

Analysis of Production Budget Formulation Using the Least Squares Method at CV. Amirah Ramadhani Cemara, Makassar

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Abstract

This study investigates the application of the Least Squares method for production budget planning at CV. Amirah Ramadhani Cemara Kora, Makassar. Employing a quantitative descriptive approach, the research analyzes sales data from January to December 2024, beginning inventory data for January 2025, and 2024 production reports, substantiated by interview data. The findings indicate that the Least Squares method yields significantly more accurate and structured production forecasts compared to the company's previous conventional methods. Analysis using the trend equation $Y = a + bX$ reveals a consistent upward trend from January to December 2025, thereby mitigating risks associated with overstocking or stockouts. The projected 2025 production budget estimates a total output of 6,808 short-sleeve shirts and 6,466 long-sleeve shirts. The total estimated production cost is IDR 749,205,900, comprising IDR 463,920,000 for raw materials, IDR 66,830,000 for direct labor, and IDR 218,455,900 for factory overhead. This approach enables the company to optimize raw material and labor allocation based on predictive trends, effectively preventing production inefficiencies such as the overproduction observed in April 2024. Conclusively, the implementation of the Least Squares method allows CV. Amirah Ramadhani Cemara to enhance operational efficiency, streamline resource management, and facilitate strategic data-driven decision-making.

Keywords: Production Budget, Least Square Method, Raw Material Budget, Direct Labor Budget, Factory Overhead Budget.

1. Introduction

In the era of globalization, companies are compelled to enhance efficiency and effectiveness across every operational aspect to remain competitive (Zainab et al., 2023). A pivotal element in supporting operational success is the formulation of accurate production budgets, which serve as essential tools for cost control (Chamidah et al., 2023). Inaccurate production budgeting can lead to overstocking or stockouts, thereby significantly impacting profitability and business sustainability.

Production budgets are formulated based on sales forecasts and inventory requirements, encompassing budgets for raw materials, labor, and overhead costs (Warnaningtyas & Rohmatiah, 2022). To enhance planning precision, the Least Squares method serves as an effective tool, analyzing historical data to forecast production requirement trends (Susanti et al., 2021).

CV. Amirah Ramadhani Cemara, a garment manufacturer based in Makassar, encounters similar operational challenges. Its production decisions are currently predicated solely on the previous month's sales figures, lacking detailed budgetary planning. Consequently, this approach led to significant overstocking in April 2024, resulting in financial losses. The ending inventory and production cost data for the period of January to August 2024 are presented on Table 1.

As illustrated in Table 1, a significant inventory surge occurred in April 2024, reaching 6,850 units with a corresponding production cost of IDR 253,450,000—the highest recorded value during the observed period. This anomaly indicates an incidence of overstocking attributed to the absence of accurate production budget planning, as production decisions were predicated solely on the preceding month's sales volume. Consequently, this excess inventory resulted in cost inefficiencies and the stagnation of working capital turnover.

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Analogous operational challenges were identified at CV. Jodion Unggul Perkasa, as investigated by (Syahanifadhel et al., 2023). Their study highlighted the firm's difficulty in determining optimal production quantities, leading to failures in meeting targets or, conversely, engaging in overproduction. If left unaddressed, such persistent overproduction poses a significant financial risk to the company.

According to (Chamidah et al., 2023), inaccuracies in production budget planning can precipitate either overproduction or underproduction, ultimately diminishing operational efficiency and corporate profitability. Therefore, the implementation of historical data-driven production budgeting—specifically utilizing the Least Squares method—is crucial for proportionally optimizing inventory levels and production costs.

Table 1. Ending Inventory Data January-August 2024.

Month	Inventory (units)	Production Cost (IDR)
January	6,400	236,800,000
February	6,300	233,100,000
March	5,950	220,150,000
April	6,850	253,450,000
May	6,400	236,800,000
June	5,500	203,500,000
July	5,550	205,350,000
August	4,513	166,981,000

Source : CV. Amirah Ramadhani Cemara

The excess inventory observed at CV. Amirah Ramadhani Cemara underscores a fundamental deficiency in its current production budget planning system. (Yanto et al., 2022) emphasize that accurate production budgeting is vital for maintaining an equilibrium between product availability and market demand. To mitigate financial losses stemming from supply-demand mismatches, firms require a robust methodology capable of forecasting production requirements based on rigorous historical data analysis.

The Least Squares method functions as a robust quantitative forecasting instrument for production budgeting. As elucidated by (Susanti et al., 2021) this method calculates trends based on historical data to predict future requirements with superior accuracy. By analyzing sales trends, companies can determine optimal production volumes, thereby enhancing the efficiency of raw material allocation, labor utilization, and overhead cost management. Furthermore, (Wahyudi, 2022) asserts that forecasting is not merely pivotal for determining production and sales targets but is equally critical for effective finished goods inventory planning.

Based on this context, this study aims to analyze the formulation of production budgets using the Least Squares method at CV. Amirah Ramadhani Cemara, Makassar. This research intends to demonstrate how the method facilitates the development of a more accurate, efficient, and data-driven production budget, thereby supporting strategic decision-making within the company’s operational framework. Additionally, the findings are expected to serve as a practical reference for other garment manufacturers encountering similar challenges in production planning.

