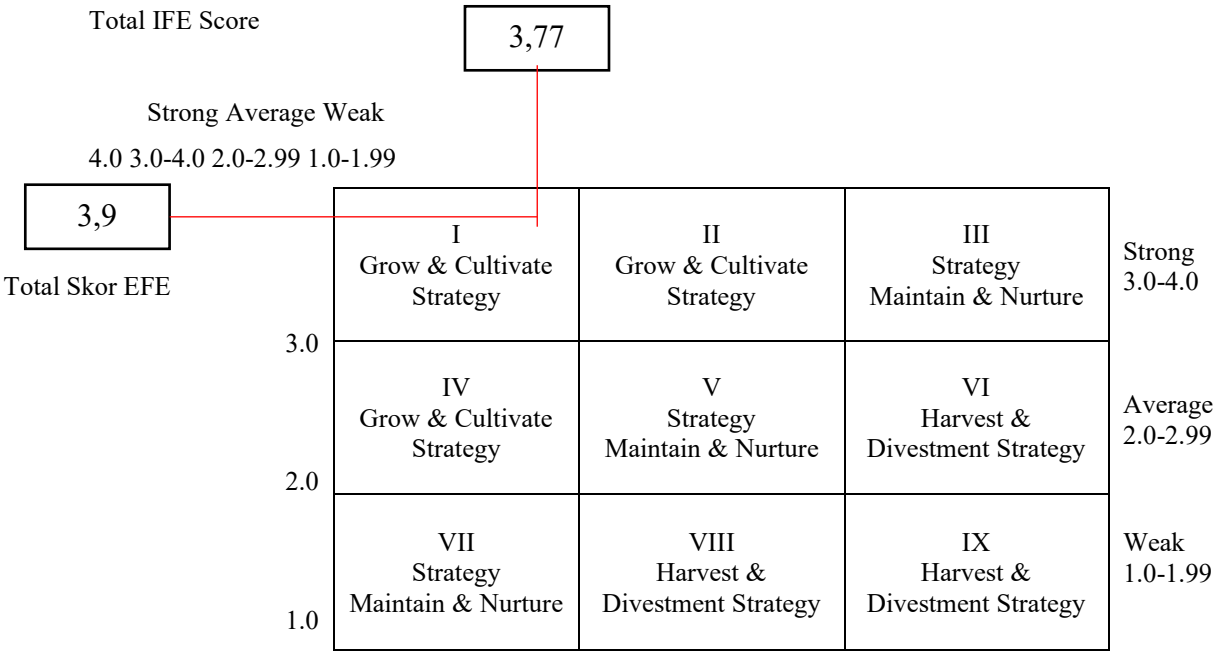

Figure 1. Position Matrix of Subak Buluh, Baturiti Village

INTERNAL / EXTERNAL	***STRENGTHS* (S)**	***WEAKNESSES* (W)**
	1. The natural beauty of Subak. 2. Availability of tracking routes along the Subak. 3. Fertility of rice fields. Subak culture and ceremonies . 5. Cleanliness of the Subak environment.	1. Internal funding sources of subak. 2. Tourist attractions are not yet developed. 3. Tourism Village promotional activities are still limited. 4. No public transportation is operating. 5. There has been no outreach regarding Subak tourism.
***OPPORTUNITIES* (O)**	**SO Strategy**	**WO Strategy**
1. Tourist visits to Tabanan Regency. 2. There is a Tourism Village program in Baturiti Village 3. Shifting trends in global tourism from mass tourism to alternative tourism. 4. Located in an agrotourism development area . 5. Support from local communities.	1. Maintain the natural beauty of Subak to become a tourist attraction.	1. Collaborate with the government to promote Subak Buluh, and to receive further education regarding the development of Subak as agrotourism.
***TREATHS* (T)**	**ST Strategy**	**WT Strategy**
1. No accommodation available. 2. Lack of government support in the subak development process. 3. There is a density of tourists. 4. Road damage occurs. 5. Environmental pollution occurs.	1. Improve facilities in the Subak area , such as building public toilets and providing stalls along the tracking route . 2. Provide trash bins in the Subak area to minimize environmental pollution.	1. Promote Subak Buluh through social media such as Instagram , Facebook, and Tiktok .

