

# CHAPTER I

## INTRODUCTION

This chapter discusses about the foundational aspects of the research, including the research background, problem formulation, research objectives, research limitations, and the outline of the research.

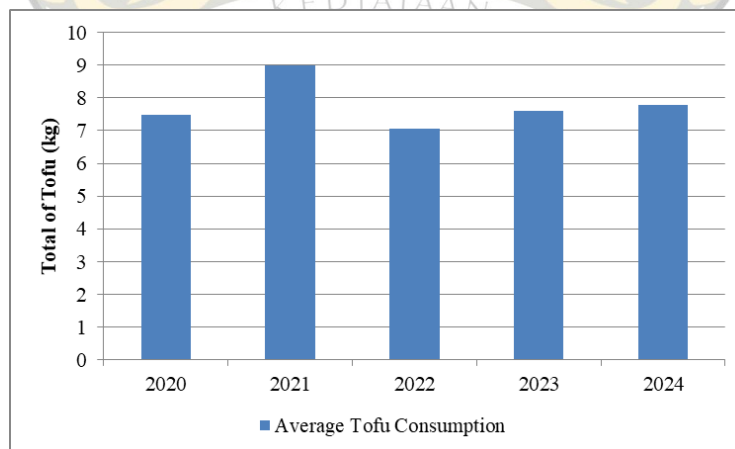
### 1.1 Background

Small and Medium Industries (SMIs) play a crucial role in the national economy, particularly in driving economic growth (Wahyudi, 2022). According to data from the Ministry of Industry in 2024, the number of SMIs units in Indonesia had reached 4,52 million businesses by the third quarter of 2024. SMIs has successfully absorbed approximately 13.11 million workers, or 65,52% of the workforce in the industrial sector (Kementerian Keuangan Republik Indonesia, 2024). This number consists of 1,02 million workers from medium-sized industries and 12,09 million workers from small industries.

SMIs also contributes to the growth of the manufacturing sector's Gross Domestic Product (GDP) by 4,72% annually and 3,69% to the national GDP (Kementerian Keuangan Republik Indonesia, 2024). The government is continuously striving to increase the output value of SMIs in the non-oil and gas manufacturing industry, as its contribution remains at 21,53%. According to data from the Ministry of Industry in 2023, the largest contribution to the non-oil and gas manufacturing industry comes from the food industry sector, accounting for 39,10% of the non-oil and gas manufacturing GDP (Kementerian Keuangan Republik Indonesia, 2023). This makes the food SMIs sector one of the labor-intensive industries that not only supports economic growth but also plays a vital role in creating job opportunities for the community (Maharani & Riyanto, 2022).

The potential of the food SMIs in Indonesia is supported by a large population, increasing food demand, and abundant natural resources (Rusdiana & Maesya, 2017). The National Food Agency states that local food SMIs plays a crucial role in growing the local food industry (Sumarsono & Sumekar, 2022). Local food SMIs has a significant impact on economic growth and national food security. As one of the provinces that serve as a food production center in Indonesia, West Sumatra has strong food security that can contribute to the well-being of the community (Khairad et al., 2018).

The raw materials for the food sector of SMIs in West Sumatra come from local agricultural products and imported goods. The import of raw materials occurs because the demand exceeds the current supply. Soybeans are one of the essential food commodities needed in West Sumatra (Sri, 2023). According to data from the Badan Pusat Statistik (BPS) in 2022, soybean production in West Sumatra amounted to only 19 tons/year, while soybean demand is 2.892,6 tons/year. As a result, industries that use soybeans as raw materials, such as local tofu producers have become dependent on imported soybeans (Manggabarani & Kandatong, 2024). The consumption of tofu in West Sumatra tends to increase every year, particularly in areas like Padang City. Based on BPS data, the average tofu consumption/capita/year in Padang City tends to increase from 2022 to 2024 presented in **Figure 1.1**.