2. Literature Review

A production budget constitutes a comprehensive financial framework encompassing all aggregate costs requisite for the manufacturing of goods or services over a designated fiscal period. It entails meticulous planning regarding production volume, raw material utilization, direct labor allocation, and manufacturing overhead costs (Megawati et al., 2024). Functionally, the production budget serves as a strategic plan formulated by the entity to determine the specific quantity of output required.

This planning is rigorously aligned with projected sales demands while accounting for both beginning and ending inventory levels for a specific period (Siswanti, 2021; Tjandrakirana et al., 2023). Furthermore, Bustami and Nurlela (2006, as cited in Harahap et al., 2024) define the production budget as a detailed projection of unit production for the forthcoming period, explicitly specifying product types, quantities, and the scheduling of operational execution.

The formulation of production cost budgets serves as an effective mechanism for assisting enterprises in estimating total annual production expenses. Simultaneously, it facilitates the strategic planning and control of expenditures to ensure cost minimization (Pravitasari, 2022; Rohmah et al., 2024; Hazmi et al., 2023). Developing a precise production budget necessitates the application of a robust methodological approach; one such effective technique is the Least Squares method.

The Least Squares method constitutes a forecasting technique that utilizes linear equations to determine the *line of best fit* from historical datasets, thereby predicting future trends (Andriyani, 2018; Ridwan et al., 2020; Shidiq et al., 2022). Application of this method yields a trend equation characterized by the minimization of forecasting errors (Mamuaya, 2023; Rahayu & Nurdiansyaha, 2022). Consequently, the Least Squares method is capable of calculating and predicting data trends by minimizing deviations, resulting in superior forecasting accuracy (Putri et al., 2024).

According to (Muhtarom, 2016), the production budget comprises four primary components, specifically:

- 1) Production Volume Plan A projection of the quantity of products to be manufactured, derived from the sales budget while rigorously accounting for beginning and ending inventory levels.
- 2) Raw Material Budget This component encompasses three sub-elements:
 - a) Raw Material Usage Budget (in physical units): A plan determining the specific quantity of raw materials required for the production process in the upcoming period (Adnyana, 2020).
 - b) Raw Material Purchase Budget (in units and monetary value): A projection detailing the quantity and cost of raw materials to be procured in the subsequent period (Adnyana, 2020).
 - c) Raw Material Cost Budget (in monetary value): A financial plan presenting the total cost of raw materials consumed during the production process, expressed in monetary terms (Adnyana, 2020).
- 3) Direct Labor Budget A comprehensive plan estimating the workforce requirements and associated wage costs for personnel directly involved in the production process, ensuring alignment with the planned output targets (Adnyana, 2020).
- 4) Factory Overhead Budget An estimation of all manufacturing costs incurred during the production process, excluding direct raw materials and direct labor costs.

The Raw Material Budget is defined as a systematically structured and detailed plan governing the utilization of raw materials within the production process for a specified future period (Sahla, 2017). Concurrently, the Direct Labor Cost Budget entails a systematic projection regarding workforce magnitude, estimated labor hours, and wages payable to personnel directly engaged in manufacturing operations. This budget incorporates critical variables—including product specifications, work centers, wage rates, and production schedules—to facilitate effective cost control and workforce requirement planning (Amalia, 2018; Murrizki, 2024; Pasaribu, 2019).

3. Research Method

This study employs a quantitative approach, specifically focusing on the analysis of production budget formulation using the Least Squares method at CV. Amirah Ramadhani Cemara for the fiscal year 2025. A descriptive quantitative design is utilized to 'analyze data by describing or depicting the collected material as it exists, without aiming to establish generalized conclusions' (Sugiyono, 2020).

The primary variable under investigation is the production budget, formulated based on sales forecasts derived from the Least Squares method. Data sources employed in this research encompass both primary and secondary data. Primary data were acquired via observation and supporting interviews. Conversely, secondary data were extracted from corporate documentation, specifically comprising historical sales records, production output figures, and inventory data (beginning and ending balances) for the period spanning January to December 2024.

Data collection was conducted utilizing two primary techniques: documentation study and interviews. The documentation study involved the aggregation of corporate records pertaining to sales volume, production output, and inventory levels. Concurrently, interviews were performed to elicit supporting information regarding the company's existing budgeting practices. Subsequently, data analysis was executed through the following systematic stages:

1. Data Aggregation and Processing Aggregating and processing historical sales data spanning from January to December 2024 utilizing the Least Squares method to forecast sales for the 2025 fiscal year. The forecasting model is governed by the following linear trend equation:

$$Y = a + bX$$

$$a = \frac{\sum Y}{n}$$

$$b = \frac{\sum XY}{\sum X^2}$$

- Y = denotes the predicted value (dependent variable, i.e., sales volume).
- a = represents the constant value or the trend value at the base period (intercept).
- b = signifies the slope coefficient, representing the average trend growth per time unit.
- X = stands for the independent time variable (coded index for days, weeks, months, or years).
- $\sum Y$ = is the summation of historical sales data.
- $\sum X$ = is the summation of the time period codes.
- $\sum XY$ = represents the summation of the product of sales volume and the time period index.
- n = indicates the total number of data points (observations).

