Jurnal Ilmu Ilmu Agribisnis: Journal of Agribussiness Science, 12(3): 181-188, Agustus 2024 *ISSN(p): 2337-7070*
Accredited S4 based on DGHE, RTM Republic of Indonesia, No. 204/E/KPT/2022 *ISSN(e): 2620-4177*
Available Online: https://jurnal.fp.unila.ac.id/index.php/JIA

DAMPAK PANDEMI COVID-19 TERHADAP STRUKTUR BIAYA DAN KEUNTUNGAN AGROINDUSTRI TEMPE DI KOTA BANDAR LAMPUNG

THE IMPACT OF COVID-19 PANDEMIC ON THE COST STRUCTURE AND PROFITABILITY OF TEMPE AGROINDUSTRY IN THE CITY OF BANDAR LAMPUNG

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ABSTRACT

The Covid-19 pandemic in 2020 affected every aspect of life, including the slowdown of economic growth. However, there are sectors that have proven to be resilient in the midst of the pandemic, namely the agricultural sector and the processing industry. This research aims to determine the impact of the Covid-19 pandemic on the cost structure and profits of the tempe agro-industry in Bandar Lampung. This research involved 32 tempe agro-industries using quota sampling technique. The data analysis methods used include cost structure analysis, profit analysis, and paired sample t-tests. The research results show that the cost structure and profits of the tempe agro-industry in Bandar Lampung are influenced by the Covid-19 pandemic. The largest and most significant cost structure difference lies in the main raw material, which is soybeans, with a percentage of 62.99 percent before the pandemic and 66.46 percent after the pandemic. Meanwhile, the total costs have significantly increased, rising by 8.59 percent each month following the occurrence of the Covid-19 pandemic. In addition, the pandemic also significantly affected the profit structure of the tempe agro-industry, reducing income by 11.80 percent and profits by 40.15 percent.

Keywords: Agroindustri, Pandemi Covid-19, Tempe, UMKM

Received: 8 June 2024 Revised:12 July 2024 Accepted:30 August 2024 DOI: http://dx.doi.org/10.23960/jiia.v12i3.9449

INTRODUCTION

The Covid-19 pandemic persisted worldwide from 2020 to 2022. The epidemic adversely affects not only health but also economic and social dimensions worldwide. Aeni, (2021) asserts that the Covid-19 epidemic has induced alterations in the demand and supply of products and services from an economic perspective. This affects diminishing economic growth. Aeni, (2021) observed that the economic framework bolstered by the agriculture business sector and the processing industry exhibited positive growth during the Covid-19 Pandemic. According to Ika et al., (2023), the Covid-19 epidemic has led to a decline in economic growth, while the agricultural sector remains comparatively steady.

Industries operating at the MSME scale are among those impacted by the Covid-19 Pandemic (Rosita, 2020; Prakoso, 2020; Sugiri, 2020; Hardilawati, 2020; Amri, 2020). Nevertheless, several industries managed to endure throughout the Covid-19 Pandemic. As stated by Rosita (2020), these sectors encompass those that fulfil fundamental human need, including power, potable water, agriculture, livestock, plantations, fisheries, and automobile production and financial institutions.

Furthermore, Rosita, (2020) indicates that several industries have indeed enjoyed growth during the Covid-19 Pandemic. The relevant industries are involved in food, pharmaceuticals, technology, and communication. Agricultural production and the food and beverage sector contribute positively to economic growth, however modestly (Tampubolon, 2023). The study's results indicate that the agricultural product processing sector within MSMEs (Micro, Small and Medium Enterprises) retains potential for growth despite the Covid-19 pandemic.

The agricultural product processing sector is commonly referred to as agroindustry. Indonesia's agricultural sector, rich in natural resources, positions the agro-industry as a crucial contributor to the production of value-added agricultural products. Furthermore, the agro-industry significantly aids in fulfilling basic material requirements, generating employment

Opportunities, and fostering economic development (Saragih, 2010).

Bandar Lampung City is one of the regions with a large concentration of processing industries. The Processing Industry sector makes the most significant positive contribution to Gross Regional Domestic Product relative to other sectors in the city. The Processing Industry Sector's contribution 21,09 percent (Badan Pusat Statistik Kota Bandar Lampung, 2022). In Bandar Lampung, the tempeh agroindustry is a readily accessible MSME-scale enterprise. Tempeh is a high-protein processed food derived from fermented soybeans. Tempeh is categorised as an economical cuisine due to its low cost and accessibility. Furthermore, tempeh is abundant in isoflavone antioxidants that promote health.