**Figure 1.1** Average Tofu Consumption per Capita per Year in Padang City

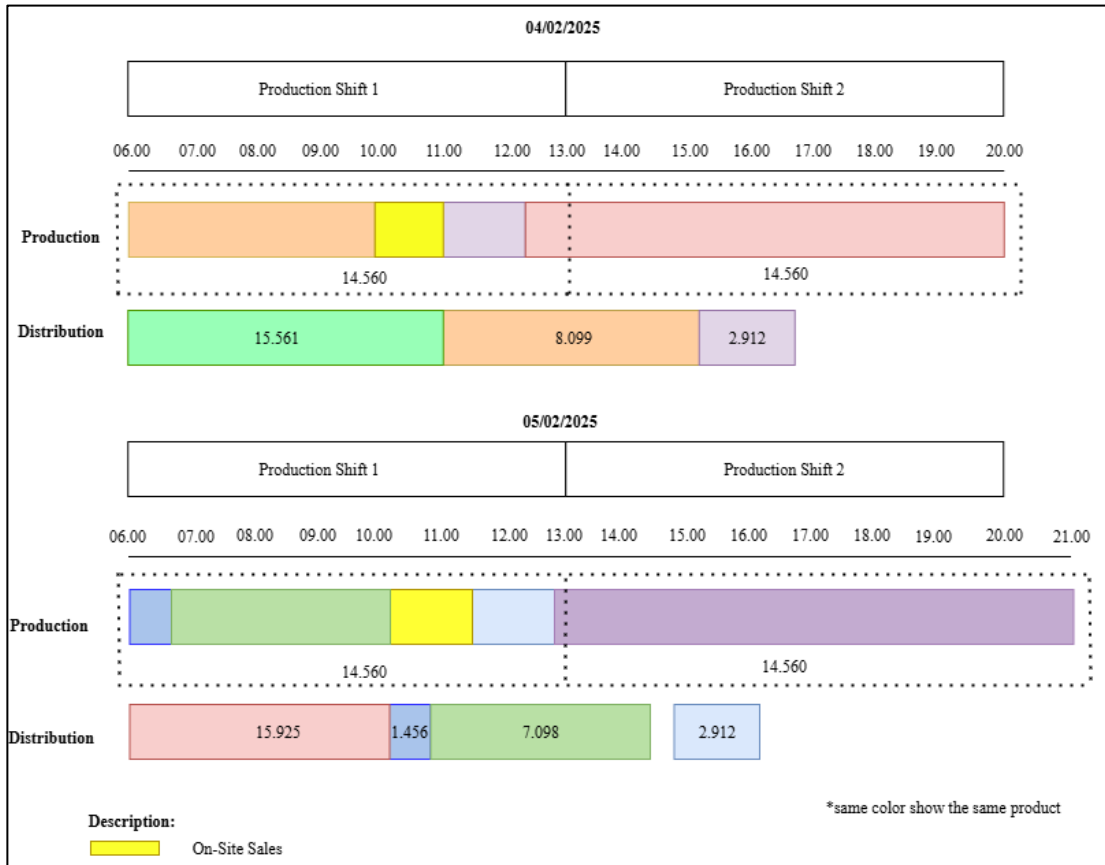
According to the National Standardization Agency (BSN), which has issued SNI 3142:2018, tofu is a soft-textured food produced from soybean processing through a protein precipitation process with the addition of specific ingredients. Tofu is a high-protein, low-fat, and affordable food. There are various types of tofu commonly consumed by Indonesians, such as white tofu, sumedang tofu, silken tofu, yellow tofu, and pong tofu (Barus et al., 2020).

Sumedang tofu has a salty, savory taste and a crispy texture. There is several sumedang tofu SMIs operate in Padang City, including Tahu Sumedang CC, Tahu Sumedang Winda, Tahu Sumedang Ibuk Anita, Tahu Sumedang Mas Yetno, and Tahu Sumedang Nikmat Jaya. Among them, Tahu Sumedang CC is located on Jl. Teratai, Batuang Taba Nan XX, Padang City. This SMIs has employs 19 workers, consisting of 16 production workers, 2 distribution staff, and 1 administrative staff. Tahu Sumedang CC operates from Monday to Saturday with a two-shift production system. The first shift runs from 06:00 AM to 01:00 PM, while the second shift starts from 01:00 PM to 08:00 PM, with 8 workers assigned to each shift.

The production process at Tahu Sumedang CC using make-to-stock system, where tofu is produced in advance to meet market demand. The production activities are carried out using various tools and machines, such as a firewood stove, grinding machine, steam boiler, filtering machine, molds, pressing machine, and cutting ruler. Tahu Sumedang CC can produce 29.120 unit/day, which are sold at Rp500/unit. To meet customer demand, Tahu Sumedang CC consumes 800 kg of soybeans daily.