2. Production Budget Formulation Formulating the production budget derived from the sales forecasts (calculated in the previous stage), while rigorously accounting for the beginning and ending inventory levels for each month.
3. Manufacturing Cost Budgeting Developing the comprehensive cost budgets—specifically for raw materials, direct labor, and factory overhead—predicated upon the established production schedule.

Through the application of this systematic methodology, this study anticipates providing a precise framework for an effective and efficient production budgeting process at CV. Amirah Ramadhani Cemara.

4. Results and Discussions

CV. Amirah Ramadhani Cemara operates as a manufacturing entity within the garment sector, primarily specializing in the production and retail of t-shirts across a diverse spectrum of colors and specifications. In addition to marketing its proprietary product lines, the firm also undertakes custom manufacturing orders, including Daily Service Uniforms (*Pakaian Dinas Harian* or PDH), alma mater blazers, athletic wear, and screen-printed t-shirts. The historical sales data specifically for the company’s in-house t-shirt production is presented below:

Table 2. Historical Sales Data January-December 2024.

Month	Sales (units)		Amount (units)
	Short Sleeve	Long Sleeve	
January	460	307	767
February	283	188	471
March	485	397	882
April	229	153	382
May	450	300	750
June	500	750	1.2500
July	720	480	1.200
August	796	972	1.768
September	527	352	879
October	352	529	881
November	577	385	962
December	292	195	487
Total	5.672	5.007	10.679

Source : Processed Data, (2025)

As presented in Table 2, the sales volume for December 2024 stood at 487 units. Furthermore, data obtained from the business owner indicates a total ending inventory of 1,262 units for December 2024, comprising 505 short-sleeve shirts and 757 long-sleeve shirts. This ending balance is subsequently carried forward as the beginning inventory for January 2025. Additionally, the remaining raw material inventory was recorded at 16.5 kg of fabric.

The data reveals significant monthly fluctuations in sales performance at CV. Amirah Ramadhani Cemara throughout the fiscal year. The lowest sales volume was recorded in April at 382 units, a decline attributed to seasonal factors. Conversely, the peak sales volume occurred in August, reaching 1,768 units. This surge is directly correlated with Indonesia's National Independence Day celebrations, which historically drive demand for specific apparel. Cumulatively, the company recorded a total sales volume of 10,679 units from January to December 2024.

Historically, CV. Amirah Ramadhani Cemara has operated without a formal production budget, relying solely on retrospective sales data to determine production output. Consequently, purchased raw materials often stagnate in the warehouse due to unplanned utilization. To mitigate the risks associated with inventory surplus or deficit, it is imperative to formulate a structured production budget, commencing with a rigorous sales forecast.

4.1. Sales Budget

The sales budget projection covers the fiscal period from January to December 2025. The forecasting model employs the following linear trend equation:

$$Y = a + bX$$

Prior to executing the trend analysis, an auxiliary calculation table is constructed to facilitate the determination of the coefficients “a” and “b”. The computational worksheet is presented below:

Table 3. Calculation of components Y, X, XY, X2 of short-sleeved T-shirts

Month	Y	X	XY	X ²
January	767	-11	-5,062	121
February	471	-9	-2,543	81
March	882	-7	-3,396	49
April	382	-5	-1,146	25
May	750	-3	-1,350	9
June	1,250	-1	-500	1
July	1,200	1	720	1
August	1,768	3	2,387	9
September	879	5	2,637	25
October	881	7	2,467	49
November	962	9	5,195	81
December	487	11	3,214	121
Total	5,672	0	2,622	572

Source : Processed Data, (2025)

Table 4. Calculation of Y, X, XY, X2 components of Long Sleeve T-Shirt

Month	Y	X	XY	X ²
January	307	-11	-3,375	121
February	188	-9	-1,696	81
March	397	-7	-2,778	49
April	153	-5	-764	25
May	300	-3	-900	9
June	750	-1	-750	1
July	480	1	480	1

August	972	3	2,917	9
September	352	5	1,758	25
October	529	7	3,700	49
November	385	9	3,463	81
December	195	11	2,143	121
Total	5.007	0	4,199	572

Source : Processed Data, (2025)

a. Short Sleeve T-shirt

$$a = 5,672/12 = 473$$

$$b = 2,622/572 = 5$$

Januari 2025

$$\begin{aligned} Y \text{ (Januari)} &= a + bX \\ &= 473 + 5 (13) \\ &= 538 \end{aligned}$$

b. Long Sleeve T-shirt

$$a = 5,007/12 = 417$$

$$b = 4,199/572 = 7$$

Januari 2025

$$\begin{aligned} Y \text{ (Januari)} &= a + bX \\ &= 417 + 7 (13) \\ &= 508 \end{aligned}$$

Table 5. T-Shirt Sales Budget Calculation Results

Month	Sales Budget (units)		Amount (units)
	Short Sleeve	Long Sleeve	
January	538	508	1,046
February	548	522	1,070
March	558	536	1,094
April	568	550	1,118
May	578	564	1,142
June	588	578	1,166
July	598	592	1,190
August	608	606	1,214
September	618	620	1,238
October	628	634	1,262
November	638	648	1,286
December	648	662	1,310
Total	7,116	7,020	14,136

Source : Processed Data, (2025)

Based on computations derived from the Least Squares method, the projected sales budget for January 2025 is estimated at 1,046 units. This figure comprises 538 short-sleeve shirts and 508 long-sleeve shirts. Upon establishing the sales forecast, the subsequent analytical phase involves determining the required production volume for each respective month.

