PRODUCTION ELASTICITY AND INCOME ANALYSIS OF MICRO-SCALE MIDLE ENTERPRISE (MSME) TEMPE BUSINESSES BEFORE AND DURING THE COVID-19 PERIOD IN KUPANG CITY

(Analisis Elastisitas Produksi Dan Pendapatan Usaha Tempe Skala Mikro Sebelum dan Selama Masa Covid-19 di Kota Kupang)

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ABSTRACT

MSMEs are important in the national economy, including the processed food sector such as tempeh. The purpose of this study is to analyze the production elasticity of tempeh in three MSMEs in Kupang City and to analyze the income of these three MSMEs before and during the COVID-19 pandemic. The selection of locations was purposive for three MSMEs in Kupang City, namely Nemter, Putri Tunggal, and Seumur Hidup MSMEs. The analysis was conducted quantitatively and descriptively. The data used were primary and secondary data, collected through interviews, observations, and documentation. Data analysis was conducted using production elasticity formulas and income calculation formulas. From this study, it can be concluded that the highest production elasticity before the COVID-19 pandemic was obtained in Nemter MSMEs on capital input with a value of 2.03. The production elasticity experienced in Putri Tunggal MSMEs had the highest variation in labor input with a value of 1.13 and the lowest production elasticity in capital input with a value of -0.67. Meanwhile, the highest production elasticity at UMKM Seumur Hidup was observed in raw material inputs with a value of 1.02, and the lowest production elasticity was in capital inputs with a value of -0.02. Production elasticity during the Covid-19 period in Nemter MSMEs was 1.72, the highest value for capital input, and the lowest elasticity was found in labor input at 1.23. Production elasticity in Putri Tunggal MSMEs had the highest value for capital input at 1.69 and the lowest value for raw material input at 1.01. At the Seumur Hidup SME, the highest production elasticity was observed in raw material inputs at 1.49, while the lowest was in capital inputs at -2.24. Revenue received by the Nemter SME before the COVID-19 pandemic was IDR 53,031,980, and during the pandemic, it was IDR 36,303,817. Meanwhile, the income from the Putri Tunggal SME before the COVID-19 pandemic was IDR 72,035,466 and during the COVID-19 pandemic was IDR 52,021,675. Furthermore, the income obtained by the Seumur Hidup SME before the COVID-19 pandemic was IDR 30,195,550 and during the COVID-19 pandemic was IDR 44,114,278.

Keywords: Covid-19, Income, Production Elasticity

ABSTRAK

UMKM merupakan sektor penting dalam perekonomian nasional, termasuk sektor pangan olahan seperti tempe. Tujuan penelitian ini adalah menganalisis elastisitas produksi tempe pada tiga UMKM di Kota Kupang dan menganalisis pendapatan ketiga UMKM tersebut sebelum dan selama pandemi COVID-19. Pemilihan lokasi secara purposive terhadap tiga UMKM di Kota Kupang, yaitu UMKM Nemter, Putri Tunggal, dan Seumur Hidup. Analisis dilakukan secara kuantitatif dan deskriptif. Data yang digunakan berupa data primer dan sekunder, yang dikumpulkan melalui wawancara, observasi, dan dokumentasi. Analisis data dilakukan dengan menggunakan rumus elastisitas produksi dan rumus perhitungan pendapatan. Dari penelitian ini dapat disimpulkan bahwa elastisitas produksi tertinggi sebelum pandemi COVID-19 diperoleh pada UMKM Nemter pada input modal dengan nilai sebesar 2,03. Elastisitas produksi yang dialami UMKM Putri Tunggal memiliki variasi tertinggi pada input tenaga kerja dengan nilai 1,13 dan elastisitas produksi terendah pada input modal dengan nilai -0,67. Sementara itu, elastisitas produksi tertinggi pada UMKM Seumur Hidup terdapat pada input bahan baku dengan nilai 1,02, dan elastisitas produksi terendah terdapat pada input modal dengan nilai -0,02. Elastisitas produksi pada masa Covid-19 pada UMKM Nemter sebesar 1,72, nilai tertinggi untuk input modal, dan elastisitas terendah terdapat pada

