



Supply Chain Management Analysis of Soybean-Based MSMEs Using Fishbone and SWOT Approaches in West Aceh

Al Kautsar¹, Tya Ulfah^{2*}, Asmaulia Al adawiya³, Najwa Aja Balqis⁴, Alya Nafira⁵,
Dimas Juliansyah⁶, Deni Setiawan⁷, Suci Ayu Lestari⁸ and Roja Safitriyawi⁹
^{1,2,3,4,5,6,7,8,9}Department of Industrial Engineering, Teuku Umar University, Aceh, Indonesia
*tyaulfah@utu.ac.id

Abstract. Micro, Small, and Medium Enterprises (MSMEs) engaged in soybean processing—such as tofu, tempeh, and soy milk—hold a significant role in meeting community needs while also supporting the local economy in West Aceh. Despite this, many of these enterprises encounter recurring challenges, particularly in the availability of raw materials, production efficiency, product quality, and distribution networks. This research seeks to examine supply chain management (SCM) practices within soybean-based MSMEs by utilizing Fishbone Diagram and SWOT Analysis as analytical tools. The study, conducted in June 2025 across four business units in West Aceh through direct observation and interviews, applied the Fishbone Diagram to trace root causes of production-related issues in areas such as human resources, equipment, methods, materials, and the working environment. Subsequently, SWOT Analysis was used to assess both internal strengths and weaknesses as well as external opportunities and threats that affect business development. Findings highlight several key problems, including dependence on imported soybeans, limited use of modern technology, short product shelf-life, and distribution limitations. On the other hand, MSMEs benefit from strong consumer demand and affordable prices, coupled with opportunities arising from growing health-conscious food trends and potential for product diversification. Integrating SCM, Fishbone, and SWOT results, the study suggests strategic measures such as upgrading production technology, enhancing workforce competencies, seeking alternative local soybean sources, and expanding distribution channels. Overall, the research provides insights into strengthening the competitiveness and sustainability of soybean-based MSMEs in West Aceh.

Keywords: Supply Chain Management, Production Efficiency, Fishbone Diagram, SWOT Analysis, MSMEs.

1 Introduction

Supply Chain Management (SCM) is an umbrella process in which products are created and delivered to consumers from a structural perspective. A supply chain refers to the complex network of relationships that maintain an organization with its business partners to obtain production resources in delivering to consumers. SCM is the integration and organization of supply chain management and activities through cooperative organizational relationships, effective business processes, and a high level

of information sharing to create a high-performance value system that gives member organizations a sustainable competitive advantage. SCM is an effort by suppliers to develop and implement the most efficient and economical supply chain possible [1]. To support efficient supply chain management as described in SCM, one useful problem visualization method is the fishbone diagram, which helps map the causal relationships between causes. The definition of a fishbone diagram is a fishbone diagram (fishbone chart) has the use of showing various main factors that influence quality and result in the problem being studied. The use of the diagram is intended to explain the causes of problems graphically or to identify the causes and effects of problems, for example, factors that cause product defects. Fishbone Diagram is a form of data that is predominantly collected subjectively through observation and analysis that can be derived from objective or subjective things using quantitative or qualitative data. The impact of failure will be written on the right side of the fish's head, while the factors causing the failure can be written on the body of the fish. The benefits of this Fishbone Diagram can help us determine the root cause of the problem in a User Friendly manner . The research that has been done from several stages, namely: conducting a SWOT analysis, making a fishbone diagram and conducting a supply chain analysis.

Previous research journal on SWOT analysis in previous trading businesses: According to the results of research conducted [2] using SWOT analysis at UD. Mahameru Candipuro, the implementation used Growth Oriented Strategy. This is because the SWOT analysis Cartesian diagram shows that the highest total score is in the first quadrant where the quadrant is very profitable.

In the study [1] conveys supply chain agility as a strategic capability that allows companies to quickly respond and feel to internal and external uncertainty through effective integration, agile companies can turn challenges into opportunities that can be exploited. A company according to [2] has a sustainable competitive advantage (which is the company's characteristic) where the company has demonstrated good performance that has outperformed major competitors in a particular competitive market in a long period and can withstand the power of a highly competitive business environment that expects rapid change. [3] Supply Chain Management has a positive effect on company performance. With the increasing importance of SCM implementation in companies, it is necessary to dig deeper into Supply Chain Management that influences the improvement of operational performance. From the results of this study it can be seen that the application of supply chain management in Lalapan Tanamo is very effective and helps in the process of managing its supply chain, can help ensure that the products sold are always from fresh and quality raw materials. In addition, it can also help increase customer satisfaction by providing products on time, this can be done by increasing the accuracy of demand forecasts [4][5][6].