The Tempe Agroindustry Centre, located in Gunung Sulah Village, Way Halim District, Bandar Lampung, has a long-standing presence. The tofu agroindustry is centred in this region as well as tempeh. The region contains 181 agroindustries, comprising 115 tofu and 66 tempeh facilities (Kelurahan Gunung Sulah, 2019).

Tempeh is one of the processed foods that can be made conventionally on a household basis because it is comparatively simple to prepare. Despite its traditional production methods, tempeh agro-industry participants in Gunung Sulah Village utilise imported soybeans as raw materials for tempeh manufacturing. They assert that imported soybean grains are larger and appropriate for tempeh production. Furthermore, imported soybeans are more accessible and less expensive than domestic soybeans. Nevertheless, the pandemic during that period resulted in an increase in the price of imported soybeans, a fundamental basic material for tempeh. Mubarokah et al. (2022) indicated that soybean price volatility post-Covid-19 pandemic was significantly greater than that observed prior to the pandemic.

Wuryantoro et al. (2022) state that the price of soybean raw materials plays a significant role in the cost structure of tempeh, influencing the industry's ability to generate added value and function economically. The whole expense of tempeh production in Jakarta rose by 19.80 percent as a result of escalating soybean prices, accompanied by a significant decline in revenue (Naelis & Novindra, 2017). A study in Palembang indicated that production costs escalated from Rp 5,147/kg to Rp 6,023/kg following the rise in soybean prices, demonstrating a direct association between raw material expenses and total production costs (Titania & Ningrum, 2022). According to these studies, the escalation in the cost of soybean raw materials within the agroindustry may lead to heightened production expenses and diminished profitability for the sector. Besides the expense of raw materials, the profitability of the tempeh agroindustry during the pandemic may also be impacted by other expenses in the cost structure of the sector.

Given the context and prevailing issues, it is deemed essential to understand the effects of the Covid-19 Pandemic on the cost and profit framework of the Tempe Agroindustry in Bandar Lampung. The extent to which this agro-industry can endure the Covid-19 pandemic can be ascertained. The objective of this study is to examine the effects of the Covid-19 Pandemic on the cost and profit framework of the Tempe Agroindustry in Bandar Lampung City.

RESEARCH METHODS

This research methodology employed the survey technique. The conducted analysis encompasses both descriptive and quantitative methodologies. The utilised data comprises primary data from agroindustry stakeholders and secondary data from relevant agencies. The data collection method involved conducting interviews utilising questionnaires.

The study was performed in Gunung Sulah Village, Way Halim District, Bandar Lampung City. The investigation was intentionally conducted at a site identified as the hub of the tempeh agroindustry in Bandar Lampung. The study was carried out from April to October 2021. Sampling employs non-random procedures, specifically quota sampling. Quota sampling is a method for selecting samples from populations with specific characteristics to meet a predetermined quota (Sugiyono, 2013).

The population comprises 66 tempeh agroindustries, with a sample picked at 50 percent, amounting to 32 tempeh agroindustries, based on the premise that this proportion adequately represents the characteristics of MSMEs across all extant agroindustries.

The employed data analysis techniques encompass cost structure analysis and profit analysis. The cost structure comprises fixed and variable cost components and their respective percentages of the

total cost. Rosyidi (2011) posits that the overall cost can be calculated using the following formula:

TC=TFC+TVC ..... (1)

Information:
TC = Total Cost (Rp)
TFC = Total Fixed Cost (Rp)
TVC = Total Variable Cost (Rp)

The industry's production cost structure comprises three primary components: raw materials (direct materials), direct labour wages, and factory overhead costs (Manufacturing Overhead) (Oktora et al., 2023). Therefore, the total cost formula is expressed as follows:

TC = DM + DL + MO..... (2)

Information:
DM = Direct Material Cost (Rp)
DL = Direct Labor Wages (Rp)
MO = Factory Overhead Cost (Rp)

Furthermore, total revenue can be calculated using the equation:

TR = QxP ..... (3)

Information:
TR = Total revenue (Rp)
Q = Number of products (kg)
P = Selling price of the product (Rp)

Profits are obtained by calculating the difference between revenue and production costs incurred in a certain production period (Soekartawi, 2010):

π =TR–TC ..... (4)

π= (Y.Py)–(X . Px) ..... (5)

Information:
π = Profit (Rp)
TR = Total revenue (Rp)
TC = Total cost (Rp)
Y = Production yield (kg)
Py = Unit price of production (Rp)
X = Production factor(i=1,2,3, ,n)
Px = Price of the it production factor (Rp)

A differential test analysis was conducted prior to and following the Covid-19 Pandemic. The analysis employed the Wilcoxon Signed Ranks Test for paired comparisons. Differential analyses are performed on the cost structure (raw material expenses, direct labour expenditures, and factory overhead costs), total revenues, and profits.