input tenaga kerja sebesar 1,23. Elastisitas produksi pada UMKM Putri Tunggal memiliki nilai tertinggi untuk input modal sebesar 1,69 dan nilai terendah untuk input bahan baku sebesar 1,01. Pada UMKM Seumur Hidup, elastisitas produksi tertinggi terdapat pada input bahan baku sebesar 1,49, sedangkan terendah terdapat pada input modal sebesar -2,24. Pendapatan yang diterima UKM Nemter sebelum pandemi COVID-19 adalah Rp53.031.980, dan selama pandemi sebesar Rp36.303.817. Sementara itu, pendapatan UKM Putri Tunggal sebelum pandemi COVID-19 adalah Rp72.035.466 dan selama pandemi COVID-19 adalah Rp52.021.675. Selanjutnya, pendapatan yang diperoleh UKM Seumur Hidup sebelum pandemi COVID-19 adalah Rp30.195.550 dan selama pandemi COVID-19 adalah Rp44.114.278.

Kata Kunci: Covid-19, pendapatan, elastisitas produksi

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a significant role in the national economy. In addition to contributing to the Gross Domestic Product (GDP), the government reported as many as 3.79 million micro, small, and medium enterprises (MSMEs). This number represents about 8% of the total MSMEs in Indonesia, which is 59.2 million (Nurhidayanti, 2020).

Production is a method used to generate goods and services (Mahfud, 2012). The production of goods can be grouped into three major categories. First, production related to the agricultural sector, where the goods produced result from cultivation processes such as crops, livestock, and fisheries. Second, production related to services, such as tailoring, content creation, and graphic design. Third, production involving the processing of raw materials using production tools, commonly found in small-scale industries or home industries, such as cake making, handicrafts, and the processing of tofu and tempeh. Tempeh processing industries are closely related to production and are highly relevant to the concept of elasticity.

Income is the difference between revenue and total costs. Income is obtained from the difference between gross income and production costs, calculated monthly or annually. Maryana (2021) states that production costs are all expenses associated with the product, whether directly or indirectly, which can be identified during the production activities. Production costs include raw materials, labor costs, variable costs, and others. These costs are the production factors in tempeh production.

The coronavirus, commonly known as COVID-19, is an infectious disease caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). According to research by Herliandry et al. (2020), this disease was first discovered on December 31, 2019, in Wuhan, the capital of Hubei Province, China, and has since spread globally. Goma (2021) reported that COVID-19 cases developed rapidly, and Indonesia ranked 19th in ASEAN with a total of 735,124 confirmed COVID-19 cases.

Tempeh processing in Kupang City varies in terms of production capacity and scale. The following data was obtained from brief interviews regarding production capacity at three micro-enterprises: Nemter, Putri Tunggal, and Seumur Hidup. At the Nemter micro-enterprise, the average production from 2019 to 2022 was 14,368 tempeh units per cycle. At Putri Tunggal, the average production during the same period was 14,744 tempeh units per cycle. At Seumur Hidup, from 2019 to 2022, the average production was 10,515 tempeh units per cycle.

These three micro-enterprises have different production outputs due to variations in raw material usage and other factors. Several issues contributed to a decline in production during the COVID-19 period: The rising cost of raw materials, particularly soybeans, which increased from IDR 10,000/kg to IDR 15,000/kg. Inconsistencies in raw material weight, where a sack labeled 50 kg often weighed less, sometimes only 49 kg per sack. Social restrictions, which limited in-person interactions, resulting in fewer buyers or customers during the pandemic.

The objective of this study is to analyze the production elasticity of tempeh in three MSMEs in Kupang City to understand the extent to which changes in factors such as raw materials, labor, and capital affect output levels or production, which in turn impacts income. The income analysis aims to evaluate the enterprise's ability to generate profit.

RESEARCH METHODOLOGY

The research was conducted on micro-enterprises in three locations, namely in Bakunase 1, Bakunase 2, and Oebufu Sub-Districts in Kupang City, East Nusa Tenggara. The location determination method used was purposive sampling, targeting micro tempeh businesses that showed production elasticity and stable income levels before and after the COVID-19 period.