According to [7] Soy milk is one of the processed products of soybean extraction. Soy milk is a drink made from soybeans that are melted and processed so that it is similar to animal milk. Agree with [8] that soy milk contains eight essential amino acids, namely lysine, tryptophan, phenylalanine, leucine, isoleucine, threonine, methionine, valine. These essential amino acids are very necessary for the body, but are not synthesized from food ingredients at a sufficient speed, so they must be provided

in the finished form that is consumed. [8] added that soy milk is a highly nutritious drink, especially its protein content. It also contains fat, carbohydrates, calcium, phosphorus, iron, provitamin A, Vitamin B complex (except B12), and water.

Research is a process in which we must carry out a series of logical steps [9] Research is basically a scientific method that we use to obtain data with certain goals and uses [10]. Research means searching, exploring or finding meaning again repeatedly [11]. The essence of research is to search again [12] This means that research is an activity carried out by researchers in certain fields which is carried out with logical steps with certain goals and uses in the form of repeating research that has been carried out by previous researchers in order to find meaning again. Research results require validity and accuracy of information through a proper research process and procedures and continuously, continuously and always refined (re-to search).

Journal of fishbone analysis research on previous trading businesses: Several previous studies have shown the effectiveness of Fishbone Diagram in analyzing the causes of product defects. A study by [10] in the snack food industry showed that the main factors causing product defects were inconsistent work methods and unsuitable raw materials. Meanwhile, research from [11] in the chips industry concluded that human factors (human error) and cleanliness of the work environment were the dominant causes of product damage. Research [13] in frozen food MSMEs showed that the application of Fishbone Diagram was not only able to identify the causes of defects, but also could be the basis for decision making in improving the overall production system.

Research is a process in which we must carry out a series of logical steps [10] Research is basically a scientific method that we use to obtain data with certain goals and uses [11]. Research means searching, exploring or finding meaning again repeatedly [11]. The essence of research is to search again [12] This means that research is an activity carried out by researchers in certain fields which is carried out with logical steps with certain goals and uses in the form of repeating research that has been carried out by previous researchers in order to find meaning again. Research results require validity and accuracy of information through a proper research process and procedures and continuously, continuously and always refined (re-to search).

Tempeh is a traditional Indonesian product made from fermented soybeans. Tempeh is made by a natural fermentation process. Tempeh is made with the fungus (*Rhizopus oligosporus*) which is used in the fermentation process and is also known as a tempeh starter. Tempeh is very popular in Java and is a staple protein source [13]. Currently, tempeh is made using soybeans which are one of the most popular vegetable protein sources in Indonesia. Tempeh made in Indonesia has several types of production methods which also have varying tempeh characteristics [13]. Currently, many studies show that tempeh also has many health benefits, besides being a source of protein, tempeh also has other benefits, especially as a source of isoflavones, vitamin B12, and calcium [2]. Tempeh has health benefits to prevent obesity through its role as a functional food that can help improve blood lipid profiles, reduce body fat ratios and help reduce weight [3].

2 Research methods

2.1. Data collection

equipment, production volume, marketing, production processes, and business challenges in production, as well as interview data regarding the company's efforts. To obtain this data, the researcher conducted direct monitoring. This research was conducted at trading businesses in West Aceh, with researchers conducting research at four different trading businesses. This research was conducted from June 6, 2025, to June 8, 2025. The research hours were adjusted to the working hours of the trading businesses.

2.2. Data Processing and Analysis

Data processing is carried out in several stages as follows:

a. Conducting interviews

Interviews were used to gather information directly from the sources, providing insights into the production process, marketing, and challenges encountered during production. Through these interviews, we can conclude that the data obtained from these interviews can be used as factual and accurate data, covering everything from raw materials and production processes, machinery, workers, and marketing.

