Kilisuci International Conference on Economic & Business

Vol. 3 Year 2025

Analysis quality control of white tofu products using the seven tools method in the home industry of Mrs. Menuk.

Tiara Putri Insani [1], Lilia Pasca Riani [2]

Yogyakarta State University Jl. Colombo No.1 Karangmalang Caturtunggal Depok Sleman DIY, 55281, Indonesia

tiara139fe.2022@student.uny.ac.id, lilia.pasca.riani@uny.ac.id

*corresponding author

Article Information

Submission date April 14, 2025

Revised date April 20, 2025

Accepted date May 16. 2025

Abstract

Research aim : This study analyzes quality control in white tofu production using the Seven Tools method at Tofu Factory Ibu Menuk, Bantul, Yogyakarta.

Design/Methode/Approch : A quantitative descriptive approach was used, with data collected through observations and interviews on 250 samples over 15 production cycles.

Research Finding *:* The results show that the most dominant defects were inconsistent texture (36.84%), unpleasant odor (22.49%), dark coloration (21.05%), and mold contamination (19.62%).Control charts indicate that the process remains within statistical control, though fluctuations require monitoring.The Fishbone Diagram analysis identified key defect causes, including raw material quality, machinery, worker skills, environment, and processing methods.

Theoritical contribution/Originality : This study contributes to quality management theory and practice by demonstrating how statistical tools improve product consistency and minimize defects.

Practitionel/Policy implication : These findings offer practical insights for tofu producers in implementing structured quality control tools to enhance product reliability.

Research limitation : Despite its limitation to a single factory, future research could extend to other industries, incorporate advanced monitoring technologies, and explore alternative quality improvement strategies.

Keywords : Quality Control, Seven Tools, Tofu Production, Statistical Process Control, Defect Analysis.

1. Introduction

Competition in the business world is greatly influenced by the level of operational efficiency of the company, competitive product prices, and the quality of the products offered. To ensure that the products produced still meet consumer standards and expectations, good quality control is needed at every stage of the production process. Only companies that are able to maintain high quality and optimal productivity can continue to compete and achieve success in the market (Simamora, 2011). Therefore, product quality and efficiency in production are key factors in achieving success and sustainable growth in the industry..

Currently, various industries are increasingly aggressively designing and implementing quality control systems to face increasingly fierce competition and minimize losses due to quality costs arising from product non-conformity. Quality control aims to ensure that the products produced have uniformity by identifying the factors that cause defects, increasing customer satisfaction, increasing profitability, and reducing unnecessary quality control costs.

Tofu is a food made from soybeans which is one of the traditional Indonesian foods and is widely consumed by the public. Based on pre-research, in the process of making tofu, there is still little attention paid to the aspect of quality control, especially because most of the production process is still carried out manually, except at the stage of soybean milling that uses machines. The tofu manufacturing process starts from soybean soaking, grinding, separation between pulp and soybean juice, then boiling, clumping process with coagulant, printing, compaction, cutting, and storage. According to Sutrisno (2016), quality control is a management and technical activity that aims to measure and compare product quality characteristics so that corrective action can be taken if non-conformities are found. One of the methods that can be applied in quality control is *seven tools*, which help in the analysis and improvement of product quality..

The seven tools method in quality control involves various statistical tools, including Check Sheet, Scatter Diagram, Fishbone Diagram, Pareto Chart, Flow Chart, Histogram, and Control Chart. According to Darmawan (2023), Check Sheets function as a recording tool in the form of a form that facilitates the collection of data on the number of defects in tofu products during the production process. Fishbone Diagram plays a role in identifying various factors that cause a problem. Meanwhile, the Pareto Chart presents issues by priority, from the most dominant to the lowest. Flow Charts describe the flow of the production process systematically, while Histograms display the frequency distribution of the data obtained. Control Charts are used to analyze changes in the production process over time. This study aims to identify factors that affect the quality of tofu before it is marketed and evaluate the tofu processing process to improve product quality.

1.1 Statement of Problem

In the tofu production process, there are still problems related to inconsistent product quality, which is caused by the lack of implementation of a comprehensive quality control system. The majority of production stages are carried out manually, so the potential for product defects is higher. Lack of attention to quality control results in high costs due to products that do not meet standards, decreased customer satisfaction, and disruption of the company's competitiveness in the market. Therefore, it is necessary to identify the factors causing product defects and evaluate the tofu production process in order to improve production quality and efficiency.