Subak Buluh Development Strategy

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 76-83 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

The SWOT matrix is a combination of internal factors, namely strengths and weaknesses, with external factors, namely opportunities and threats, so that it will find four alternative strategies and a combination of the two, namely the SO strategy (*Strengths and Weaknesses). Opportunities*), ST (*Strength Threats*), wO (*Weekness Opportunities*) and WT (*Weakness Threats*) (Rangkuti 2001) below is the SWOT Matrix, among others.

Frozen Strawberry Business Development Strategy

Table 3 shows the SWOT matrix of the Subak Buluh development strategy as agrotourism, namely:

1) SO Strategy (Strengths-Opportunities)
   A strategy that uses strengths to capitalize on opportunities involves preserving the natural beauty of the Subak to attract tourists. This strategy aims to ensure that Subak Buluh has its own unique appeal to offer .
2) ST (Strengths-Threats) Strategy
   The strategy uses strengths to overcome threats by improving facilities in the Subak area, such as providing public toilets and stalls along the trail . Providing trash receptacles in the Subak area to minimize environmental pollution. This strategy is excellent for Subak Buluh's development as an agrotourism destination.
3) WO Strategy (Weekness-Opportunities)
   A strategy that minimizes weaknesses by capitalizing on existing opportunities. The strategy used is to collaborate with the government to promote Subak Buluh and to receive further education on developing Subak as an agrotourism destination, thereby further enhancing opportunities. Collaborating with the government will facilitate promotion, and farmers who have previously not received education on developing Subak as an agrotourism destination will receive education on Subak as an agrotourism destination.
4) WT Strategy (Weeknesses-Threaths)
   A strategy to minimize weaknesses and anticipate threats is to promote Subak Buluh through social media platforms like Instagram , Facebook, and TikTok . This is because social media promotion is easier and faster, and tourists can quickly learn about Subak Buluh as an agrotourism destination.

CONCLUSION AND SUGGESTIONS

Based on the research results and discussion, the following conclusions can be drawn:

1) Internal factors influencing the Subak Buluh development strategy as an agrotourism destination are strengths and weaknesses. The strongest strength factor is 2.22, indicating good capabilities. The main weakness is the Subak's internal funding sources, indicated by a total score of 0.36. External factors consist of opportunities and threats, with the strongest opportunity being 0.76, indicating good opportunities. Meanwhile, the lowest threat factor is government support in the Subak development process, with a score of 0.15 .
2) Subak Buluh Development Strategy As an agrotourism Subak Buluh is in a very advantageous position because it has strengths and opportunities, which can be utilized optimally. The strategy for Subak Buluh is in quadrant I, namely the company must support an aggressive development policy. So the appropriate strategy is the SO strategy , namely maintaining the natural beauty of Subak to attract tourists. The ST strategy is to improve facilities in the Subak area such as providing public toilets and providing stalls along the tracking route . Providing trash cans in the Subak area to minimize environmental pollution. The WO strategy is to collaborate with the government to promote Subak Buluh and so that farmers receive further counseling regarding the development of Subak as an agrotourism. The WT strategy is to promote Subak Buluh through social media such as Instagram , Facebook, and Tiktok .

SUGGESTION

1) For Farmers
   Farmers should address existing weaknesses by leveraging internal strengths, particularly by implementing ST strategies to improve facilities and environmental management.
2) For the Government
   Government institutions are encouraged to strengthen collaboration with farmers and local communities to support agro-tourism development and subak preservation.
3) For Further Researcher
   Future studies should integrate SWOT analysis with other strategic analysis methods to provide deeper insights into sustainable agro-tourism development, besides using the SWOT analysis method.

A G R I M E T A
"Journal of Agriculture Based on Ecosystem Balance"
http://e-journal.unmas.ac.id/index.php/agrimeta
Vol 15 No 2 (Oktober 2025) 76-83 e-ISSN : 2721-2556 ; p-ISSN : 2088-2531

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A G R I M E T A
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EFFECT OF LOCAL MICROORGANISMS (MOL) OF MORINGA LEAVES ON THE GROWTH AND YIELD OF PAKCOY MUSTARD (*Brassical rapa L.)*

