CHAPTER I
INTRODUCTION

1.1 Outlook of Research Object

1.1.1 Company Profile

PT DBAS was first established in 1997 in Cirebon, West Java, as an independent company owned by H. Hamdi. The first company business was a cotton bud as the main product. In 2013, the owner expanded the business into a self-production cotton bud by establishing a manufacturing facility in Ibun, Kab. Bandung, partnering with his wife as a new business entity of CV (*Commanditaire Vennootschap*), namely CV. DBAS. According to Wijayanta et al (2007, p.69), the definition of CV is an alliance to run a business and is founded by one or more active allies with one or more limited partners. And this new business entity brought the owner's business expanded and bigger.

Seven years later, in the early 2021, the owners of the company decided to upgrade their business entity to become a PT (Perseroan Terbatas) or Limited Liability Company to grab all self-production from upstream to downstream, namely PT DBAS, and this new business entity is expected to focus on overall product components production.

Products of PT DBAS are focusing on hygiene cleansing products made from cotton such as cotton bud, beauty cotton, cleansing cotton for hospitals, etc. Of course, the products produced vary based on quality grade and purposes. For example, the cotton bud products are including cotton bud for baby uses and regular uses with two types of quality grade, grade A and grade B. As well as beauty cotton and cleansing cotton are. Mostly, they have varied quality grades.

The production activities include raw material, cotton processing, forming cotton product line, sticks for cotton bud, packaging, and distribution. The market for distributing the products includes West Java and some parts of Medan. PT DBAS engages with some distributors directly, so that the management can control and manage the distribution freely. Now, the main manufacturing facility and office of PT DBAS are in Ibun, Kab. Bandung, with 500+ employees involved in the production activity series.

1.1.2 Products and Quality Assurance

PT DBAS involves the production of cotton products both upstream and downstream. The upstream products produced by the company include bleach cotton, sliver, cotton jumbo roll and packaging. The downstream products of PT DBAS are produced based on market demand and agreement between the management and clients. Table 1.1 below shows the downstream products produced by the company (Team, 2021).

Table 1.1 Downstream End Products and Details

No.	Product	Extension	Unit sell	Content per carton	Content per dozen	Content per package
1	Cotton Bud	BABY-GRADE-A	carton	540 dozen	12 packages	100 cotton bud sticks per package
		BABY-GRADE-B			12 packages	
		REGULAR-GRADE-A		450 dozen	12 packages	
		REGULAR-GRADE-B			12 packages	
2	Beauty Cotton	GRADE A		450 dozen	12 packages	
		GRADE B			12 packages	
3	Cleansing cotton	FOR PUBLIC		450 dozen	12 packages	
		FOR HOSPITALS		customs	customs	customs

Source: (Team, 2021)

According to the management team, they will innovate a new product if the market necessarily needs it. Besides that, in the new business form, the management will be updated by adding a special division for research and development (R&D) to respond the fluctuating business environment. Furthermore, to provide the quality assurance in the production activity series, the management registers their product and brand to the legal entity of Indonesia such as Health Department of Indonesia by number of *DepKes RI PKD 10106400307* and to Merk Registration Department by number of *IDM 000000480*. Thus, all activities of production in the company could be quality assured.

To connect with, the product of PT DBAS that would be analysed and forecasted in this research is cotton bud product extension. This is based on the company's request in finding a solution to the problems experienced by their main product, cotton buds, during the last two years. Details are in the next sections.

1.1.3 Company's Vision, Mission and Value

Vision and mission statements are considered as an important part of the strategic management process for organisations (Taiwo et al, 2016). It applies to all types of organisations. As well as PT DBAS. They created the vision and mission of the company is to set the parameters for their business activity. The vision, mission and value of PT DBAS are:

Vision : "Menjadi produsen produk kapas yang diminati masyarakat"

"Be the preferred cotton producer in the society"

Mission : "Bertakwa dan berikhtiar"

"Be righteous and attempted"

Value : "Utamakan sholat dan keselamatan"

"Prioritise prayer and safety"

1.1.4 Corporate and Work Culture

A strong company and work culture have a significant and positive influence on employee commitment, such as performance excellence, discipline, perfect process, integrity, and innovative (Hermayanti & Rahmawati, 2015). PT DBAS believes that a company culture could shape the performance of the employees. The company applies a religious work culture for its employees and company environment. The purpose is to remind all parties within the company about the importance of Allah's roles in their activities to get His blessing. This is indicated by the application of prayer punctuality for every Muslim employee in the company.