4.2. Production Budget

The production budget is formulated subsequent to the determination of the projected sales volume. The calculation methodology for the January 2025 production budget is detailed as follows:

a. Short Sleeve Shirts

Projected Sales	538
Add: Ending Inventory	<u>164</u>
Total Requirements	702
Less: Beginning Inventory	<u>505</u>
Required Production (January 2025)	197

b. Long Sleeve Shirts

Projected Sales	508
Add: Ending Inventory	<u>157</u>
Total Requirements	665
Less: Beginning Inventory	<u>757</u>
Required Production (January 2025)	-92

To facilitate a comprehensive overview of the projected requirements, the detailed production budget spanning January to December 2025 is summarized in the following table:

Table 6. T-Shirt Production Budget Calculation Results

Month	Production Budget (units)		Amount (units)
	Short Sleeve	Long Sleeve	
January	197	-92	197
February	551	526	1,077
March	561	540	1,101
April	571	554	1,125
May	581	568	1,149
June	591	583	1,174
July	601	596	1,197
August	611	610	1,221
September	621	624	1,245
October	631	638	1,269
November	641	653	1,294
December	651	666	1,317
Total	6,808	6,466	13,366

Source : Processed Data, (2025)

As detailed in Table 6, the production budget analysis for January indicates a positive production requirement of 197 units for short-sleeve shirts. Conversely, the calculation for long-sleeve shirts yielded a negative value of -92. This negative figure signifies an inventory surplus, implying that the existing beginning inventory is sufficient to cover both the projected sales and the target ending inventory. Consequently, CV. Amirah Ramadhani Cemara is advised to proceed with the production of short-sleeve shirts solely, while suspending production for long-sleeve shirts for this period due to the adequacy of current warehouse stock.

The analysis of the production budget calculations reveals a consistent upward trajectory in production volumes for both short-sleeve and long-sleeve t-shirts spanning from January to December 2025. This progressive monthly increase in projected production output is graphically depicted in the following figure:

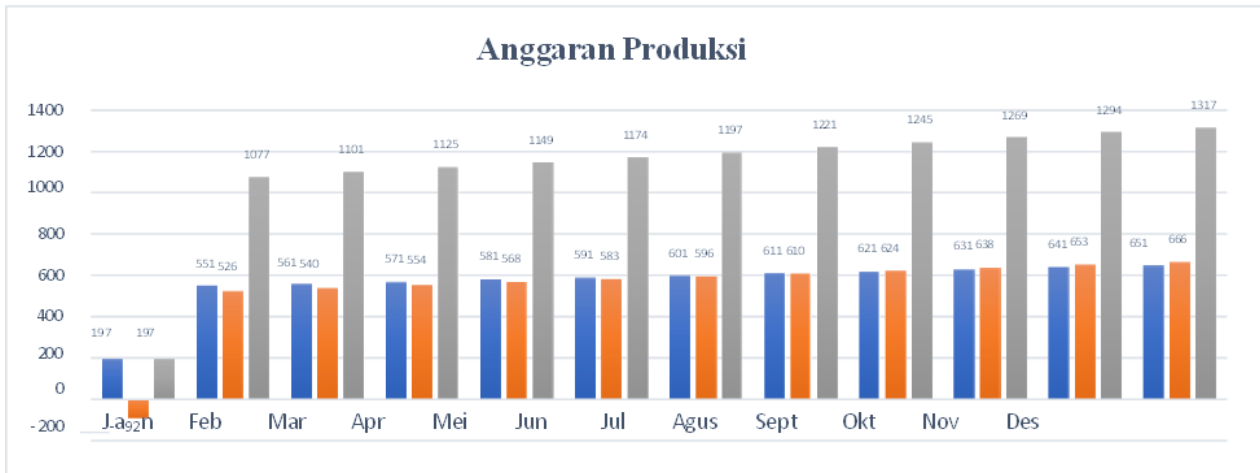


Figure 1. Production Budget 2025

4.3. Raw Material Requirements Budget

Prior to formulating the raw material requirement budget, it is essential to determine the Standard Usage Rate (SUR), defined as the standard quantity of material input required to produce a single unit of output. Based on data elicited from interviews with the business owner, raw material procurement is conducted in rolls, where one roll of fabric is equivalent to 25 kilograms. In terms of production yield, one kilogram of fabric generates approximately four units of short-sleeve shirts or three units of long-sleeve shirts.