The hypothesis under examination are as follows:

1. Null Hypothesis (H0): There is no disparity in the cost structure, total revenues, and profits prior to and subsequent to the Covid-19 pandemic.
2. The alternative hypothesis (Ha): a disparity exists in the cost structure, total receipts, and earnings before and after the Covid-19 pandemic.

Decision-making stipulates that:

1. If the Asymptotic Significance (2-tailed) is less than 0.05, then the alternative hypothesis (Ha) is accepted.
2. If the Asymptotic Significance (2-tailed) is greater than 0.05, then the alternative hypothesis (Ha) is rejected.

RESULT AND DISCUSSION

Characteristics of Agroindustry Respondents.

The respondents' characteristics in this study encompass economic and social elements intrinsic to the tempeh agroindustry owner that may influence business operations. It comprises gender, owner's age, educational attainment, family size, experience in the tempeh agroindustry, and business status.

Table 1 indicates that the respondents in this study are primarily male, of working age, possess an average of 2-3 dependents, and have a low level of education (elementary school). The respondents has extensive expertise in the tempeh agro-industry, often ranging from 16 to 30 years. This indicates that proficiency in tempeh production was acquired through commercial experience. This business acumen is typically acquired across generations.

All participants consider the tempe agroindustry their primary source of income. This illustrates the significant impact of the tempe agroindustry in Gunung Sulah Village, Way Halim District, Bandar Lampung City.

Capital utilised in tempeh agroindustry operations often originates from the proprietors of the agroindustry. They typically engage in agro-industrial operations with the assistance of available family members.

Table 1. Characteristics of tempeh agroindustry respondents in Bandar Lampung City

No	Characterictic	Number	Persentage (%)
1	Gender		
	Male	19,00	59,38
	Female	13,00	40,62
	Total	32,00	100,00
2	Age (year)		
	15-65	32,00	100,00
	> 65	0,00	0,00
3.	Education		
	SD	17,00	53,13
	SMP	6,00	18,75
	SMA	7,00	21,87
	S1	2,00	6,25
	Total	32,00	100,00
4.	Number of Dependents (person)		
	0-1	6,00	18,75
	2-3	25,00	78,13
	4-5	1,00	3,12
	Total 32.00	100,00	
5.	Business Experience (years)		
	0-15	4,00	12,50
	16-30	21,00	65,62
	31-45	7,00	21,88
	Total 32.00	100,00	
6.	Business Status		
	Main	32.00	100.00
	Side	0.00	0.00
	Total	32.00	100,00

Cost Structure of Tempeh Agroindustry in Bandar Lampung

The cost structure comprises the expenses associated with tempeh production. The cost structure is utilised to assess the total incurred expenses. The cost structure in the tempeh agroindustry in Gunung Sulah Village comprises Total Costs, which include Raw Material Costs, Direct Labour Costs, and Overhead Costs. The cost structure and profit data for the tempeh agroindustry for a one-month period in Bandar Lampung City is presented in Table 2.

Table 2 indicates that the predominant proportion of cost structure relative to total cost is attributed to soybean raw materials, specifically 62.99 percent before to the Covid-19 Pandemic, which escalated to 66.46 percent subsequent to the pandemic. The effect of the rise in expenses prior to and following Covid-19 is prominently seen in the pricing of raw materials. Covid-19 offers the rise in the cost of soybean raw materials was 14.59 percent. The rise in raw material costs is unavoidable for tempeh agroindustry participants, as the production and quality of tempeh are significantly reliant on the amount and quality of the soybean raw materials utilised.

Imported soybeans are the primary raw material utilised in the tempeh agroindustry in Bandar Lampung City. The imported soybeans originate from the United States and Argentina. Imported soybeans are utilised because of their larger grains.