1.2 Research Background

Early year 2019, the market competition of the cotton industry was still tight and would increase in general. However, in the downstream cotton industry, there has been no authority information given by specific institutions that measure the industry competition and collects certain data of major cotton business player, and there is no association of cotton producing companies in Indonesia. Therefore, the information of cotton industry market share cannot be conveyed in a specific number. Likewise, PT DBAS just has felt the tension of competition to be quite tight throughout 2019 and 2020 (Team, 2021).

In general, the best well-known cotton producers' companies in Indonesia which are based in West Java are PT. Charmindo Mitra Raharja and PT. Cottonindo Ariesta Tbk. Despite enrolling a declining value share, PT. Charmindo Mitra Raharja actually drove cotton fleece/buds/cushions in decades through broad contributions of different cotton items in West Java. The company markets a wide scope of cotton items in its portfolio and offers premium just as economic items. Besides PT. Charmindo Mitra Raharja, PT. Cottonindo Ariesta Tbk, briefly, is estimated to be a company with a production output that ranks second as a supplier of cotton products for beauty purposes in Indonesia.

Currently rivalry is getting an ever-increasing number of escalated in practically all business sectors. Theoretically, in particularly competitive surroundings, a particular organisation or company that can see and foresee the future and those that can adjust to new conditions accomplish their objectives (Polat, 2007). The number of managerial focuses for the forecasting process ought to be in direct extent to the significance of the forecasted products or services. The more significant the products for the company, the more consideration ought to be given to the process to ensure that all that could be within reach has been done to improve the precision forecasting (Flores, 2000). According to Radford and Richardson (1977), forward planning or forecasting gives a course by which to guide: if the plan is intensely at fault the organisation can set out toward a bad disaster: if there is no forward planning it can drift perilously. Sales forecasting is a fundamental component in forward planning or forecasting as its expectations will influence the kinds of products to be produced and marketed, creation of manufacturing facilities, volume of yield and inventory level. Besides that, forecasting for product planning might be helpful to dim the excessive production and overlapping inventory in the warehouse to get maximum profit.

The interconnection to this, PT DBAS is a local private limited company that has played in the production of cotton products since 1997 to grab all the market opportunity in the cotton sector. The business has applied many strategies of operational production, management, distribution, and marketing in West Java although it is still traditional and use non-theoretical simple forecasting method to be the basis of their production activity. Yet, the company believes that the forecasting accuracy would be low when a company not utilising any hypothetical forecasting technique, after linear regression strategy is applied the exactness fundamentally

increases (Team, 2021). Nevertheless, the company of PT DBAS had done the forecasting production planning based on their assumption to gain the product quantity by adding 10-30% of the previous year demand numbers and monthly production number.

In the product and quality assurance section, it shows that the company has produced several cotton-based products. In this research, however, the product that would be forecasted and analysed is a cotton bud product extension only. This is based on the data provided by the company as cotton bud is the main product of the company and the company wants to focus on the main product analysis. The main data is cotton bud historical production data from 2019 to 2020. Moreover, according to the management, the cotton bud products had the most fluctuated demand and sales in the past two years, especially the BABY-GRADE-A cotton bud product. Meanwhile, in the cotton bud product, BABY-GRADE-A product was favourable cotton bud product before 2019. So, the company invested and had a strong intention in producing BABY-GRADE-A cotton bud. They assume that this happened because of the impact of China's cotton raw material availability, China-Indonesia export-import policies, and tight production and distribution policies due to the COVID-19 outbreak in 2020. The company also realises that they have an inaccurate forecasting in determining the amount of production. Despite of all, the company believes that the internal problem is the very first thing that should be settled. Thus, the management team is now focusing on finding the suitable forecasting method for the cotton bud product to keep their main products existed, meet the demand, survive in the market, and increase the sales. The Table 1.2 below shows the percentage of increase in 2020 production from the number of 2019 demand for cotton bud product category.

Table 1.2 Percentage Increase in 2020 Production from the Number of 2019 Cotton Bud Demand

Product Type	Demand 2019	Forecasting 2020	Increase	Percentage
BABY-GRADE-A	8,051	9,730	1,679	17.3%
BABY-GRADE-B	5,663	5,312	(351)	-6.6%
REGULAR-GRADE-A	7,992	9,288	1,296	14.0%
REGULAR-GRADE-B	7,521	9,957	2,436	24.5%

Source: (Team, Production Unit PT DBAS, 2021)

Based on the table above, most of the cotton bud product extensions had a plus increasing percentage yet the BABY-GRADE-B had a decreasing forecasting number due to the less demand for the product by the market during 2020. The percentage number above are based on assessment of some factors including festive season, government policy to cotton export-import, climate, labour availability, price and many more.