Table 7. T-shirt Raw Material Needs Budget

Month	Short Sleeve			Long Sleeve			Need (kg)
	Production	SUR	Need (kg)	Production	SUR	Need (kg)	
	a	b	c = a x b	d	e	f = d x e	
January	197	0.25	49	0	0.33	0	49
February	551	0.25	138	526	0.33	174	311
March	561	0.25	140	540	0.33	178	318
April	571	0.25	143	554	0.33	183	326
May	581	0.25	145	568	0.33	187	333
June	591	0.25	148	583	0.33	192	340
July	601	0.25	150	596	0.33	197	347
August	611	0.25	153	610	0.33	201	354
September	621	0.25	155	624	0.33	206	361
October	631	0.25	158	638	0.33	211	368
November	641	0.25	160	653	0.33	215	376
December	651	0.25	163	666	0.33	220	383

Total	6,808	1,702	6,558	2,164	3,866
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Source : Processed Data, (2025)

As analyzed in Table 7, the raw material requirements for CV. Amirah Ramadhani Cemara are determined based on the Standard Usage Rate (SUR) relative to the projected production volume. The SUR for short-sleeve shirts (0.25 kg/unit) demonstrates greater material efficiency compared to long-sleeve shirts (0.33 kg/unit). Consequently, although the aggregate production volume for short-sleeve units is higher, the total fabric consumption remains comparatively lower. This discrepancy indicates that long-sleeve products incur a higher raw material cost per unit. Specifically for January, production activities necessitate 49 kg of fabric to manufacture 197 units of short-sleeve shirts. Conversely, production for long-sleeve units remains suspended during this period due to the adequacy of existing warehouse inventory. Commencing in February, the company is scheduled to resume the production of long-sleeve shirts, requiring a projected raw material input of 174 kg.

4.4. Raw Material Purchase Budget

The Raw Material Purchase Budget constitutes a strategic plan formulated to determine the precise quantity of raw materials required for procurement in the forthcoming period. The detailed projection for raw material purchases is presented in Table 8:

Table 8. T-Shirt Raw Material Purchase Budget

Month	Need (kg)	Ending Inventory (kg)	Total Needs (kg)	Initial Inventory (kg)	Purchase (kg)	Price (IDR)	Purchase (IDR)
	a	b	c = a + b	d	e = c - d	f	g = e x f
January	49	93	142	16.5	125.5	120,000	15,060,000
February	311	95	406	93	313	120,000	37,560,000
March	318	98	416	95	321	120,000	38,520,000
April	326	100	426	98	328	120,000	39,360,000
May	333	102	435	100	335	120,000	40,200,000
June	340	104	444	102	342	120,000	41,040,000
July	347	106	453	104	349	120,000	41,880,000
August	354	108	462	106	356	120,000	42,720,000
September	361	110	471	108	363	120,000	43,560,000
October	368	113	481	110	371	120,000	44,520,000
November	376	115	491	113	378	120,000	45,360,000
December	383	117	500	115	385	120,000	46,200,000
Total	3,866		5,127	1,161	3,966.5		475,980,000

Source : Processed Data, (2025)

The raw material procurement budget is formulated based on production requirements, rigorously accounting for monthly beginning and ending inventory levels. Specifically for January, the company is required to procure 125.5 kg of fabric, amounting to a total cost of IDR 15,060,000. This procurement volume is calculated to satisfy the immediate production requirement of 49 kg while simultaneously establishing a target ending inventory of 93 kg. A substantial increase in raw material procurement is observed from February through December, correlating with the escalation in production requirements. This trend reaches its peak in December, necessitating the purchase of 385 kg of material at a cost of IDR 46,200,000. Given the raw material unit price of IDR 120,000 per kilogram, the aggregate purchase budget for the fiscal year amounts to IDR 475,980,000.

These figures underscore the critical importance of strategic procurement planning in maintaining operational continuity and mitigating risks associated with material shortages or excessive stockpiling. Furthermore, the consistent upward trajectory in procurement reflects the anticipated growth in market demand and the corresponding graduated increase in planned production throughout the year. Cumulatively, the total raw material procurement volume for the year reaches 3,966.5 kg, with the most significant volume concentrated in the second semester, aligning with the projected expansion in production output.

4.5. Raw Material Inventory Budget

The Raw Material Inventory Budget delineates the strategic plan for maintaining desired ending inventory levels. Based on qualitative data obtained from interviews with the proprietor, the company's inventory policy establishes the target ending inventory at 30% of the raw material requirements for the subsequent month. The projected raw material inventory budget for t-shirt production is presented in the following table:

Table 9. Raw Material Inventory Budget

Inventory	Units (kg)	Price (IDR)	Amount (IDR)
	a	b	c = a x b
January	93	120,000	11,160,000
February	95	120,000	11,400,000
March	98	120,000	11,760,000
April	100	120,000	12,000,000
May	102	120,000	12,240,000
June	104	120,000	12,480,000
July	106	120,000	12,720,000
August	108	120,000	12,960,000
September	110	120,000	13,200,000
October	113	120,000	13,560,000
November	115	120,000	13,800,000
December	117	120,000	14,040,000
Total	1,261		151,320,000

Source : Processed Data, (2025)

Table 9 presents a detailed breakdown of the raw material inventory budget for t-shirt production on a monthly basis. Inventory quantities are quantified in kilograms and subsequently multiplied by the standard material cost of IDR 120,000 per kilogram to derive the monetary valuation of the budget. The data reveals a consistent upward trend in inventory value throughout the period, correlating directly with escalating production requirements. Specifically, in January, the inventory value was recorded at IDR 11,160,000, progressively rising to reach IDR 14,040,000 by December. Cumulatively, the total raw material inventory for the fiscal year amounts to 1,261 kg, representing a total valuation of IDR 151,320,000. This structured approach to inventory budgeting serves as a critical preventive measure, minimizing the risk of raw material shortages that could otherwise disrupt production continuity. Furthermore, the consistent application of the 30% ending inventory policy affords the company operational flexibility to navigate supply chain uncertainties, a crucial advantage within the dynamic garment industry.