1.2 Research Objectivies

Study this aiming for :

1. Identify the types of defects that most often occur in tofu products during the production process
2. Analyzing the factors that cause tofu product defects using the Seven Tools method in quality control.
3. Evaluate the tofu production process to find stages that require improvement.
4. Provide recommendations for improvements to the production system to improve the quality of tofu products and the efficiency of the overall production process.

2. Method

This research is descriptive research with a quantitative approach. Descriptive research aims to provide a systematic, factual, and accurate description of the facts and characteristics

of the object under study. The quantitative approach is used to analyze data statistically to describe phenomena that occur objectively and measurably, especially related to product defects in the tofu production process.

The subject of this research is a tofu household industry owned by Mrs. Menuk located in Janten, Ngestiharjo, Kasihan District, Bantul Regency, Yogyakarta Special Region. The subject was chosen because it is a small-scale tofu industry that still runs the production process manually, so it has the potential to face various product quality problems. Meanwhile, the object of the research is the tofu production process, starting from the soybean soaking stage, milling, separation of pulp and soybean juice, boiling, agglomeration with coagulants, molding, compaction, cutting, to storage.

Data in this study were collected through two main techniques: Interviews, namely conducting direct questions and answers with business actors (Mrs. Menuk and workers) to obtain in-depth information about the production process, constraints faced, and efforts that have been made to maintain product quality. Observation, which is direct observation of the production process in the field to document workflow, work behavior, tool conditions, and record the occurrence of defects in tofu products during the process. A total of 250 tofu samples were observed for 15 times of data collection, to obtain product defect data that is representative enough and can be analyzed statistically.

This research uses the Seven Tools method in quality control to analyze and evaluate the tofu production process. The tools used include: defect data with Check Sheet, flow chart, making frequency distribution with histogram, making control diagram, and analyzing the cause with fishbone.

3. Results and Discussion

3.1. Check Sheet

The sample data and product defects are shown in table 1. From the data on the type of non-conformity of defective products, 250 samples were taken with 15 takes, so that the number of defective products was calculated as 209.

Table 1. Data on Type of Non -Conformity of Defective Products

No	Data Sampel	Jenis Cacat				Jumlah Produk Cacat
		Tekstur Tidak Sesuai	Berwarna Kehitaman	Jamur	Bau Tidak Sedap	
1	250	5	2	3	3	13
2	250	6	4	2	5	17
3	250	7	3	4	4	18
4	250	4	3	1	1	9
5	250	8	5	3	4	20
6	250	5	0	2	2	9
7	250	6	2	5	4	17
8	250	7	0	0	1	8
9	250	8	4	3	1	16
10	250	5	5	3	3	16
11	250	2	2	3	4	11
12	250	3	3	4	2	12

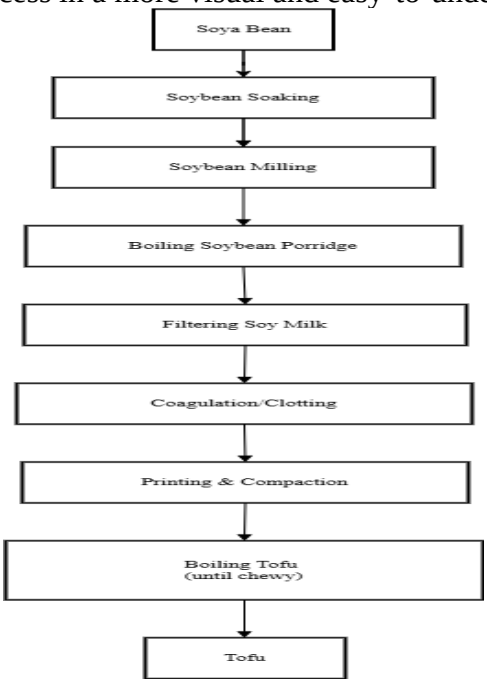
13	250	2	2	1	5	10
14	250	4	5	4	6	19
15	250	5	4	3	2	14
Jumlah	**3750**	**77**	**44**	**41**	**47**	**209**

Source : Primary data of Mrs. Menuk's home industry

During 15 productions, defects were obtained in tofu products such as defects in unsuitable texture products, blackish product defects, defects due to mold, and defects in unpleasant smelling products. The highest number of defective products were the type of defects in the texture of the inappropriate texture (as many as 77 products) followed by defects in unpleasant odor (47 products), blackish in color (44 products) and defects due to mold (41 products).