Customers of Tahu Sumedang CC SMIs can purchase products directly at the production site or orders for delivery. The business uses two vehicles for distribution, each with a capacity of 74 buckets/vehicle. Customers can purchase in 1 bucket (182 units tofu) or 1/2 bucket (91 units tofu) for each delivery, but for the on site sales customer can purchase per-unit. Vehicle 1 delivers products to Pasar Pagi Parak Laweh, Pasar Gaung, and Pasar Raya Padang and vehicle 2 distributes products to

Lubuk Buaya. Deliveries are made in three sessions per day at 06:00 AM, 11:00 AM, and 03:00 PM WIB. The production and distribution schedule of Tahu Sumedang CC is shown in **Figure 1.2**.

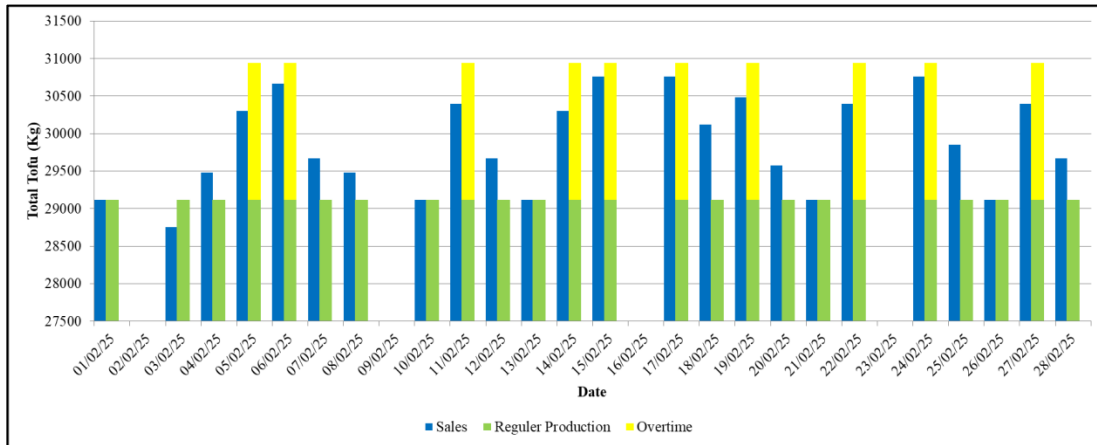


**Figure 1.2** Production and Distribution Schedule

Based on **Figure 1.2**, it can be seen that some of the product is distributed on the same day. For example, tofu that produced between 06:00 - 10:00 AM on February 4 with totaling 8.099 units was distributed on the same day at 11:00 AM. However, the tofu distributed in the morning is the result of the previous day's production.

Sales often exceed regular production, requiring workers to work overtime. Tahu Sumedang CC's current regular working hours can only produce 29.120 units of

tofu per day. If tofu sales exceed regular production, workers will work overtime. Sales and production output data of Tahu Sumedang CC SMIs in February 2025 can be seen in **Figure 1.3**.



**Figure 1.3** Sales and Production Output Data in February 2025

Based on **Figure 1.3**, it can be seen that 2,98% of the 336 working hours in February 2025 were spent on overtime due to frequent sales that exceeded regular production at Tahu Sumedang CC. The number of products produced during each overtime session remains the same. This occurs because every overtime session requires processing one sack of soybeans, which is equivalent to 1.820 units of the product. Sumedang tofu has a shelf life of approximately 4–5 days, so overproduction is not a problem for SMIs because the products can be sold immediately at the next sales session. The overproduction from the previous day is sold first before the current day’s production, following FIFO principles.

Based on an interview with the owner of Tahu Sumedang CC, the overtime has become one of the owner's concerns the owner have to pay an overtime wages amounting to Rp15.000/hour for each workers. The total overtime wages paid by the owner in February 2025 are shown in **Table 1.1**.