The types of data used in this study are primary and secondary data. Primary data was obtained through interviews, conducted directly with business owners using a set of prepared questions (questionnaire). Secondary data was gathered from documents available at the research locations. In this study, the researcher used several data collection methods, particularly the survey method. The data analysis method applied in this research was quantitative descriptive analysis.

Analysis Method

Calculation of Production Elasticity

The calculation of elasticity, according to Siregar (2020), is as follows:

1. **Total Product**

$$TP = f(X)$$

Explanation of Terms:
TP = Total Production
X = Input factor

If only one production factor is used, for example labor, the formula can be expressed as follows:

$$TP = F(L, M, K)$$

Explanation of Terms:
TP = Total Production
L = Labor
M = Material
K = Capital

2. **Average Production**

$$AP = Q / (L, M, K)$$

Explanation of Terms:
AP = Average Product
Q = Output
L = Labor
M = Material
K = Capital

3. **Marginal Product**

The marginal product of each input, according to Siregar (2020), is mathematically written as follows:

$$MP_L = \frac{Change\ in\ Output}{Change\ in\ Input} = \frac{\Delta F\ (Q)}{\Delta L} = \frac{\Delta Q}{\Delta L}$$

$$MP_M = \frac{Change\ in\ Output}{Change\ in\ Input\ (material)} = \frac{\Delta F\ (Q)}{\Delta M} = \frac{\Delta Q}{\Delta M}$$

$$MP_K = \frac{Change\ in\ Output}{Change\ in\ Input\ (Capital)} = \frac{\Delta F\ (Q)}{\Delta \mathrm{K}} = \frac{\Delta Q}{\Delta \mathrm{K}}$$

Where the production elasticity with respect to each input, namely labor, raw materials, and capital is expressed as follows:

$$EP_L = \frac{\Delta Q}{\Delta \mathrm{K}} = \frac{L}{Q}$$

$$EP_M = \frac{\Delta Q}{\Delta \mathrm{M}} = \frac{M}{Q}$$
$$EP_k = \frac{\Delta Q}{\Delta \mathrm{k}} = \frac{k}{Q}$$

Gross Margin Calculation

The gross margin calculation, according to Ringwood (1998), is formulated as follows:

$$GM = TR - VC$$

Explanation of Terms:

GM : Gross Margin (IDR)
TR : Total Revenue (IDR)
VC : Variable Cost (IDR)

RESULTS AND DISCUSSION

General Description of the Research Location

Nemter MSME

The 'Nemter' micro-enterprise is located at Jl. Kecipir RT.12 RW.04, Bakunase 1 Sub-district, Kota Raja District, Kupang City, East Nusa Tenggara. It is a business engaged in tempeh production. The enterprise was established by Mr. Nemter Tlonaen in 2002. This micro-enterprise produces tempeh that is sold directly to consumers. The 'Nemter' micro-enterprise was founded based on the knowledge gained from Mr. Nemter's experience working with Javanese people. He then took the initiative to start his own business with limited capital and knowledge, and has managed to sustain the business up to the present in producing tempeh.

Putri Tunggal MSME

The "Putri Tunggal" micro-enterprise is located at Jalan Semangka, RT.017/RW.005, Bakunase Sub-district, Kota Raja District, Kupang City, East Nusa Tenggara. It is a business engaged in tempeh production. The micro-enterprise was established by Mr. Mardikai Sanam in 2008, and it produces tempeh that is sold directly to consumers. The founder of "Putri Tunggal" MSME initially worked at a tempeh and tofu company named "BAFLO" (Bandung Flobamor) starting in 1995. However, over time, the company could not survive and went bankrupt in 1998. Then, in 2008, Mr. Mardikai Sanam, with the knowledge and capital he had accumulated, decided to establish his own business in tempeh production, which has persisted up to the present.