The results of product interviews at four processing facilities (two tofu production facilities, one tempeh production facility, and one soy milk production facility) are shown in the following table:

1. Data Collection Table

Product Name	Producer	Use (Industry and Purpose)	Purchase price (IDR)	Selling Price	Number of Workers	Shelf Life	Marketing	Business Scale (IDR)	Business Sensitivity	Business Conflict
UD. Kacang Telor Bandung	Forever	Instant food and snack with long shelf life; appeal to a variety of applications	± 125-200/sachety	IDR. 33,333/bowl and 13,333/pc (subject to agent/supplier)	4 People	2-3 days (normal work conditions)	Direct sales and resellers; stalls or online	Medium scale; steady turnover	Workers could be sensitive?	Not mentioned
UD. Sukun Rasa Bandung	soy milk	Vegetarian drink (soy milk); suitable as healthy and affordable beverage	Depands (on supplier)	IDR 6,667 /pack	4 people	2-3 days storage in refrigerator at low temerature	Direct sales and resellers; stalls or online	Small-medium scale; steady demand	Not mentioned	Not mentioned
UD. Munggah Tinggi	Tempeh	Traditional food product (easy cooking)	± 250 /kg raw material	Branded IDR. 4,250- IDR. 10,500/pc (subject to location)	4 people (1 production and 3 sale persons)	3-5 days (depends on production conditions/storage)	Tie Area Market and Nearby Vendor	Medium scale; steady turnover	Workers could be sensitive? (errors, safety)	Workers could be sensitive? (errors, safety)

a. Creating a fishbone diagram

Fishbone diagrams are used as a tool to identify and analyze various factors that cause problems that occur in the tofu production process. Through this diagram, it can be systematically seen the main causes that come from the aspects of raw materials, machines, methods, labor, and the production environment.

b. Conducting Observations

Observation is used to deduce data accurately, factually, and objectively, from the place of direct research, which is used to understand behavior, and processes ranging

from the aspect of raw materials to exploring the problems that occur so that this research becomes an accurate research in a certain context.

2.3. Diagram Fishbone

To identify the source of the problems that occur in each processing unit, an analysis tool in the form of a fishbone diagram (Ishikawa) is used. This diagram helps map the main causative factors of various production problems, whether they originate from humans, machines, methods, materials, or the environment. The following are four fishbone diagrams that describe the conditions in each production unit, namely two tofu productions, one tempeh production, and one soy milk production.

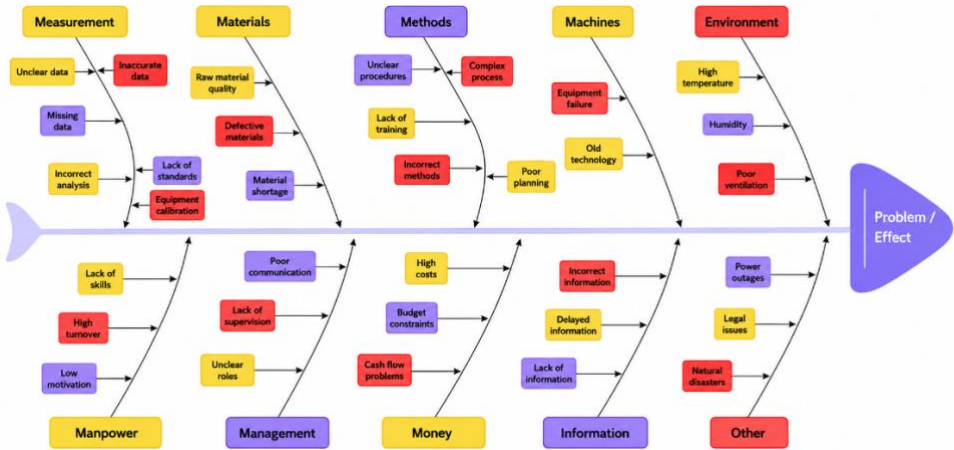


Figure 1. Fishbone Tofu UD Pictures. Know Two Brothers

The main problems of tofu production are influenced by limited worker skills, manual equipment, the absence of standard working methods, dependence on imported soybeans, and short product shelf life due to environmental conditions.