**Table 1.1** Overtime Wages for February 2025

Date	Production (unit)	Workers	Overtime Wages /hour	Total Overtime Wages	
01/02/2025	0	8	Rp0	Rp0	
03/02/2025	0		Rp0	Rp0	
04/02/2025	0		Rp0	Rp0	
05/02/2025	1820		Rp15.000	Rp120.000	
06/02/2025	1820		Rp15.000	Rp120.000	
07/02/2025	0		Rp0	Rp0	
08/02/2025	0		Rp0	Rp0	
10/02/2025	0		Rp0	Rp0	
11/02/2025	1820		Rp15.000	Rp120.000	
12/02/2025	0		Rp0	Rp0	
13/02/2025	0		Rp0	Rp0	
14/02/2025	1820		Rp15.000	Rp120.000	
15/02/2025	1820		Rp15.000	Rp120.000	
17/02/2025	1820		Rp15.000	Rp120.000	
18/02/2025	0		Rp0	Rp0	
19/02/2025	1820		Rp15.000	Rp120.000	
20/02/2025	0		Rp0	Rp0	
21/02/2025	0		Rp0	Rp0	
22/02/2025	1820		Rp15.000	Rp120.000	
24/02/2025	1820		Rp15.000	Rp120.000	
25/02/2025	0		Rp0	Rp0	
26/02/2025	0		Rp0	Rp0	
27/02/2025	1820		Rp15.000	Rp120.000	
28/02/2025	0		Rp0	Rp0	
<b>Total</b>				<b>Rp1.200.000</b>	

Based on **Table 1.1**, it can be seen that the total overtime wages paid by the owner in February 2025 amounted to Rp1.200.000, which is an 6,25% increase from regular labor costs. This amount is quite significant for Tahu Sumedang CC, which is still classified as a medium-scale industry with relatively modest profits. Beside of implementing overtime, Tahu Sumedang CC still frequently experiences production delays.

Based on the data, the number of tofu produced often does not meet customer demand during the first delivery session by vehicle 1. The distribution in the first session by vehicle 1 frequently requires two trips, leading to increased transportation costs and affecting customer satisfaction. Tofu is delivered using buckets, each with a maximum capacity of 182 units. The historical distribution data of Tahu Sumedang CC can be seen in **Table 1.2**.

**Table 1.2** Historical Data of Product Distribution by Vehicle 1 in First Session

Date	Vehicle 1 (First Session)		
	Demand (unit)	Ready to Distributed (unit)	Not Ready to Distributed (unit)
01/02/2025	7189	7189	-
03/02/2025	7553	7553	-
04/02/2025	8008	8008	-
05/02/2025	8918	7462	1456
06/02/2025	8645	7553	1092
07/02/2025	8463	8463	-
08/02/2025	9191	7917	1274
10/02/2025	7917	7917	-
11/02/2025	9009	7917	1092
12/02/2025	9009	7917	1092
13/02/2025	7553	7553	-
14/02/2025	7917	7917	-

Based on **Table 1.2** it can be seen that within two weeks, 6,04% of the tofu production in session 1 was not ready for distribution due to production delays. Products that are not ready to be distributed by vehicle 1 will be distributed by vehicle 2 after the missing quantity has been fulfilled. This indicates that the current condition of Tahu Sumedang CC cannot meet production targets on time. Based on the field visit conducted, inefficiencies were found in the activities during the production process. The sequence of the production process for one batch of soybeans at Tahu Sumedang CC can be seen in **Figure 1.4**.

FLOW PROCESS CHART										
SUMMARY										
ACTIVITIES		NOW		PROPOSED		DIFFERENT				
		Total	Time	Total	Time	Total	Time			
○	OPERATION	24	2783,54					Task : Sumedang Tofu Production		
□	INSPECTION	2	4,5					No Map : 01		
⇒	TRANSPROTATION	10	250,16					Mapped By : Putri Oktaviani		
D	DELAY	3	157,36					Mapped Date : March 18, 2025		
△	STORAGE	2	240							
No	Sequence of Activities	Symbol					Distance (m)	Quantity	Time (minute)	Note
		○	□	⇒	D	△				
1	Taking the buckets								5,33	
2	Putting soybeans into the bucket								18,67	
3	Filling the bucket with clean water								10,67	
4	Soaking the soybeans								240,00	
5	Arranging wood in the steam furnace								3,00	
6	Burning wood								3,00	
7	Checking the soaking result								0,48	
8	Transferring the soybeans to the strainer basin								12,46	
9	Straining the soybeans								19,56	
10	Transferring the soybeans to be ground								24,84	
11	Grinding the soybeans								158,85	
12	Transferring the ground soybeans to the boiling station								10,83	
13	Setting up the filter								27,64	
14	Waiting for boiling								133,03	
15	Putting the soybeans porridge								32,38	
16	Boiling the soybean porridge								313,04	
17	Filtering the soybean porridge								107,53	
18	Separating the foam from the soybean extract								47,37	
19	Mixing the soybean extract with vinegar water								28,43	
20	Stirring the soybean extract mixture								149,42	
21	Checking the coagulation result								4,02	
22	Waiting for the leftover water to be drained								14,33	