4.6. Budget for Raw Material Costs Used in Production

The budget for raw material costs utilized in production is derived by multiplying the unit purchase price by the total material quantity required for the respective period. The detailed projection of raw material costs allocated for the production process is presented in the following table:

Table 10. Budget for Cost of Raw Materials Used

Month	Need (kg)	Price (IDR)	Amount (IDR)
	a	b	c = a x b

January	49	120,000	5,880,000
February	311	120,000	37,320,000
March	318	120,000	38,160,000
April	326	120,000	39,120,000
May	333	120,000	39,960,000
June	340	120,000	40,800,000
July	347	120,000	41,640,000
August	354	120,000	42,480,000
September	361	120,000	43,320,000
October	368	120,000	44,160,000
November	376	120,000	45,120,000
December	383	120,000	45,960,000
Total	3,866		463,920,000

Source : Processed Data, (2025)

As evidenced in Table 10, the calculated raw material consumption costs exhibit a consistent monthly upward trajectory, commencing at IDR 5,880,000 in January and peaking at IDR 45,960,000 in December. Specifically for January, material requirements were limited to 49 kg of fabric. This reduced volume is attributed to the exclusive production of short-sleeve shirts during this period; the production of long-sleeve units was suspended due to the sufficiency of existing finished goods inventory in the warehouse. This escalation in costs aligns with the company's strategic objective to progressively scale production volumes throughout the fiscal year. Cumulatively, the total budgeted raw material cost for the year stands at IDR 463,920,000, corresponding to a total material requirement of 3,866 kg.

4.7. Labor Cost Budget

Based on qualitative data elicited from interviews with the proprietor, the workforce structure at CV. Amirah Ramadhani Cemara comprises general administrative staff, warehouse personnel, cutters, and sewers. The compensation policy distinguishes between fixed and variable labor costs. Administrative and warehouse staff are compensated via fixed monthly salaries (classified as indirect labor or overhead). Conversely, cutters and sewers are remunerated under a piece-rate system, classifying them as direct labor. The established piece rates for direct labor are IDR 1,500 per unit for the cutting process and IDR 3,500 per unit for the sewing process. Consequently, the total direct labor cost per unit is IDR 5,000. The projected Direct Labor Cost Budget is detailed in the following table:

Table 11. Labor Cost Budget

Month	Cutting			Tailoring		Total TKL Cost (IDR)
	Production Amount	Wage Rates (IDR)	Total TKL Cost (IDR)	Wage Rates (IDR)	Total TKL Cost (IDR)	
	a	b	c = a x b	d	e	f = c + e
January	197	1,500	295,500	3,500	689,500	985,000
February	1,077	1,500	1,615,500	3,500	3,769,500	5,385,000
March	1,101	1,500	1,651,500	3,500	3,853,500	5,505,000
April	1,125	1,500	1,687,500	3,500	3,937,500	5,625,000
May	1,149	1,500	1,723,500	3,500	4,021,500	5,745,000
June	1,174	1,500	1,761,500	3,500	4,109,000	5,870,000
July	1,197	1,500	1,795,500	3,500	4,189,500	5,985,000
August	1,221	1,500	1,831,500	3,500	4,273,500	6,105,000
September	1,245	1,500	1,867,500	3,500	4,357,500	6,225,000
October	1,269	1,500	1,903,500	3,500	4,441,500	6,345,000

November	1,294	1,500	1,941,500	3,500	4,529,000	6,470,000
December	1,317	1,500	1,975,500	3,500	4,609,500	6,585,000
Total	13,366		20,049,000		46,781,000	66,830,000

Source : Processed Data, (2025)

As derived from the collected data, the compensation structure for cutting and sewing personnel operates on a piece-rate basis contingent upon the number of units completed. The specific rates are established at IDR 1,500 per unit for cutting and IDR 3,500 per unit for sewing. Consequently, the total direct labor cost implies a direct correlation with the monthly production volume, characterizing it as a purely variable cost. For instance, in January, the total direct labor cost was recorded at IDR 985,000. This figure experiences a gradual escalation parallel to the production schedule, culminating at IDR 6,585,000 in December. This upward trajectory in labor costs reflects the consistency of the planned production expansion throughout the fiscal year. Cumulatively, the projected annual direct labor budget amounts to IDR 66,830,000, comprising IDR 20,049,000 allocated for cutting expenses and IDR 46,781,000 for sewing expenses.