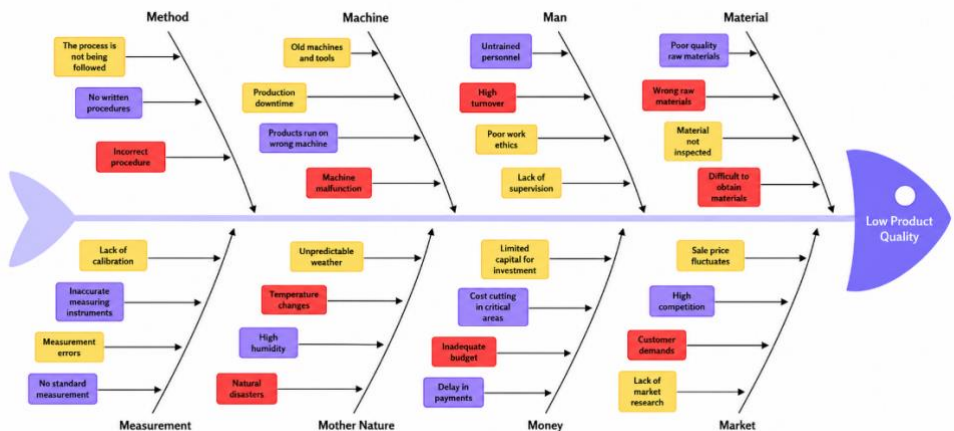


Figure 2. UD Soy Milk fishbone. Know Two Brothers

Soy milk production is constrained by a very short shelf life, simple equipment, working methods without standard standards, dependence on raw materials from tofu, and limited distribution so that the market cannot develop widely.

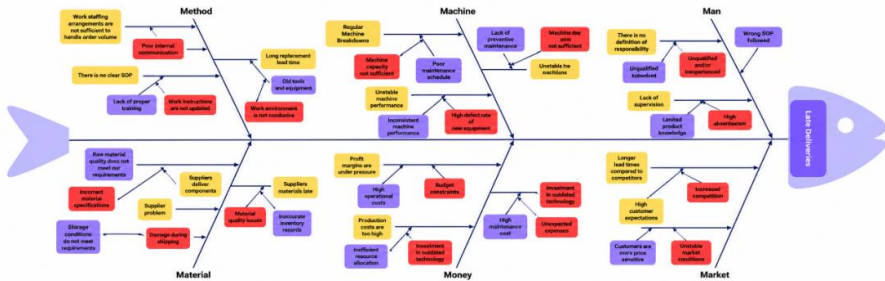


Figure 3. fishbone Tahu Seunebok

The main problem of tofu production in UD. Seuneubok tofu includes dependence on imported soybeans, simple equipment, no production recording system, limited worker skills, and short product shelf life.

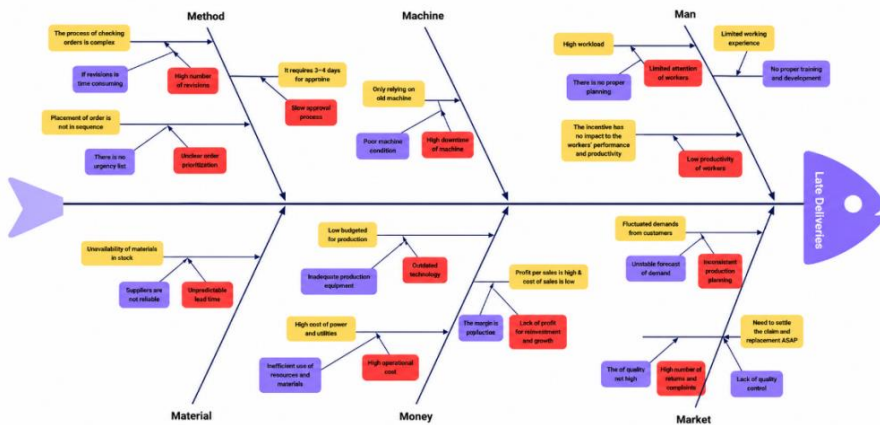


Figure 4 Fishbone Tempeh Ud. Roses

Tempeh production is constrained by fluctuating imported raw materials, simple machinery, limited labor, short shelf life, especially during the rainy season, and the absence of diversification of products other than tempeh

2.4. SWOT Analysis

Based on the results of the analysis using the fishbone diagram, several main problems in the production process were identified, such as lack of equipment maintenance, limited labor skills, suboptimal management of raw materials, and simple waste management. These problems are interrelated and affect production efficiency and the quality of the products produced. The results of the identification are then used

as the basis for compiling a SWOT analysis, so that the strengths, weaknesses, opportunities, and threats faced in the production process can be known.