Figure 1.4 Flow Process Chart of Sumedang Tofu Production



FLOW PROCESS CHART								
SUMMARY								
ACTIVITIES	NOW		PROPOSED		DIFFERENT		Task	
	Total	Time	Total	Time	Total	Time		
○	OPERATION	24	2783,54					Task : Sumedang Tofu Production
□	INSPECTION	2	4,5					No Map : 01
⇒	TRANSPROTATION	10	250,16					Mapped By : Putri Oktaviani
D	DELAY	3	157,36					Mapped Date : March 18, 2025
△	STORAGE	2	240					

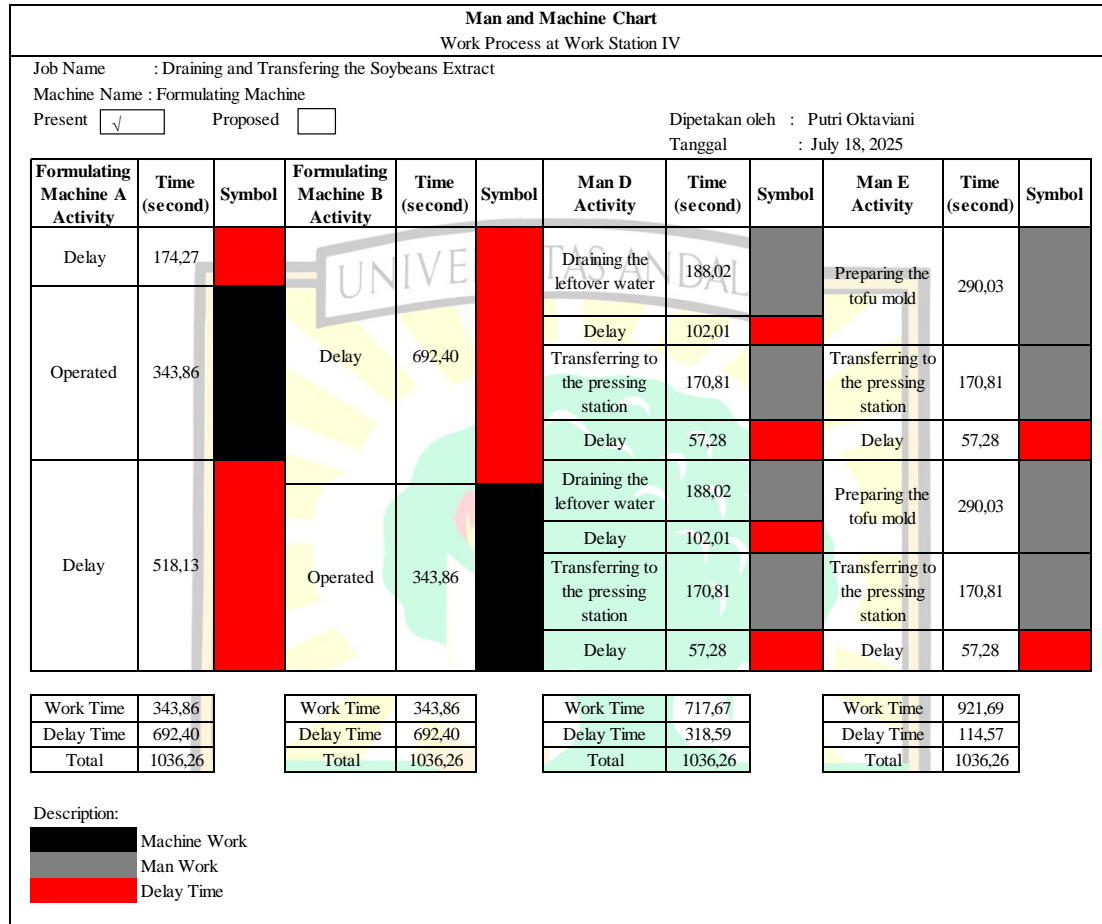
  

No	Sequence of Activities	Symbol					Distance (m)	Quantity	Time (minute)	Note
		○	□	⇒	D	△				
23	Preparing the tofu mold	●							193,36	
24	Draining the leftover water	●							125,35	
25	Waiting for the soybean extract to be transferred				●				10,00	
26	Transferring the soybean extract to the pressing station				●				113,88	
27	Installing the pressing tool	●							229,03	
28	Letting the tofu coagulate	●							691,08	
29	Tightening the pressing tool	●							10,65	
30	Letting the tofu coagulate	●							159,58	
31	Opening the pressing tool	●							129,81	
32	Taking the cutting ruler			●					16,70	
33	Cutting the tofu	●							100,86	
34	Moving the cutting ruler			●					17,50	
35	Putting the tofu into the bucket	●							224,26	
36	Transferring the tofu to the finished product area				●				48,62	
37	Washing the mold cloth	●							49,57	
38	Storing the tofu					●				

**Figure 1.4** Flow Process Chart of Sumedang Tofu Production (continue)

Based on **Figure 1.4**, it can be seen that several activities within the production process are not yet running effectively. In a single production batch, 4,58% of the total activities time is recorded as experiencing delays which do not add value to the production process. A more detailed review of the operational activities shows that not all operations are effective. For example, at the work station IV the process is grinding and setting up the filtering machine that responsible for activities

23-24. During the operational activities, the first workers experiences delay as he wait for the second worker as illustrated in **Figure 1.5**.



**Figure 1.5** Man and Machine Chart at Work Station IV

Based on **Figure 1.5**, it can be observed that there are several instances of delay time occurring both on the machines and among the workers. There is 30,74% of delay occurred at first worker and 11,05% of delay occurred at the second worker. This difference occurs because there is a 19,69% delay by the first worker while the second worker is preparing the tofu before they continue to complete the transferring to the pressing station together. These percentages are relatively high, indicating that the worker spends too much non-productive time at the station. Therefore, it is necessary to propose work method improvement and workload balancing at Tahu

Sumedang CC SMIs. Workers without assigned activities should be reassigned to assist with other tasks in order to improve overall productivity.