Seumur Hidup MSME

The "Seumur Hidup" micro-enterprise is located at Jl. Perintis Kemerdekaan RT.37 RW.10, Oebufu Sub-district, Oebobo District, Kupang City, East Nusa Tenggara. This business is engaged in tempeh production. It was founded by Mr. Marzuki, and the micro-enterprise produces tempeh that is sold directly to consumers. The "Seumur Hidup" micro-enterprise was established based on knowledge gained from experience. Mr. Marzuki then took the initiative to start his own business in tempeh production, which continues to operate successfully to this day.

1. Production Factors
a) Capital

Table 1. Capital Usage in MSMEs in Kupang City, 2019–2022

MSME	Capital per year (Rupiah)			
	2019	2020	2021	2022
Nemter	73.750.000	79.650.000	72.291.667	63.375.000
Putri Tunggal	72.708.333	73.958.333	79.875.000	63.437.500
Seumur Hidup	43.500.000	50.835.500	56.208.333	59.666.667
Total	189.958.333	204.443.833	208.375.000	186.479.167
Average	63.319.444	68.147.944	69.458.333	62.159.722

Source: Primary Data Analysis, 2025

Based on Table 1, the capital used by the MSMEs Nemter, Putri Tunggal, and Seumur Hidup from 2019 to 2022 fluctuated. The highest average capital usage occurred in 2021, when the COVID-19 situation had eased to a milder condition. The lowest usage was in 2022, a period when the MSMEs began to resume their activities after a temporary halt due to the COVID-19 outbreak in the previous year.

b) Material

Table 2. Material Usage in MSMEs in Kupang City, 2019-2022

MSME	Material per year (Kg)			
	2019	2020	2021	2022
Nemter	174.050	174.050	148.872	119.004
Putri Tunggal	148.022	131.276	131.276	85.070
Seumur Hidup	105.125	104.522	87.517	80.103
Total	427.197	409.848	367.665	284.177
Average	142.399	136.616	122.555	94.726

Source: Primary Data Analysis, 2025

Based on Table 2, the usage of soybean raw materials is shown. Looking at the average raw material usage, the highest amount was in 2019, totaling 142,399 kg, and the lowest was in 2022, with 94,726 kg. In terms of annual variation, Nemter MSME used the largest amount of raw materials over the four consecutive years from 2019 to 2022, followed by Putri Tunggal MSME. The lowest raw material usage was observed in Seumur Hidup MSME.

c) Labor

Table 3. Labor Usage in MSMEs Kupang City, 2019-2022

MSME	Labor (hours/year)			
	2019	2020	2021	2022
Nemter	472	472	408	338
Putri Tunggal	461	473	414	292
Seumur Hidup	348	347	296	298
Total	1.281	1.292	1.118	928
Average	427	431	373	309
Person-days	61	61,57	33,28	44,14

Source: Primary Data Analysis, 2025

Based on Table 3 above, the highest average labor usage occurred in 2020, while the lowest was in 2022. In 2019, the largest work input (HOK/man-days) was at Nemter MSME, and the lowest was at Seumur Hidup MSME. Meanwhile, in 2020, the highest work input for tempeh production occurred at Putri Tunggal MSME, only slightly higher than that of Nemter MSME. In 2021, among the three MSMEs, Putri Tunggal MSME had the highest work input for tempeh production, while Seumur Hidup MSME had the lowest. During the COVID-19 easing period in 2022, the highest work input was at Nemter MSME, and the lowest was at Putri Tunggal MSME.

d) Production

Table 4. Production of MSMEs in Kupang City, 2019-2022

MSME	Production per year			
	2019	2020	2021	2022
Nemter	18.658	15.821	12.857	10.135
Putri Tunggal	18.101	17.892	15.368	10.028
Seumur Hidup	10.979	10.948	10.812	9.321
Total	47.738	44.661	39.037	29.484
Average	15.913	14.887	13.012	9.828

Source: Primary Data Analysis, 2025

Based on Table 4, the average annual production of the three MSMEs shows that production was relatively stable before COVID-19, from 2019 to early 2020. A decline in production occurred from the early COVID-19 period to its peak, from mid-2020 to mid-2021. During the peak of COVID-19, the macroeconomy experienced a downturn, causing many employees to be furloughed. Economic activity began to gradually recover during the relief or easing period from late 2021 to 2022.