Next, by using the company's current method of forecasting and its historical cotton bud production data, it results in the least error for the three out of four cotton bud product extensions. BABY-GRADE-A, however, it resulted the most forecasting error number as much as 17.8% rather than the other three product extensions that have less than 12%. Table 1.3 below shows the Mean Absolute Percentage Error (MAPE) for each cotton bud product extension.

Table 1.3 Number of MAPE for Each Cotton Bud Production Extension

COTTON BUD PRODUCT EXTENSION	MAPE
BABY-GRADE-A	17.8%
BABY-GRADE-B	9.9%
REGULAR-GRADE-A	11.2%
REGULAR-GRADE-B	10.3%

Source: Data Processing (2021)

Since BABY-GRADE-A cotton bud product extension has the most MAPE number, this research is focusing on analysing and forecasting the BABY-GRADE-A cotton bud product extension. Table 1.4 below shows the breakdown of 17.8% MAPE for BABY-GRADE-A product.

Table 1.4 BABY-GRADE-A MAPE Breakdown

BABY GRADE A						
Period	**Sales**	**Production**	**Error (Gap)**	**MAD**	**MSE**	**MAPE**
Jan-19	613	762	149	149	22,201.00	24%
Feb-19	622	514	(108)	108	11,664.00	17%
Mar-19	580	646	66	66	4,356.00	11%
Apr-19	694	628	(66)	66	4,356.00	10%
May-19	649	671	22	22	484.00	3%
Jun-19	697	683	(14)	14	196.00	2%
Jul-19	739	798	59	59	3,481.00	8%
Aug-19	715	740	25	25	625.00	3%
Sep-19	625	720	95	95	9,025.00	15%
Oct-19	636	589	(47)	47	2,209.00	7%
Nov-19	684	736	52	52	2,704.00	8%
Dec-19	797	846	49	49	2,401.00	6%
Jan-20	750	1,037	287	287	82,369.00	38%
Feb-20	759	711	(48)	48	2,304.00	6%
Mar-20	529	921	392	392	153,664.00	74%
Apr-20	693	522	(171)	171	29,241.00	25%
May-20	621	759	138	138	19,044.00	22%
Jun-20	834	730	(104)	104	10,816.00	12%
Jul-20	559	744	185	185	34,225.00	33%
Aug-20	777	719	(58)	58	3,364.00	7%
Sep-20	762	995	233	233	54,289.00	31%
Oct-20	773	629	(144)	144	20,736.00	19%
Nov-20	821	1,011	190	190	36,100.00	23%
Dec-20	934	1,121	187	187	34,969.00	20%
Average				120	22,700.96	17.8%

Source: Data Processing (2021)

To minimise the information in the table above, the bar chart below is the visualisation of BABY-GRADE-A MAPE from Table 1.4. The highest percentage of errors happened in March 2020 as much as 74%. Moreover, three months in 2020 had a high percentage of errors of more than 30% that are 38%, 33% and 31% respectively for January 2020, July 2020, and September 2020. The period that had more than 20% of errors are April 2020, May 2020, November 2020, and December 2020. Nevertheless, the BABY-GRADE-A percentage of errors in 2019 are mostly controllable by maintaining the number ranging from 2-24%.