Based on the problem obtained at Tahu Sumedang CC, there are several inefficient work arrangements during the production process. Therefore, it is imperative to reduce the inefficiencies that occur through proposed workload balancing and improvements to work methods, so that idle time can be significantly minimized. This effort is expected to increase the production capacity of Tahu Sumedang CC and reduce delays in the production process, which in turn will improve overall operational effectiveness.

## **1.2 Problem Statement**

Tahu Sumedang CC frequently cannot meet the demand. One of the causes is the inefficiency of activities, such as delays that lead to not optimal production capacity.

## **1.3 Research Objective**

The purpose of this research is to propose work method improvements and workload balancing to minimize inefficient activities, so that production capacity can be increase.

#### **1.4 Research Scope**

The research scopes in this research are as follows:

1. The research did not consider external factors such as supply chain disruptions.
2. The research was conducted based on daily production and sales data from February to May 2025.

#### **1.5 Research Assumptions**

This research assumes that the rating performance and %allowance for workers that work at the same workstation are the same.

#### **1.6 Outline of Research**

The outline of research that will be used in writing this final project report are as follows.

##### **CHAPTER I INTRODUCTION**

This chapter contains explanations related to the background, problem formulation, research objectives, and research scope.

##### **CHAPTER II LITERATURE RIVIEW**

This chapter contains an explanation of the theories related to the research topics that will be raised and used as guidelines in solving problems in the research conducted. These theories include work charts, standard time calculation, motion economy, forecasting, Master Production Schedule (MPS), and Rough Cut Capacity Planning (RCCP), and previous research.

### **CHAPTER III RESEARCH METODOLOGY**

This chapter contains an explanation of the stages that will be carried out in the research starting from the beginning until the objectives of this research can be achieved. These stages include preliminary study, literature studies, problem identification, problem formulation, method selection, data collection, data processing, analysis, and closing.

### **CHAPTER IV DATA COLLECTING AND DATA PROCESSING**

This section contains the collection of data required for the research. The collected data is then processed by performing calculations in accordance with the predetermined method.

### **CHAPTER V ANALYSIS**

This section contains the analysis of the previously processed data. The analysis is carried out on work method improvement, workload balancing, and Impact Analysis of Research Results Economic Aspects.