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ABSTRACT

To support sustainable vegetable cultivation, the use of organic fertilizers is essential for improving soil quality and minimizing pest disturbances. Pak choi is a widely cultivated horticultural crop due to its high nutritional value and strong economic potential, creating a need for more environmentally friendly cultivation practices. One such approach is the use of Local Microorganisms (MOL), produced through the fermentation of natural materials containing active microorganisms from plants or plant parts. These include *Rhizobium* sp., *Azospirillum* sp., *Azotobacter* sp., *Pseudomonas* sp., *Bacillus* sp., and phosphate-solubilizing bacteria that support soil fertility and plant growth. Moringa leaves (*Moringa oleifera*) are a potential source of MOL due to their growth-promoting properties. This study aimed to evaluate the effect of moringa leaf MOL on pak choi growth and to identify the most effective concentration. Conducted at the Bali Agricultural Technology Study Center, the results showed that the treatment had a highly significant effect on plant height, number of leaves, leaf area, total fresh weight, above-ground fresh weight, and total oven-dry weight, but no significant effect on fresh and dry root weight. The highest leaf number was observed at the P3 concentration.

Keywords: *Local microorganism, kelo leaves, cultivation, mustard greens*

INTRODUCTION

Scotch Mustard (*Brassica rapa* L.*)* is a type of rain-resistant vegetable. This annual plant is also known as spoon mustard. Pakcoy mustard has the genus or genus Barassica so it is included in the type of mustard green. Mustard pakcoy has green leaves with a nutritional content of grams of carbohydrates, 105 milligrams of calcium, 252 milligrams of potassium, 223 micrograms of vitamin A, 19 milligrams of magnesium, In addition, pakcoy also contains fiber, folic acid, antioxidants, and vitamins C, K, and B6 (Sienny, 2022). Pakcoy mustard plant (*Brassical rapa* L.*)* is one of the vegetables that is in great demand among the public. According to data (BPS, 2020) it is stated that the production of mustard (*Brassica rapa* L.*)* in Bali is included in the highest production of horticultural products, which is 29,052.00 tons. In Indonesia, the production of pakcoy mustard (*Brassical rapa* L.*)* It is also relatively high, which is around 667,473.00 tons in 2020. This increase in production figures is not uncommon in Bali, as well as on a larger scale, namely Indonesia. In 2018 and 2020 production has increased. Pakcoy plant cultivation can be done organically or inorganically, but to get the yield of pakcoy mustard (*Brassical rapa* L.*)* Of course, organic cultivation must be carried out immediately, considering the increasing residue produced from the use of inorganic fertilizers and inorganic pesticides. According to (Arum, Setiawan, 2020) The excessive and untargeted use of inorganic fertilizers and pesticides can cause various problems including plant

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poisoning, the occurrence of pest resistance, soil and water pollution, as well as having a negative impact on humans and other living things. Therefore, there is a need for efforts to develop efficient organic fertilizers to be able to increase soil fertility and pest and disease control.

Environmentally friendly cultivation practices can be implemented by replacing chemical inputs with the application of Local Microorganisms (MOL). Plant breeders use MOL as a solution towards environmentally friendly agriculture and free from fertilizers and chemical drugs. MOL materials are easy to obtain and easy to process. MOL is an active microorganism that is located somewhere, which is obtained from plants or plant parts. MOL solution is a fermented solution made from various locally available resources that contain micro and macro nutrients and also contains bacteria that have the potential to be an organic matter remodeler, growth stimulant, and as a pest and disease control agent. Therefore, MOL can be used both as a decomposer, biofertilizer and as an organic pesticide especially as a fungicide. (Arum, Setiawan, 2020).

Produced from locally available natural materials, MOL is a self-made liquid containing beneficial microorganisms that support plant growth and soil fertility, including *Rhizobium* sp., *Azospirillum* sp., *Azotobacter* sp., *Pseudomonas* sp., *Bacillus* sp., and phosphate-solubilizing bacteria (Rahayu and Tamtomo, 2017). Moringa leaves are one of the natural materials that have the potential to serve as a source of MOL and growth stimulants. The presence of chemical compounds such as calcium, magnesium, phosphorus, iron, sulfur, and cytokinin hormones enables moringa leaves to be utilized in the production of liquid organic fertilizers.

RESULTS AND DISCUSSION

Based on the outcomes of statistical analysis of the design used, the effect of giving moringa leaf moles on the growth and yield of pokcay mustard (*Brassica rapa* L.*) plants was obtained.* as a result of the treatment given has a very a significant effect on plant height, leaf number, leaf area, total fresh biomass, above-ground fresh biomass, and total oven-dry biomass and the unreal influence on the parameters of the fresh weight of the plant roots and the dry weight of the plant roots Table 1.