3.2. Flow Chart

A flowchart is a diagram used to represent a process, system, or algorithm in the form of graphic symbols connected by arrows. Flowcharts help in understanding the workflow or steps that must be done in a process in a more visual and easy-to-understand way.



Picture 1. Tofu Making Process

The production process begins by soaking soybeans for 12 hours, then is applied to the grinding process and producing soy milk. The mill is squeezed to separate the milk liquid from the soybean pulp. Soy milk that has been squeezed is then cooked to a boil to kill bacteria, then coagulant ingredients are added to make curd. It takes a few minutes for the soy milk to solidify and separate into curds (lumps) and residual water (whey). The curd that forms is separated from whey water by filtering it using a cloth. Then the printing process, the curd that has been separated is then put into the tofu mold. The boiling process, the tofu that has been formed is then boiled in boiling water for a few minutes until the tofu is cooked and chewy.

3.3. Histogram

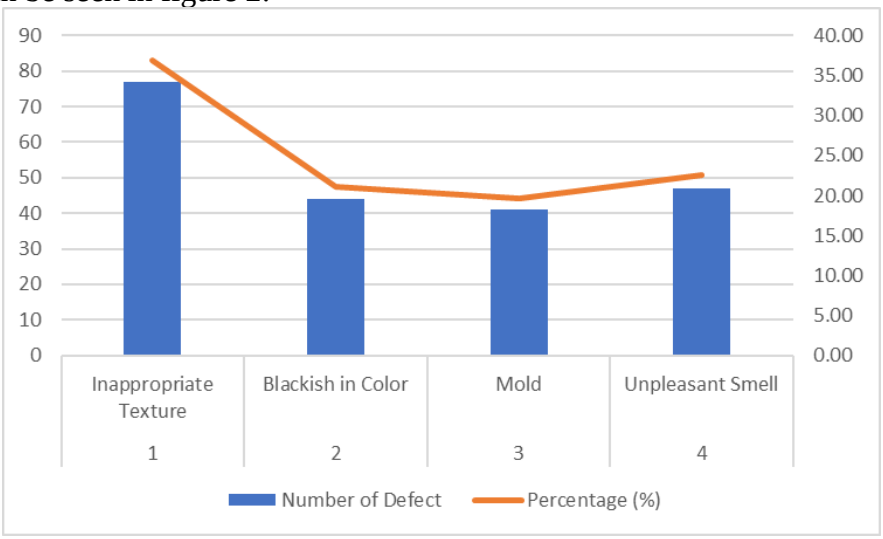
Histograms are used to display the frequency distribution of a piece of data in the form of a bar chart. Histograms help in understanding data dissemination patterns, variations in the production process, and detecting any deviations or quality inconsistencies in a product. The following data obtained from the type and percentage of defects in tofu can be seen in table 2.

Table 2. Defect Percentage

No	Types of Defects	Number of Defects	Percentage(%)
1	Inappropriate Texture	77	36.84
2	Blackish	44	21.05
3	Mold	41	19.62
4	Unpleasant Smell	47	22.49
	Total	**209**	**100**

Source : Processed Excel results, 2025.

After knowing the percentage of defects, a histogram is made based on the type of defect, which can be seen in figure 2.



Picture 2. Histogram of Tofu Production Defects
Source : Processed Excel results, 2025.

Based on the diagram above, it can be seen that the texture defect is not suitable by 36.84%, blackish defect is 21.05%, defect due to mold is 19.62%, while defect with an unpleasant odor is 22.49%.

3.4. Pareto Diagram

The Pareto chart aims to find out the most dominant defects in tofu products. The data obtained from the type and percentage of defects are seen in table 2.

From the results of the calculation of each type of disability, the number of defects was 209. After knowing the percentage of each defect, it can be classified again according to the most dominant defect. The priority of quality control according to the most dominant defects can be seen in table 3.