2. Production Elasticity in Micro-Scale Tempe Businesses in Kupang City

Table 5. Production Elasticity in Kupang City, 2019–2022

Production Factors	MSME								
	Nemter			Putri Tunggal			Seumur Hidup		
	2019 ke 2020	2020 ke 2021	2021 ke 2022	2019 ke 2020	2020 ke 2021	2021 ke 2022	2019 ke 2020	2020 ke 2021	2021 ke 2022
1. Material	1,37	1,39	1,23	0,21	1,81	1,02	1,02	0,07	1,49
2. Labor	1,56	1,38	1,23	-0,84	1,13	1,18	0,98	0,08	-0,66
3. Capital	-1,90	2,03	1,72	-0,67	-1,76	1,69	-0,02	-0,12	-2,24

Source: Primary Data Analysis, 2025

Based on Table 5, looking at the overall production elasticity of the three production factors at Nemter MSME from 2019 to 2022, it is considered high, where Ep>1. The three inputs used are highly productive, especially labor and capital. For example, regarding labor input from 2021 to 2022, a positive value of 1.39 means that adding 1 unit of labor input will increase production by 1.39%.

At Putri Tunggal MSME, the production elasticity from 2019 to 2022 is considered medium, where Ep≈1. The input usage is very stable and efficient, although it tends to decrease slightly. For instance, from 2019 to 2020, the labor input coefficient is -0.84, meaning that adding 1 unit of labor input would actually decrease production by 0.84%.

At Seumur Hidup MSME, production elasticity from 2019 to 2022 is considered low, where Ep<1. Incorrect input usage caused each input's elasticity to be negative, meaning that adding even 1 unit of input will reduce production, especially for capital. The capital input at this MSME shows that increased capital usage actually decreases production, as indicated by the negative coefficient.

First, regarding raw material input, in line with the study by Andriani (2017), a positive coefficient value for raw materials has a positive effect, meaning that adding 1 unit of input will increase maximum production. Second, regarding labor input, this aligns with Herawaty (2019), which states that a positive labor coefficient will result in maximum production. Conversely, Triwahyudi (2021) states that a negative input coefficient will reduce production output. Third, regarding capital input, this aligns with Ananda (2023), which states that if the capital input coefficient is positive, each additional unit of input in production will generate maximum output and is considered effective.

3. Selling Price, Revenue, and Variable Cost
a) Selling Price

Table 6. Selling Price of MSMEs in Kupang City, 2019-2022

MSME	Selling Price (Rupiah)			
	2019	2020	2021	2022
Nemter	5.000	6.000	7.000	8.500
Putri Tunggal	6.000	6.000	6.500	8.000
Seumur Hidup	5.000	6.000	6.500	8.000
Total	16.000	18.000	20.000	24.500
Average	5.333	6.000	6.667	8.167

Source: Primary Data Analysis, 2025

The selling price of tempe per batch tended to increase from 2019 to 2022. The price increase from 2019 to 2022 reached 53.1%, rising from IDR 5,333 per batch in 2019 to IDR 8,167 per batch in 2022.

b) Revenue

Table 7. Revenue of MSMEs in Kupang City, 2019-2022

MSME	Revenue per year (Rupiah)			
	2019	2020	2021	2022
Nemter	93.291.980	94.925.100	89.997.483	86.151.693
Putri Tunggal	108.608.800	107.352.000	99.896.675	80.225.600
Seumur Hidup	54.895.550	65.685.365	70.280.681	74.567.820
Total	256.760.330	253.478.465	260.174.839	240.945.113
Average	85.586.777	84.492.821	86.724.946	80.315.037

Source: Primary Data Analysis, 2025

Based on Table 7, the average revenue received by the three MSMEs shows that the highest revenue occurred in 2021, amounting to IDR 86,724,946, while the lowest revenue was in 2022, at IDR 80,315,037. The highest revenue occurred during the peak of COVID-19, which is suspected to be due to a reduction in tempeh sellers (Suek et al., 2023), while the demand for tempeh remained relatively stable, causing tempeh prices to be relatively higher compared to the previous and following years.