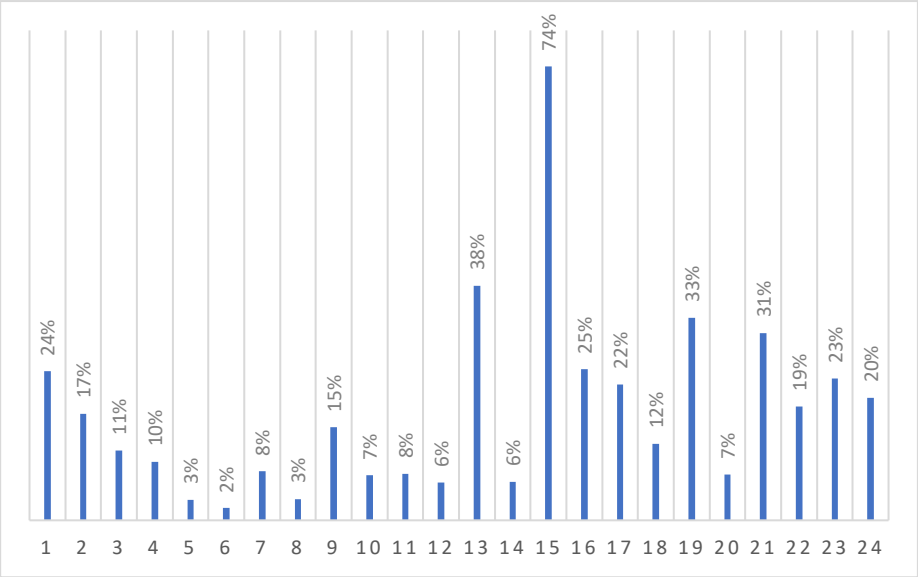

Figure 1.1 Percentage of Errors Cotton Product BABY-GRADE-A
Source: Data Processed (2021)

The percentage of errors indicates the accuracy of forecasting. The higher the number of errors, the least accuracy in forecasting (Montaño et al, 2013). For instance, in March 2020, the percentage of errors was 74% and had an overproduction (gap) of 392 cartons. This results in an accumulation of goods and less effective warehousing capacity due to overproduction. The company applies unfixed layout strategy for the overproduction occurrences. Table 1.4 shows that if there was a higher previous demand, the company would produce higher afterwards. However, Table 1.4 shows also that there are some periods in the past two years that the company produced BABY-GRADE-A products less than the forecasted. There are 9 out of 24 months that the company less produced the products than the forecasted. The least production was April 2020 as 25% or 171 carton gaps.

The most problematic problem with underproduction is that the company loses sales because they cannot meet demand. In the end the company appealed to overtime work to overcome unmet demand and prepare more products. This is resulting in greater expenditure to pay overtime labour, at least repacking, and sorting out products that were overproduced from the previous period. Likewise, if there is overproduction, even though the product is durable with a longer expiration period, the company faces several obstacles such as placing excess production in the limited warehouse that are crammed with other products, delayed inventory turnover that indicates weaker sales and declining demand for the cotton bud products, higher inventory and holding costs,

damaged products such as damp and dirty products, and environmental problems like havoc on the production floor.

In numbers, inventory cost per carton is approximately as much as IDR540,000 times ±250 cartons in one turnover. It resulted IDR135,000,000 were deposited in warehouses over one period. This might be a big problem for the company to sell the products in a short period unless there is another aspect should be revised by the company, for example, the marketing strategy or inventory management. Also, in terms of labouring, the approximate wage rate is IDR60,000 per one extra hour times four hours a day times ±40 workers. It resulted IDR9,600,000 per day to pay overtime. These numbers have great influence on the company's cash flow due to overproduction and shortage production.

To connect with the production time, before March 2020, the company applied one shift in a day for 7 days' work per week. However, if there were necessary overtime due to the emergence of production, the company would apply a new work shift to meet the target as 4 hours a day starts from 6 PM - 10 PM. Extra working time means extra cost. The company should prepare the raw material availability and extra wages for the employees who do the overworking. Table 1.5 below shows the normal and over work time in PT DBAS.

Table 1.5 Working Hours in PT DBAS (Before March 2020)

Monday to Sunday	
Shift 1	08:00 - 17:00
Additional Shift (if necessary)	18:00 - 22:00

Source: (Team, Production Unit PT DBAS, 2021)

However, during the COVID-19 pandemic, the company reduces its working hours. According to the management team, it is because the income during the pandemic is floating, uncertain, fluctuating. The extreme climate changing is also affecting the productivity become lesser because the company still uses the energy of sunlight in the production. Nevertheless, the company decides to not terminate the employees. So, to reduce the excessive expenditure, the company applies new working time for its

employees. They reduce the working hour up to 2 hours a day and only operating from Monday to Saturday. A two-hour additional working hour would be necessarily added if there were an emergence in shortage production. Yet, the overworking time now is rarely happening. This new working hour strategy is expected to reduce the expenditures during the uncertain economic condition. Here Table 1.6 shows the new working hours of PT DBAS during pandemic.

Table 1.6 New Working Hour in PT DBAS (2021)

Monday to Saturday	
Shift 1	08:00 - 15:00

Source: (Team, Production Unit PT DBAS, 2021)

To summary, from Bisnis.com by Fauzan (2021), the performance of cotton imports, which is one of the important products in the textile and textile products (TPT) industry, is estimated not to improve in 2021. This is closely related to the pandemic situation, COVID-19, which broke out in the second quarter of 2020. The biggest challenge now faced by the company is the COVID-19 effects on the economy, an extreme climate changes, increasing raw material price, distribution, and health issues. Nevertheless, this fluctuated situation has forced the company to set the best and suitable strategy in order to survive in the industry, either considering the aspects of raw materials availability, the lead time or budgeting. One of the solutions towards the challenges is that the internal company provides a suitable forecasting method for their main product, specifically, for the most problematic product both in sales and demand that is cotton bud product and its extension, BABY-GRADE-A, to get a proportional production in meeting the demand and gaining the sales.