Table 3. Quality Control Priorities

No	Types of Defects	Number of Defects	Percentage(%)	Cumulative	Priority
1	Inappropriate Texture	77	36.84	36.84	1
2	Unpleasent Smell	47	22.49	59.33	2
3	Blackish	44	21.05	80.38	3
4	Mold	41	19.62	100.00	4
	Total	**209**	**100**		

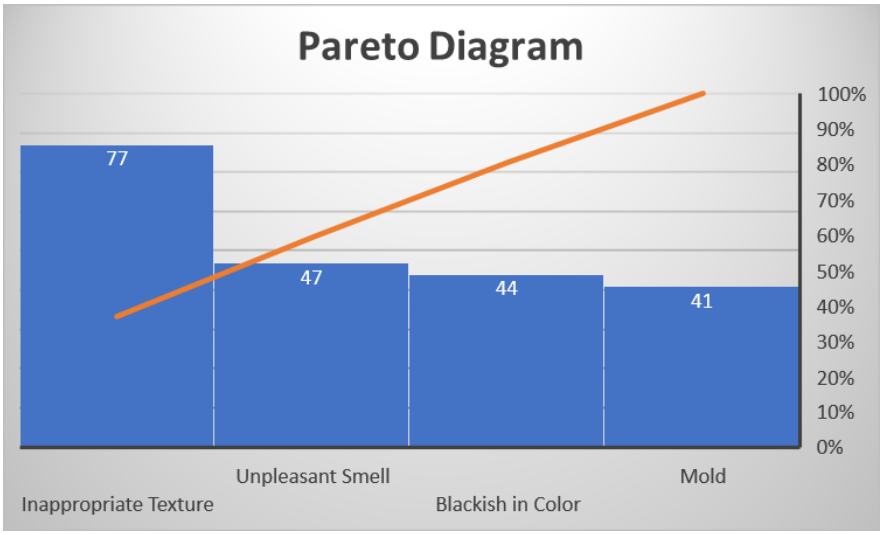
Source : Processed Excel results, 2025.

From the results of the data above, it can be concluded as follows:

1. The type of texture defect is not in line with the percentage of 36.84% ranked first in quality control priority.
2. The type of bad odor defect with a percentage of 22.49% is ranked second in quality control priority.
3. Blackish defect type with a percentage of 21.05% is ranked third in quality control priority.
4. Type defect due to mold with a percentage of 19.62% is ranked fourth in quality control.

After knowing the most dominant defects, a pareto chart can be made based on the type of defect can be seen in figure 3.

.



Gambar 3. Pareto chart of defective products by defect type
Source : Processed Excel results, 2025.

3.5. Control Chart

The Control Chart is a map used to show how it changes over time, as shown in table 4.

Table 4. Control Chart

No	Inappropriate Texture	Blackish	Mold	Unpleasant Smell	Xi	R
1	5	2	3	3	3.25	3
2	6	4	2	5	4.25	4
3	7	3	4	4	4.5	4
4	4	3	1	1	2.25	3
5	8	5	3	4	5	5
6	5	0	2	2	2.25	5
7	6	2	5	4	4.25	4
8	7	0	0	1	2	7
9	8	4	3	1	4	7
10	5	5	3	3	4	2
11	2	2	3	4	2.75	2
12	3	3	4	2	3	2
13	2	2	1	5	2.5	4
14	4	5	4	6	4.75	2
15	5	4	3	2	3.5	3
Jumlah	**77**	**44**	**41**	**47**	**52.25**	**57**

Source : Processed Excel results, 2025.

The Control Chart is divided into 2, namely:

3.6. Variable Maps

$$\bar{x} = \frac{\sum xi}{n} = \frac{52.25}{15} = 3.48$$

$$\bar{R} = \frac{\sum R}{n} = \frac{57}{15} = 3.8$$

Table of Factors

A2 = 0.577
D3 = 0
D4 = 2.114

UCL $\bar{x} = \bar{x} + (A2 \,.\, \bar{R})$

= 3.48 +(0.577 x 3.8) = 5.67

LCL $\bar{x} = \bar{x} - (A2 \,.\, \bar{R})$

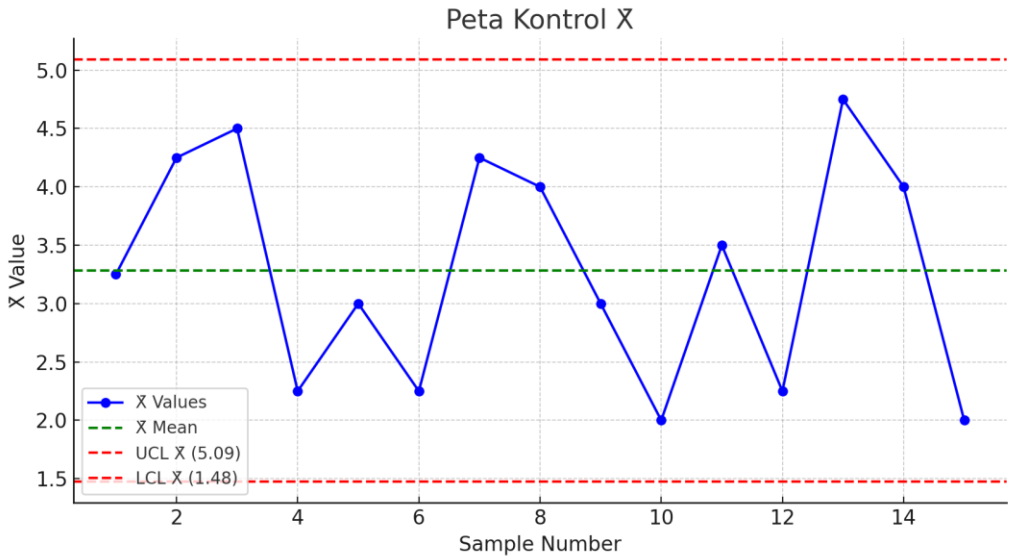
= 3.48 – (0.577 x 3.8) = 1.29

UCL $\bar{R}$ = D4. $\bar{R}$

= 2.114 x 3.8 = 8.03

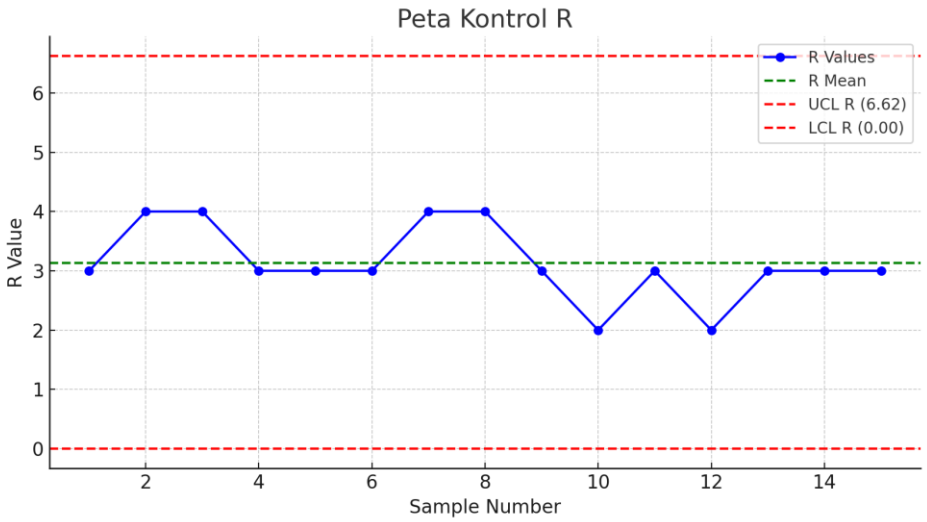
LCL $\bar{R}$ = D3. $\bar{R}$

= 0 x 3.8 = 0



Picture 4. Control Map $\bar{x}$
Source : Processed Excel results, 2025.

UCL $\bar{x}$ it is at a value of 5.09, indicating the maximum acceptable limit before the process is deemed uncontrollable. LCL $\bar{x}$ is at a value of 1.48, indicating the minimum acceptable limit. In the graph above, there is no point that is outside the boundaries of the UCL and LCL, so the process is still under control. However, the data fluctuations are quite large, which may need to be monitored further to ensure process stability.