4.8. Factory Overhead Budget

The Factory Overhead Budget (FOH) is formulated subsequent to the finalization of the raw material and direct labor budgets. The primary components of this budget are categorized into three distinct segments: (1) indirect materials, comprising sewing thread (IDR 2,500/spool), overlock thread (IDR 8,000/spool), and packaging plastic (IDR 150/sheet); (2) indirect labor, which encompasses administrative salaries; and (3) operational overheads, including machinery depreciation, facility rent, and electricity expenses.

Operational parameters indicate that every 25 kg of fabric input necessitates the consumption of 60 spools of sewing thread and 50 spools of overlock thread. Regarding production yield, the standard conversion metrics stipulate that 1 kg of fabric generates approximately four short-sleeve units or three long-sleeve units. Furthermore, packaging material usage is strictly variable, calculated at a rate of one plastic sheet per manufactured unit. The detailed Factory Overhead Budget is presented below:

Table 12. Factory Overhead Budget (January-April)

Costs	January (IDR)	February (IDR)	March (IDR)	April (IDR)
Variable Cost				
Sewing Thread	295,000	1,867,500	1,952,500	1,952,500
Overlock thread	784,000	4,976,000	5,088,000	5,216,000
Plastic Wrapping	29,550	161,550	165,150	168,750
Total Biaya Variabel	1,108,550	7,005,050	7,163,150	7,337,250
Biaya Tetap				
Salary Costs	3,000,000	3,000,000	3,000,000	3,000,000
Rent	2,000,000	2,000,000	2,000,000	2,000,000
Electricity Cost	1,550,000	1,550,000	1,550,000	1,550,000
Depreciation Costs	1,400,000	1,400,000	1,400,000	1,400,000
Miscellaneous Expense	3,000,000	3,000,000	3,000,000	3,000,000
Total Biaya Tetap	10,950,000	10,950,000	10,950,000	10,950,000
Total Biaya Overhead Pabrik	12,058,550	17,955,050	18,113,150	18,287,250

Source : Processed Data, (2025)

Table 13. Factory Overhead Budget (May-August)

Biaya	May (IDR)	June (IDR)	July (IDR)	August (IDR)
Biaya Variabel				
Sewing Thread	1,995,000	2,040,000	2,082,500	2,125,000

Overlock thread	5,328,000	5,440,000	5,552,000	5,664,000
Plastic Wrapping	172,350	176,100	179,550	183,150
Total Biaya Variabel	7,495,350	7,656,100	7,814,050	7,972,150
Biaya Tetap				
Salary Costs	3,000,000	3,000,000	3,000,000	3,000,000
Rent	2,000,000	2,000,000	2,000,000	2,000,000
Electricity Cost	1,550,000	1,550,000	1,550,000	1,550,000
Depreciation Costs	1,400,000	1,400,000	1,400,000	1,400,000
Miscellaneous Expense	3,000,000	3,000,000	3,000,000	3,000,000
Total Biaya Tetap	10,950,000	10,950,000	10,950,000	10,950,000
Total Biaya Overhead Pabrik	18,445,350	18,606,100	18,764,050	18,922,150

Source : Processed Data, (2025)

Table 14. Factory Overhead Budget (September-December)

Biaya	September (IDR)	October (IDR)	November (IDR)	December (IDR)
Biaya Variabel				
Sewing Thread	2,167,500	2,210,000	2,255,000	2,295,000
Overlock thread	5,776,000	5,888,000	6,016,000	6,128,000
Plastic Wrapping	186,750	190,350	194,100	197,550
Total Variable Costs	8,130,250	8,288,350	8,465,100	8,620,550
Fixed Cost				
Salary Costs	3,000,000	3,000,000	3,000,000	3,000,000
Rent	2,000,000	2,000,000	2,000,000	2,000,000
Electricity Cost	1,550,000	1,550,000	1,550,000	1,550,000
Depreciation Costs	1,400,000	1,400,000	1,400,000	1,400,000
Miscellaneous Expense	3,000,000	3,000,000	3,000,000	3,000,000
Total Fixed Cost	10,950,000	10,950,000	10,950,000	10,950,000
Total Factory Overhead Costs	19,080,250	19,238,350	19,415,100	19,570,550

Source : Processed Data, (2025)

Tables 12 through 14 illustrate a consistent monthly cost escalation attributed to variable overheads, specifically sewing and overlock threads, which rise in tandem with t-shirt production growth. A direct positive correlation exists: as production volume increases, the expenditure for threads and packaging materials rises proportionally. For instance, the production output in January necessitated specific quantities of auxiliary materials. The calculation methodology for these variable overhead components is detailed as follows:

a. Sewing Thread Requirements

The standard usage rate is established at 60 spools for every 25 kg of fabric. Consequently, 1 kg of fabric requires 2.4 spools of sewing thread.

$$\text{Sewing Thread} = 49\text{kg} \times 2.4 = 117.6\text{units}$$

Sewing Thread Rounded to 118units

$$\text{Cost} = 118\text{units} \times \text{Rp } 2,500 = \text{Rp } 295,000$$

b. Overlock Thread Requirements

The standard usage rate is set at 50 spools for every 25 kg of fabric. Thus, 1 kg of fabric requires 2.0 spools of overlock thread.