Furthermore, tempeh produced from imported soybeans, it is regarded as having a prolonged shelf life following the fermentation process. The quality of tempeh made from imported soybeans surpasses that derived from local soybeans.

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Table 2. Cost structure and profit of the tempeh agroindustry per month before and after the Covid-19 Pandemic occurred in Bandar Lampung

No.	Information	Before Pandemic (Rp)	% to TC (%)	After Pandemic (Rp)	% to TC (%)	Δ (Rp)	Δ (%) (%)
1	Row Material Cost (Soyabean)	9.567.468,75	62,99%	10.963.406,25	66,46%	1.395.937,50	14,59%
2	Direct Labor Cost	2.163.281,25	14,24%	2.092.968,75	12,69%	-70.312,50	-3,25%
3	Overhead Cost						
	Yest	27.750,00	0,18%	27.750,00	0,17%	0,00	0,00%
	Plastic	1.891.406,25	12,45%	1.871.250,00	11,34%	-20.156,25	-1,07%
	Fire Wood	518.437,50	3,41%	518.437,50	3,14%	0,00	0,00%
	Candle	87.187,50	0,57%	87.187,50	0,53%	0,00	0,00%
	Solar (Engine Fuel)	87.656,25	0,58%	87.656,25	0,53%	0,00	0,00%
	Transportasion	461.250,00	3,04%	461.250,00	2,80%	0,00	0,00%
	Tools depreciation	348.814,73	2,30%	348.814,73	2,11%	0,00	0,00%
	Total Overhead Cost	3.459.252,23	22,77%	3.439.095,98	20,85%	-20.156,25	-0,58%
4	Total Cost	15.190.002,23	100%	16.495.470,98	100,00%	1.305.468,75	8,59%
5	Revenue	26.116.875,00		23.035.625,00		-3.081.250,00	-11,80%
6	Profit	10.926.872,77		6.540.154,02		-4.386.718,75	-40,15%

Table. 3. Results of the wilcoxon difference test on the cost structure of the tempeh agroindustry before and after the Covid-19 Pandemic in Bandar Lampung City in 2021

Costs	Z	Asymp. Sig. (2-tailed)
Material	-4,919	0,000
Labor	-0,816	0,414
Overhead	-0,047	0,963
Total Cost	-4,694	0,000

The rise in expenses may stem from the escalation of soybean prices. Prior to the pandemic, the price of soybeans ranged from Rp6,500.00 to Rp7,000.00 per kilogramme, however during the epidemic, the price has increased to between Rp9,000.00 and Rp9,150.00 per kilogramme. To address this issue, tempeh agroindustry entrepreneurs have initiated measures to decrease production volume and reduce tempeh size, thereby mitigating the impact of rising raw material costs. Consequently, the agroindustry can persist in its operations and generate profits.

Labour costs are the second-largest cost structure relative to overall costs. Specifically, it was 14.24 percent prior to the Covid-19 pandemic and declined to 12.69 percent subsequent to its occurrence. This indicates efforts to minimise manufacturing costs related to labour utilisation. Agro-industrial entities are diminishing their labour force. Nonetheless, this endeavour appears to be limited. The Covid-19 pandemic resulted in a 3.25 percent reduction in labour costs.

The workforce employed in the tempeh agroindustry in Bandar Lampung City comprises TKDK (Domestic Labour) and TKLK (Non-Family Labour). TKDK is a nuclear family member of the proprietor of the agro-industry, while TKLK is an employee engaged in production operations inside the tempeh agro-industry in Bandar Lampung City. The labour utilised in the tempeh agroindustry typically spans from 1 to 4 individuals, encompassing both TKDK and TKLK classifications. According to research by Windyata et al. (2021) and Atiyah et al. (2022) labour and raw material expenses account for the largest portion of the agroindustry cost structure. These findings are consistent with the findings of this study.

The third greatest component of the entire cost is the expense associated with tempeh packaging plastic, which constituted 12.45 percent prior to the Covid-19 pandemic and 11.34 percent subsequent to it. The expense of plastic constitutes an overhead cost. This indicates an endeavour to minimise production expenses regarding the utilisation of plastic for tempeh product packaging. This can be accomplished simply altering the dimensions of the tempeh to be reduced in size compared to previously. Nonetheless, this endeavour appears to be undertaken minimally by participants in the tempeh agroindustry. The Covid-19 pandemic has resulted in a mere 1.07 percent reduction in the cost of plastic packaging.