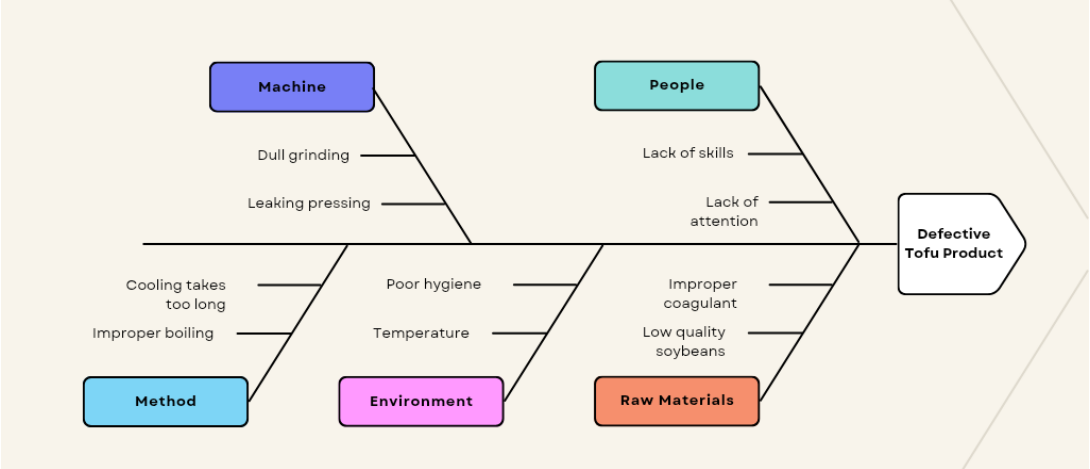
Picture 5. Control Map R.
Source : Processed Excel results, 2025.

The UCL R is at a value of 6.62, indicating the maximum acceptable limit of variation before the process is deemed uncontrollable. The LCL R is at a value of 0.00, which in the control map R is often a value of zero because the range cannot be negative. All points are within the control limits, indicating that the variation in the process is still in statistical

control. None of the points go beyond the UCL or approach zero in the extreme, suggesting that the variation in the process is stable.

3.7. Fishbone

From the observations made, it can be seen that the most dominant type of defect is an inappropriate texture. The cause of inappropriate texture defects is environmental factors because room temperature that is too high or low can affect the texture of tofu. Dull grinding machines and improper methods also result in an inappropriate tofu texture.



Picture 6. Fishbone Diagram on Defective Products Tofu.
Source : Editing by canva, 2025.

From the diagram above we can see that defects in tofu products are caused by human factors, raw materials, the environment, machines, and also methods. The types of damage that occur and the way to deal with them are :

a. Raw Materials
   Low-quality soybeans can produce less dense and unpleasantly flavored tofu. Unclean water can lead to microbial contamination. How to deal with it:
   1. Choose good quality soybeans with high protein content.
   2. Use clean water that has been filtered or cooked to avoid contamination.

b. Machine
   The blunt grinding machine makes the soybean yield less smooth. A leaky squeeze machine causes the loss of soybean juice. How to deal with it:
   1. Sharpen or replace the grinding knife periodically so that the grinding results are smooth.
   2. Check and repair the squeeze machine in case of leakage.

c. Method
   An inappropriate boiling process can hinder the formation of good tofu. Refrigeration for too long can make tofu hard or moldy. How to deal with it:
   1. Use the appropriate boiling temperature and time so that the proteins in the soybeans can clump perfectly.
   2. Refrigerate at the right time so that the tofu stays fresh and does not harden.

d. People/Human
   Less skilled workers can cause errors in mixing and processing. Lack of precision in quality checks causes defective products to pass. How to deal with it :

1. Train workers to follow the correct production procedures.
2. Implement a quality checking system at each stage of production.

e. Environment
Room temperature that is too high or low can affect the texture of tofu. Poor hygiene increases the risk of contamination How to deal with it:
1. Make sure the production site is clean and hygienic to prevent bacterial contamination.
2. Control the temperature and humidity of the room so that the tofu does not go stale or spoil quickly..

4. Conclusion

This study shows that the application of the Seven Tools method in controlling the quality of tofu production at the Ibu Menuk Tofu Factory has succeeded in identifying and analyzing the factors causing product defects. From the results of the analysis using Check Sheet, Histogram, Pareto Chart, Fishbone Diagram, and Control Chart**,** it was found that the most dominant type of defect was inappropriate texture (36.84%), followed by unpleasant odor (22.49%)**,** blackish color (21.05%), and mold (19.62%). Based on Control Maps $\bar{X}$ and R, the production process is still within the limits of statistical control, although there are data fluctuations that need to be considered to prevent future quality mismatches.