Overlock thread = 49kg x 2 = 98units Overlock thread

Cost = 98units x Rp 8,000 = Rp 784,000

c. Packaging Plastic Requirements

The requirement for packaging plastic corresponds strictly to the production volume (1:1 ratio).

197units T-shirt = 197units Plastic Wrapping

Cost = 197units x Rp150 = Rp 29,550

The formulated production budget analysis reveals a consistent upward trajectory in projected output. Specifically, for January 2025, the production requirement for short-sleeve t-shirts is calculated at 197 units, whereas the calculation for long-sleeve shirts yielded a negative value of -92 units. This result implies that manufacturing long-sleeve units is unnecessary for this initial period. Instead, the operational focus should shift toward liquidating the existing warehouse inventory. Subsequently, the period from February through December exhibits a stable escalation in production volume, as visually depicted in Figure 4, which illustrates a distinct month-on-month growth trend. This finding corroborates the study by (Putri et al., 2024), who posit that the Least Squares method is characterized by a tendency to generate increasing predictive values relative to the accumulation of historical data; consequently, as the dataset expands over time, the forecasted output demonstrates a corresponding upward inclination.

Utilizing historical sales data from January to December 2024, the sales budget was computed to forecast production requirements for the upcoming fiscal period of January to December 2025. Through the application of the Least Squares method, underlying data trends are identified, enabling the enterprise to formulate production plans with enhanced accuracy. The empirical results demonstrate the viability of the Least Squares method in structuring production budgets derived from historical sales performance. Furthermore, this study aligns with prior findings by (Susanti et al., 2021), who successfully employed the Least Squares method to mitigate production budget inaccuracies at PT. Tegal Jaya Makmur.

The following data presents a comparative analysis of CV. Amirah Ramadhani Cemara's t-shirt production volumes, contrasting the results derived from the company's conventional approach against the projected production budget formulated utilizing the Least Squares method:

Table 15. Comparison of Actual Production and Production Budget

Month	Actual Production (units)	Production Budget (units)	Difference (units)
January	1,600	197	+1,403
February	980	1,077	-97
March	1,193	1,101	+92
April	1,000	1,125	-125
May	800	1,149	-349
June	976	1,174	-198
July	1,250	1,197	+53
August	873	1,221	-348
September	1,156	1,245	-89
October	627	1,269	-642
November	612	1,294	-682
December	874	1,317	-443
Total	11,941	13,366	-1,425

Source : Processed Data, (2025)

As evidenced in Table 15, the conventional production approach employed by CV. Amirah Ramadhani Cemara, which lacks analytical rigor, manifests as unstructured and erratic. Significant instances of overproduction are observable in specific months, notably January, March, and July 2024. This tendency toward surplus production exacerbates operational risks, particularly regarding increased inventory holding costs and raw material inefficiencies.

In contrast, the Least Squares method facilitates a more accurate and structured estimation framework grounded in historical data trends. While it is acknowledged that the Least Squares projections may yield higher output figures compared to actual historical realization, this methodological approach provides a definitive advantage by offering a systematic planning capability, marking a significant improvement over the previously unplanned production strategy.

The implementation of a robust production budgeting framework is instrumental for CV. Amirah Ramadhani Cemara in mitigating the risks of overproduction, a factor often precipitating financial detriment. Concurrently, enhanced predictive accuracy serves to minimize stockout occurrences, thereby ensuring the timely fulfillment of customer demand. This study underscores the empirical conclusion that planning strategies grounded in historical data and statistical analysis yield tangible practical benefits, specifically in augmenting operational efficiency and optimizing corporate resource allocation.

By adopting this methodological approach, the enterprise is equipped to formulate more precise production budgets, which subsequently drives improvements in operational workflows and cost control effectiveness. Furthermore, the production budget functions as the foundational prerequisite for the subsequent formulation of raw material, direct labor, and factory overhead budgets. Ultimately, the precise determination of projected production volume constitutes the critical variable that enables the accurate calculation of total required production expenditures.

5. Conclusion

Based on the empirical findings, it is concluded that formulating the production budget utilizing the Least Squares method generates significantly more accurate and structured forecasts compared to the conventional ad-hoc approach currently employed by CV. Amirah Ramadhani Cemara. This methodological framework facilitates the identification of historical data trends, thereby mitigating risks associated with overproduction or stockouts, and enhancing overall efficiency in production planning. Comparative analysis highlights specific instances of overproduction under the previous system—notably in January, March, and July 2024—indicating that prior planning mechanisms were suboptimal and prone to precipitating cost inefficiencies.

Furthermore, the budgets for raw materials, direct labor, and factory overheads exhibit a consistent upward trajectory correlating with the projected production volume. Quantitatively, the total raw material requirement for the fiscal year 2025 is projected at 3,866 kg (equivalent to 155 rolls). In terms of human capital, the direct labor budget is estimated at IDR 66,830,000, with sewing costs contributing a significantly larger proportion compared to cutting expenses. Similarly, factory overhead costs demonstrate a positive correlation with the planned production output, ensuring that all cost components are aligned with the company's growth objectives.

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Finally, it is the author's hope that this research offers meaningful contributions, particularly in advancing the practice of production budgeting using the Least Squares method, and serves as a valuable reference for future studies.

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