The apparatus employed in the tempeh agroindustry includes soybean crushing machines, boiling barrels, plastic drums, huge plastic baskets, tempeh storage racks, knives, basins, tubs, buckets, sieves, and tarpaulins. The depreciation expense does not alter the cost structure of the tempeh agroindustry pre- and post-Covid-19 Pandemic. Moreover, additional overhead expenses, like yeast, firewood, candles, engine fuel, and transportation, do not alter the current cost structure. The costs employed have remained unchanged both prior to and subsequent to the Covid-19 pandemic.

The tempeh agroindustry in Bandar Lampung has had a significant fall following the Covid-19 Pandemic when assessed from the perspective of the profit structure. Total expenses rose by 8.59 percent, whilst revenue declined by 11.80 percent. This alteration resulted in a decline in the profit of the tempeh agroindustry to 40.15 percent due to the Covid-19 Pandemic.

Paired Test in the Cost Structure of the Tempeh Agroindustry in Bandar Lampung City

To clearly understand the difference as an impact on the cost structure and profit of the Bandar Lampung City tempeh agroindustry before and after the Covid-19 Pandemic occurred, a paired data difference test was conducted. This paired data difference test is conducted based on the components of industrial production costs, specifically raw material expenses, labour costs, and overhead. The outcomes of the Wilcoxon Difference Test regarding the cost structure of the tempeh agroindustry are presented in Table 3.

The pre-pandemic cost of soybean raw materials varied from IDR 4,200,000.00 to IDR 30,150,000.00, with an average value of IDR 9,567,468.75. Throughout the Covid-19 epidemic, the price of soybean raw materials escalated from IDR 4,666,500.00 to IDR 32,400,000.00, with an average value of IDR 10,963,406.25.

Table 3 indicates that Ha is approved for the expense of raw materials. This indicates a substantial disparity in the cost of raw materials pre- and post-Covid-19 Pandemic. Varied conclusions are presented on labour expenses and overhead. Table 3 indicates that the test findings reject the alternative hypothesis (Ha). This indicates that there is no substantial variation in labour expenses and overhead before and after the Covid-19 pandemic.

There exists a disparity in the average labour costs borne by tempeh agro-industry entrepreneurs in Bandar Lampung prior to and during the ongoing COVID-19 outbreak. Prior to the epidemic, the average labour cost was Rp2,163,281.25, with a range from Rp937,500.00 to Rp9,000,000.00. Subsequent to the pandemic, the mean labour cost diminished to IDR 2,092,968.75, with a range from IDR 937,500.00 to IDR 6,750,000.00. The outcomes of the differential test were not significant.

This is elucidated by the tie values in the Wilcoxon Test series, indicating that 29 out of 32 respondents possess identical values. This suggests that the majority of the agro-industry has opted not to, or is unable to, decrease the current workforce. This decision is made by the majority of tempeh agro-industry entrepreneurs in Bandar Lampung City.

The entrepreneurs in the tempeh agro-industry choose to minimise other cost structures rather than alter the labour cost structure. They recognise that decreasing labour costs, including wages and those who have terminated employment, will significantly affect the socio-economic landscape, particularly for the affected workers.

The overhead expense of the tempeh agroindustry encompasses production costs, raw material expenses, and labour expenditures. The overhead expenses in the tempeh agroindustry of Bandar Lampung City include charges for yeast, firewood, plastic, wax, transportation, fuel for soybean breaking machines (diesel), and equipment depreciation.

The study's results indicate a reduction in the average overhead costs of the tempeh agroindustry. The mean overhead expense prior to the pandemic was IDR 3,459,252.23, with a range from IDR 1,858,976.19 to IDR 11,102,503.97. Subsequent to the pandemic, the range was from IDR 1,918,976.19 to IDR 10,382,503.97. The average overhead cost declined to Rp3,439,095.98; however, the differential test results were not significant.

The Wilcoxon test indicated that 11 respondents had reduced overhead expenditures post-pandemic compared to pre-pandemic levels. Twenty-one additional respondents experienced overhead costs post-pandemic that exceeded those incurred prior to the pandemic. This indicates a disparity in decision-making behaviour among tempeh agro-industry entrepreneurs.