The main contribution of this research lies in the application of the Seven Tools method to improve the quality of tofu production systematically and based on data. Scientifically, this study adds insight into the effectiveness of statistical methods in controlling quality in the small-scale food industry. In terms of practice, the results of this study can be a reference for tofu producers to improve product quality through improving raw materials, optimizing production machines, improving labor skills, and better management of the production environment

While providing valuable insights, the study has limitations in sample coverage and limited observation time. This study was only conducted on one tofu industry over a period of time, so the results may not be generalized to similar industries in other locations. Therefore, further research can expand the scope by analyzing different tofu industries in different regions, using more complex quality control methods, as well as integrating modern technologies in production monitoring to improve the accuracy and effectiveness of quality control.

References

[1] ım, I. M, Tagseng, K.S, Saputra, M.W. and Al-Faritsy, A,Z., "Analisis Pengendalian Kualitas Produk Tahu Menggunakan Metode Seven Tools Pada UMKM Tahu Bu Ida," *Jurnal Manufaktur,* pp. 108-117, 2024. HYPERLINK "https://doi.org/10.61132/manufaktur.v2i2.342" \t "_new" https://doi.org/10.61132/manufaktur.v2i2.342

[2] ıyuningtyas, W. and Sriyanto, "Analisis Pengendalian Kualitas Pada Produk Tahu Baxo Ibu Pudji Menggunakan Metode New Seven Tools," *Jurnal Teknik Industri, Universitas Diponegoro,* 2023.

[3] ammad Arifuddin, "Analisis Pengendalian Kualitas Tahu Takwa Dengan Metode Seven Tools," *Jurnal Teknik Industri, Universitas Brawijaya,* 2023. HYPERLINK "https://repository.ub.ac.id/id/eprint/11136/" \t "_new" https://repository.ub.ac.id/id/eprint/11136/

[4] nawan,M.R. and Rahim, M.A, "Pengendalian Kualitas Produk Tahu Menggunakan Metode Seven Tools di PT X.," *Teknika : Engineering and Sains Journal* , pp. 45-60, 2023.

[5] ardika, I, "Penerapan Metode Seven Tools untuk Meningkatkan Kualitas Tahu di UMKM," *Jurnal Sains dan Teknologi*, pp. 200-210, 2017.

[6] na Marpaung et al, "Analisis Kualitas Produk Tahu Menggunakan Metode Statistical Process Control dan Seven Tools di UMKM Yogyakarta," *Jurnal Teknologi dan Manajemen,* pp. 75-85, 2021.

[7] adi et al, "Pengendalian Kualitas dengan Metode Seven Tools pada Proses Produksi Tahu di CV Yogyakarta Sejahtera," *Jurnal Teknik Industri*, pp. 100-110, 2020.

[8] sno, E. and Fitria, D.A, "Pengendalian Kualitas Produk Tahu Menggunakan Metode Seven Tools di UMKM Hasil Pertanian Yogyakarta," *Jurnal Agroindustri* , pp. 88-97, 2023.

[9] R.A and Junaidi, "Penerapan Metode Seven Tools untuk Meningkatkan Kualitas Produk Tahu di UMKM Tahu Sejahtera," *Jurnal Manajemen Mutu,* pp. 55-65, 2024.

[10] owo, A.E and Khoiroh, S.M, "Penggunaan Diagram Pareto dalam Pengendalian Kualitas Produk Tahu," *Jurnal Teknik Industri Terintegrasi,* pp. 30-40, 2023.

[11] anti, D.A and Prabowo, H.S, "Evaluasi Kualitas Produk Tahu Menggunakan Metode Seven Tools," *Jurnal Ilmu dan Teknologi Pangan* , pp. 200-210, 2024.

[12] iyah, N. and Rahman, A.H, "Implementasi Seven Quality Control Tools untuk Meningkatkan Kualitas Tahu," *Jurnal Rekayasa dan Teknologi*, pp. 150-160, 2024.

[13] ndi, S. Ruri and Wulandari, "Pengendalian Kualitas Tempe Dengan Metode Seven Tools," *Jurnal Teknovasi*, pp. 66-80, 2016.

[14] . Lilia, "Analisis Pengendalian Kualitas Produk Tahu Putih , Studi kasus Home Industri Tahu Kasih Kabupaten Trenggalek," *Akademika,* 2016.

[15] ıka and M. Ismi, "Analisa Pengendalian Kualitas Produksi dengan Menggunakan Metode Seven Tools Quality di PT. Borsya Cipta Communica," *Jurnal Industri & Teknologi Samawa*, pp. 17-21, 2020.