c) Variable Cost

Table 8. Variable Cost Usage of MSMEs

MSME	Variable Cost (Rupiah)			
	2019	2020	2021	2022
Nemter	40.260.000	54.030.000	53.691.667	48.302.500
Putri Tunggal	36.573.333	42.606.250	47.875.000	34.791.667
Seumur Hidup	24.700.000	33.204.875	31.483.333	30.453.542
Total	101.533.333	129.841.125	133.050.000	113.547.709
Average	33.844.444	43.280.375	44.350.000	37.849.236

Source: Primary Data Analysis, 2025

Based on Table 8, the highest average variable cost usage occurred in 2021, amounting to IDR 44,350,000, while the lowest was in 2019, at IDR 33,844,444. The high variable costs are suspected to be due to labor costs, as there was a reduction in the workforce during the peak of COVID-19 (Suek et al., 2023). The limited number of workers triggered an increase in wages.

4. Income of Tempeh MSMEs in Kupang City

Table 9. Gross Margin Income of MSMEs in Kupang City

MSME	Income (Rupiah)			
	2019	2020	2021	2022
Nemter	53.031.980	40.895.100	36.849.193	37.849.193
Putri Tunggal	72.035.466	64.745.750	52.021.675	45.433.933
Seumur Hidup	30.195.550	32.380.450	38.797.348	44.114.278
Total	155.262.996	138.021.300	127.668.216	127.397.404
Average per year	51.754.332	46.007.100	42.556.072	42.465.801
Average per month	4.312.861	3.833.925	3.546.339	3.538.817

Source: Primary Data Analysis, 2025

Based on Table 9, the average revenue of the tempeh MSMEs in 2019 was IDR 51,754,332 per year. Then, approaching the beginning of COVID-19 in 2020, revenue decreased to IDR 46,007,100, a decline of 11.1%, and continued to decrease by 7.5% from 2020 to 2021. Subsequently, there was a

slight decline of 0.2% from 2021 to 2022. The significant decline in the average revenue of the three MSMEs from the pre-COVID period to the early and peak COVID period aligns with the study conducted by Adu et al. (2023), which reported a 12.5% decrease in the income of mobile vendors from the pre-COVID period to the COVID period.

CONCLUSION AND RECOMMENDATION

Conclusion

Based on the results of the research and discussion, and referring to the study, the following conclusions can be drawn:

1. Before the COVID-19 period, the production elasticity for the three MSMEs was as follows: Nemter MSME: highest for capital input (2.03) and lowest for capital input (-1.90). Putri Tunggal MSME: highest for labor input (1.13) and lowest for capital input (-0.67). Seumur Hidup MSME: highest for raw material input (1.02) and lowest for capital input (-0.02).
2. During the COVID-19 period, the production elasticity for the three MSMEs was as follows: Nemter MSME: highest for capital input (1.72) and lowest for raw material and labor input (1.23). Putri Tunggal MSME: highest for capital input (1.69) and lowest for raw material input (1.01). Seumur Hidup MSME: highest for raw material input (1.49) and lowest for capital input (-2.24).
3. Revenue received by the MSMEs: Nemter MSME: before COVID IDR 53,031,980, during COVID IDR 36,303,817. Putri Tunggal MSME: before COVID IDR 72,035,466, during COVID IDR 52,021,675. Seumur Hidup MSME: before COVID IDR 30,195,550, during COVID IDR 44,114,278.

Recommendations

Based on the results, discussion, and conclusions, several recommendations are suggested:

1. For the three tempeh micro-enterprises, to stabilize production elasticity and increase revenue, entrepreneurs are expected to develop strategies for capital usage, optimize raw material usage, and improve labor efficiency.
2. For the government, it is recommended to provide subsidy-based support programs for MSMEs in Kupang City, including training and mentoring programs for micro-enterprises, as well as support in marketing systems for each MSME product.
3. For academic development, the research conducted is still fundamental, so this study can serve as a basis for further research.

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