RESEARCH METHODOLOGY

The design used was a random group design (RAK) with 6 treatments that were repeated 4 times, so that 24 treatments were obtained each treatment using a polybag with a diameter of 25 cm. So that the number of polybags needed is 6 x 4 = 24 polybags The treatment used in this experiment is as follows: P0: control (without treatment), P1: MOL concentration of moringa leaves 100 ml + water 200 ml, P2: MOL concentration of moringa leaves 200 m l + water 200 ml, P3: MOL concentration of moringa leaves 300 ml + water 200 ml, P4: Moringa leaf MOL concentration 400 ml + water 200 ml, P5: Moringa leaf MOL concentration 500 ml + water 200 ml

Making MOL Moringa Leaves How to make liquid fertilizer from moringa leaves according to Putri (2018). The ingredients of Moringa leaves are : 2.5 kg ; 16 fresh moringa leaves; 5 liters of rice water ; 0.25 kg Molasses; 0.50 liters EM4; strainers, small plastic hoses and plastic bottles. How to make MOL moringa leaves is as follows: 2.5 kg of moringa leaves that have been cut into small pieces are pounded in a container with a size of 10 liters. Next, 0.25 kg of molasses is added to the container that has been filled with moringa leaves, stirring until well mixed. then 0.25 liters of Em4 and 5 liters of rice washing water (1 kg of washed rice with 5 liters of water) were added. After all the ingredients are put into the container is done stir until mixed, then close the container tightly. Every 2 days the container is opened and stirring is carried out. Fermentation is carried out for approximately 14 – 20 days or until it smells good then filtered and stored in bottles.

A G R I M E T A
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Table 1. Significance of the effect of applying MOL concentration of moringa leaves on the growth and yield of the pokcoy mustard (*Brassica rapa* L.*) plant*

No.	Variable	Significance
1	Plant Height (cm)	**
2	Number of Leaves (strands)	**
3	Leaf Area (cm²)	**
4	Total Fresh Plant Weight (g)	**
5	Fresh Weight of Plants on Soil (g)	**
6	Total Oven Dry Weight (g)	**
7	Wet Weight of Plant Roots (g)	ns
8	Plant Root Gravity (g)	ns

Description : ns (no real difference)
** (very real difference)

Table 2 Average effect of moringa leaf MOL administration on plant height parameters, number of leaves, leaf area, total fresh weight of plants, fresh weight on the ground

Treatment	Parameters				
	Plant height (cm)	Number of leaves (strand)	Leaf area (cm²)	Total fresh weight Plants (g)	Fresh weight on the ground (g)
P0	15.10 c	9.00 d	181.01 d	66.20 c	59.52 c
P1	15.10 c	10.25 c	199.82 c	70.07 bc	62.42 bc
P2	18.98 b	10.75 c	215.72 c	74.27 b	66.46 b
P3	20.35 b	12.50 to	284.93 a	82.10 a	73.22 a
P4	24.23 a	12.00 ab	268.29 a	81.65 a	72.81 a
P5	24.13 a	11.25 bc	235.72 b	80.65 a	71.92 a
BNT 5%	1,7469	1,0142	18,5914	4,9378	4,5209

Remarks: The average value followed by the same letter in the same column, means that the difference is not real at the level of the 5% BNT test

Table 3. Average effect of moringa leaf MOL administration on plant height parameters, leaf count, leaf area, total fresh weight of plants, fresh weight on the ground

Treatment	Parameters		
	Total dry weight of the plant	Wet weight of plant roots	Dry weight of plant roots
P0	6.02 c	6.69 a	0.34 a
P1	6.87 b	7.65 a	0.38 a
P2	7.03 b	7.81 a	0.40 to
P3	8.00 a	8.88 a	0.46 a
P4	7.96 a	8.83 a	0.44 a
P5	7.90 a	8.73 a	0.43 a
BNT 5%			

Remarks: The average value followed by the same letter in the same column, means that the difference is not real at the level of the 5% BNT test