Concerning the background, the researcher is focusing on finding the suitable forecasting method for BABY-GRADE-A cotton bud product based on the sales and historical production data in the past two years (2019 – 2020). Therefore, the title of this research is "**ANALYSING THE SUITABILITY OF TIME SERIES AND ASSOCIATIVE FORECASTING METHOD FOR COTTON BUD PRODUCT IN PT DBAS**".

1.3 Problem Statements

Based on the data calculation of measurement error, BABY-GRADE-A cotton bud product extension has the most error numbers compared to other cotton bud product extensions. Environmental factors are also affecting the demand of BABY-GRADE-A product, such as cotton raw material availability, price, and the current COVID-19 outbreak. Nevertheless, the problem of this research is focusing on the operational forecasting products only. Thus, the problem statements of this research are:

a. What is MAPE numbers of BABY-GRADE-A cotton bud for each forecasting method?
b. Which suitable forecasting method does for BABY-GRADE-A cotton bud to forecast its future demand?
c. How many units of BABY-GRADE-A cotton bud in 2021 based on the suitable forecasting method?

1.4 Research Objectives

Based on the problem statements above, the research objectives are written below:

a. Discovering the error numbers for each method conducted in the research.
b. Determining the suitable forecasting method for BABY-GRADE-A product extension to forecast its future demand.
c. Discovering units of BABY-GRADE-A cotton bud in 2021 using the suitable forecasting method.

1.5 Significance of The Study

The significance of the study infers the importance of the research for the more extensive boundary of study, the inquiry of the examination, and the objective bunch under investigation (Kothari, 2006).

1.5.1 Theoretical Use

Theoretically, this research is conducted to gain the knowledge of operations management of the researcher, especially in product planning and forecasting in the manufacturing industry. Moreover, this research might be continued, tailed, and enriched by the next researcher in the future.

1.5.2 Practical Use

Since this research is based on a company condition, in practical use, this research is beneficial for the related research object, especially in determining the suitable forecasting method to have a better operations management.

1.6 Research Limitation

Price and Murnan (2004) says in their book, research limitation is those qualities of plan or technique that affected or impacted the understanding of the discoveries from the research. Thus, to have an understanding in this research, the researcher applies some research limitations, include:

d. The main data of this research are retrieved from the sales and production historical data provided by operation management team of PT DBAS in the past 2 (two) years (2019 – 2020).
e. This research limits the sales factor as the only one determining level of production to forecast.
f. This research is focusing on finding the suitable forecasting method only for BABY-GRADE-A product extension indicated by the least errors of MAD, MSE, and MAPE of a forecasting method.
g. The purpose of research is to discover the product planning and solution for the related company.

1.7 Writing Systematics

The writing systematics of scientific papers includes the opening, introduction, literature discussion, research methodology, research results, closing, and supporting sections (Rosmiati, 2017). The writing systematics of this research are:

CHAPTER I INTRODUCTION

The introduction section outlines the need for research on a problem, the statement of a problem that questions a phenomenon, the limitation of the problem, and the purpose of doing the research. The introduction generally consists of the outlook of the research object, background, statements of the problem, problem limitation, research objective and writing systematics.

CHAPTER II LITERATURE REVIEW

In the literature review section, the theories and tools explanation that are related to the problem statements are explained. The theories and tools include from relevant books, journals, and previous research. The explanations are helping the research to discover the relevant solution to the problem.

CHAPTER III RESEARCH METHODOLOGY

The research methodology section includes a description and explanation of the methods used in the research. As well as a collection of data from the research object to find the results of the research objective. The steps of doing research are explained in this section, including step of stating the problem, collection and processing data, company problem analysis, and step of concluding the findings.

CHAPTER IV RESULTS AND DISCUSSION

In the results and discussion section, it would explain all the data collection and processing according to each method in forecasting theory, as well as the analyses. Moreover, the current situation of data and the research results would be compared and analysed in this section.

CHAPTER V CONCLUSION AND SUGGESTIONS

In this section, the results of research are concluded. Furthermore, some suggestions for the company and the next researchers are provided.