The study's results indicate that the increased overhead costs post-pandemic were attributed to efforts to preserve the quality of tempeh, despite rising prices of essential ingredients owing to the pandemic's impact. The decrease in overhead costs following the pandemic resulted from tempeh agroindustry entrepreneurs' decision to lower production expenses by minimising supporting materials in response to the pandemic's impact.

Additionally, the data in Table 3 indicates that the Wilcoxon Test findings support Ha for the Total Cost. This is a significant disparity between the total cost prior to and subsequent to the Covid-19 epidemic. Consequently, it may be inferred that the tempeh agroindustry in Bandar Lampung City is impacted by Covid-19, leading to an escalation in the overall expenditures incurred for monthly tempeh production operations.

Paired Test of Profit Structure of Tempeh Agroindustry in Bandar Lampung City

The profit of the tempeh agroindustry is derived from the disparity between total revenue earned and total costs incurred in tempeh manufacturing and sales activities in Bandar Lampung City. Table 4 presents the outcomes of Wilcoxon's differential test regarding total revenue and agroindustry profits.

The study's results indicate a decline in total revenue following the occurrence of the Covid-19 epidemic. The mean total revenue generated prior to the pandemic was IDR 26,116,875.00, fluctuating between IDR 12,600,000.00 and IDR 79,200,000.00 across different business scales each month. Following the Covid-19 epidemic, the monthly revenue generated fluctuated between IDR 11,100,000.00 and IDR 61,200,000.00. Reduced to an average of IDR 23,035,625.00.

The data in Table 4 substantiates the acceptance of Ha. This indicates a substantial disparity in total receipts monthly, both pre- and post-pandemic,

across various business scales. It is clear that Covid-19 has an impact on Bandar Lampung City's tempeh agroindustry, which has led to a monthly decline in overall revenue.

The study's results indicate a decline in profits following the Covid-19 epidemic. Prior to the pandemic, the average profit was IDR 10,926,872.77, with a range from IDR 4,653,037.70 to IDR 28,947,496.03. In contrast, post-pandemic, the average profit ranged from IDR 2,343,037.70 to IDR 11,667,496.03. The mean profit generated is merely IDR 6,540,154.02 throughout the several scales of the examined tempeh agro-industry enterprises.

Table 4 illustrates the findings of a more precise examination of the profit differences observed before and after the Covid-19 Pandemic. Ha was acknowledged, indicating a significant disparity in the profitability of the tempeh agroindustry in Bandar Lampung City before and after the pandemic. The tempeh agroindustry in Bandar Lampung City experienced a decline in profitability because to the impact of the COVID-19 epidemic.

The study's findings indicate that the tempeh agroindustry, operating at a micro, small, and medium company scale in Bandar Lampung City, is impacted by Covid-19. The overall expenses increase while revenue declines, resulting in diminished earnings for tempeh agroindustry participants.

This corresponds with Amri's research, which shown that the capacity of MSMEs has persistently diminished during the pandemic, affecting both production capacity and income levels (Amri, 2020). Hardilawati (2020) indicated that MSME actors faced a direct impact during the pandemic manifested as a decline in sales turnover. According to Prakoso (2020), MSME actors must adapt to these developments, particularly in response to shifts in customer behaviour and consumption patterns.

Table 4. Results of Wilcoxon's Difference Test on Total Revenue and Profit of the Tempeh Agroindustry Before and After the Covid-19 Pandemic in Bandar Lampung City in 2021

Costs	Z	Asymp. Sig. (2-tailed)
Total Revenue	-4,704	0,000
Profit	-4,937	0,000

Tempeh is a product that often possesses an ideal competitive market structure. Consequently, proprietors of the tempeh agroindustry are anticipated to mitigate the losses stemming from the Covid-19 pandemic by the diversification of tempeh goods. This will transition the tempe market into a monopolistic competition framework, featuring diverse items differentiated by type and brand. Possible actions include producing tempeh brands and creating processed foods derived from tempeh.

CONCLUSION

The study concludes that the Covid-19 Pandemic has an impact on the cost and profit structure of the tempeh agroindustry in Bandar Lampung City. The most substantial and notably distinct pricing structure is observed in the primary raw materials, specifically soybeans, with a percentage of 62.99 percent prior to the Covid-19 Pandemic and 66.46 percent subsequent to it. The total cost has increased by 8.59 percent monthly since the onset of the Covid-19 pandemic. The agro-industry's income and profits exhibit significant disparities, with total revenue declining by 11.80 percent and profits decreasing by 40.15 percent following the Covid pandemic.

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