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DISCUSSION

The growth of Pakcoy Mustard (*Brassica rapa* L) with the MOL concentration treatment of moringa leaves has a discernible variation in plant height, duan count, leaf area, total fresh weight of plants, fresh weight of plants on the ground, and total oven dry weight of plants, and there is no significant difference between the parameters of fresh plant root weight and dry weight of plant root oven. The application of liquid organic fertilizer by adding 40% moringa cycle extract has an effect on the growth of okcoy plants. This is affected by the administration of several MOL of moringa leaves in the P3 treatment giving the best results compared to other treatments. In this treatment, there was an increase in the results from the P3 to P0 treatment, the lowest results were obtained in the P0 treatment, the administration of moringa leaf MOL during growth always increased. This relates to the findings of the Jama study (2021) which conducted research on planting mustard green plants and using moringa leaf MOL with the best treatment at 2 weeks before planting by giving MOL with a volume of 500 ml (300 ml moringa leaf solution + 200 ml water/plant), getting the best growth result.

Moringa leaf mole contains N, P, and K which are somewhat balanced, this is supported by the results of the analysis of moringa leaf MOL which is good for vegetative growth of plants because it contains carbohydrates found in rice washing water, glucose from brown sugar and EM4 as a source of microorganisms. According to the Swamp Land Agricultural Research Institute, nitrogen (N) is one of the main nutrients in stimulating growth and giving color to leaves (Balatra, 2021)

In addition, MOL enhances the availability of nutrients required for growth in the soil so as to support plant growth. Microbes in the soil stimulate the process of environmental decomposition to extract nutrients from the organic matter in the soil, which can ultimately increase the plant's nutrient intake for healthier and better plant growth. Moringa leaves wilt and break easily, indicating that the protein content is high, indicating that the nitrogen element is also high. As is known, this nitrogen element is the dominant element needed by plants during the planting season. In this study, the soil medium used with moderate nutrient content, this is proven by the results of the soil analysis lab N, P and K while motelage leaves are needed to provide nutrients to the soil.

Growth as defined as an increase in size (usually in dry weight) that is *irreversible*. Development, on the other hand, involves the process of differentiation, and is indicated by higher changes, concerning anatomical and physiological specialization. Differentiation is one of the important processes in plant cultivation. However, the change from simple cells to complex multicellular organisms cannot be fully understood. Research Results (ariambawa 2016) Growth is the process by which an organism's protoplasmic cell count increases along with its size, weight, and number of cells that are unable to revert to their initial state, while the definition of development in theory is the stages of progressive change that occur in the life span of the organism, regardless of the aspects contained in the organism.

The high growth parameter value supports both the yield and the high growth parameter value which reflects the increase in dry weight of plant spots and the wet weight of tan on the soil which reflects the economic results. Economic value of pokcoy mustard plants (*Brassica rapa* L.) found in the fresh weight parameters above the ground is able to give the best results in the P3 treatment. According to (Mursalim et al., 2018) It is seen from the more leaves, the heavier the wet the plant, the bigger it is, as well as the height of the plant, the higher the wet heavy plant.

CONCLUSION

Based on the outcomes of the research and discussions that have been carried out, it can be inferred as follows:

1. The effect of applying moringa leaf MOL on plant growth and the yield of pakcoy mustard (*Brassical rapa L.*) gives very real different results on the height parameters of the plant, Number of leaves, leaf area, total fresh weight of plants, fresh weight of plants above ground, total oven dry weight of plants and no noticeable difference to the parameters of fresh weight of plant roots, dry weight of plant roots
2. The best MOL dose concentration of moringa leaves for the growth and yield of pakcoy mustard (*Brassical rapa L.*) plants is in P3 treatment or at

A G R I M E T A
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http://e-journal.unmas.ac.id/index.php/agrimeta
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300 ml moringa leaf MOL concentration plus 200 ml of water. Applying MOL of moringa leaves to P3 or at a concentration of MOL of moringa leaves of 300 ml plus 200 ml of water on pokcoy mustard plants gives a plant height yield of 24.23 cm, the number of leaves 12.50 pieces, the area of dun 284.93 cm2, the total fresh weight of the plant 82.10 g, the fresh weight on the ground 73.22 g, the total dry weight of the oven of the plant 8.00 g, The fresh weight of plant roots was 8.88 g, and the dry weight of the plant root oven was 0.46 g. The highest compared to the results of other treatments.

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