Table 2. SWOT Analysis Table - UD. Know Two Brothers

Strength	Weakness	Opportunity	Threat
Stable soybean supply from agents in Meulaboh (Medan imports)	The equipment is still manual (only 1 grinding machine)	Demand for tofu & soy milk stabilizes in the local market	Fluctuations in soybean prices every month
Production varies: tofu and soy milk	Fast expiry products (2–3 days)	Opportunities for the development of soybean derivative products	Supply risks during a pandemic or distribution disruption
Competitive product price (retail & per board)	No specific field of work (casual worker)	Public awareness of plant-based foods increases	The product breaks down quickly if there is no cooler
Production is quite high (±120 boards/day)	Dependence on imported soybeans	The price of the board package is more attractive for large consumers	Competition with other tofu/tempeh producers
Local worker 6 people, flexible work	Limited distribution scale in	Potential to expand the market to	Long-term dependence on imported materials

Table. 3 SWOT Analysis Table - UD Soy Milk. Know Two Brothers

Strength	Weakness	Opportunity	Threat
Direct products from the tofu manufacturing process	Very short shelf life (1–2 days)	The trend of plant-based healthy drinks is increasing	Competition with modern packaged drinks
Affordable price (Rp5,000)	Production depends on demand	Can be expanded to flavor variants	Risk of quickly becoming stale without cooling
Sold directly to consumers	Limited distribution only	Local market still has potential	Limitations of external distribution to Meulaboh
Fresh and natural flavors	No modern packaging	Affordable pricing for all segments	Soybean price fluctuations

Table. 4 SWOT Analysis Table - Tofu Seunubok

Strength	Weakness	Opportunity	Threat
Soybean supply directly from Medan (in bulk, 5 tons)	Product spoils quickly (2–3 days)	The demand for the local market is quite high	Fluctuations in the price of imported soybeans
Large production (150–200 kg of soybeans per day)	Equipment is still simple	Potential to expand the market outside Meulaboh	Competition with other tofu producers
Competitive price (IDR 60,000/board, IDR 400/piece)	Dependence on soybean imports	Can add soybean derivative products	Products spoil easily if distribution is slow
Wide distribution: market, store, and direct	There is no clear production recording system yet	The quality of fresh tofu is in demand by consumers	Dependence on terrain distribution
There is a division of labor (marketing & production)	Additives (vinegar) only for thickeners	Government support for food MSMEs	Risk of supply disruption (weather, transportation)

Table 5. SWOT Analysis Table - UD. Tempeh Rose

Strength	Weakness	Opportunity	Threat
The business has been running for ±15 years	Dependence on soybeans from Medan	Tempeh demand stabilizes in the local market	Volatile soybean prices
Consistent tempeh production (50 kg/day)	Product spoils quickly (3–5 days, depending on the weather)	Public awareness of plant-based protein is high	Products are prone to spoilage in the rainy season
Prices vary according to consumer segment (IDR 2,000–IDR 5,000)	Simple production machines	Can expand marketing beyond Meulaboh	Competition with local tempeh producers
Marketing to Meulaboh & PT market	Limited number of workers (4 people)	The potential for partnerships with universities is wider	Distribution limitations
High daily profit (IDR 3–4 million)	There is no diversification of products other than tempeh	Tempeh processed products can be developed	Risk of disrupted import supply

3 Results of research and discussion

3.1. Research Results

The research was conducted on four soybean processing business units in West Aceh, namely two tofu producers (UD. Know Two Brothers and UD. Tofu Seuneubok), a tempeh producer (UD. Tempe Bunga Mawar), as well as one soybean milk producer (UD. Know Two Brothers). Primary data was obtained through observations and interviews related to raw materials, production processes, number of workers, selling prices, marketing, and business challenges.

From the results of data collection, it is known that all business units are highly dependent on the supply of imported soybeans from Medan. The average daily production amount varies: UD. Tahu Dua Saudara produces ± 120 tofu boards per day, UD. Seuneubok tofu produces 150–200 kg of soybeans per day into tofu, UD. Tempeh Bunga Marose produces ± 50 kg of tempeh per day, while soy milk is produced based on consumer demand. Product prices are relatively competitive in the local market, with a range of IDR 5,000-IDR 60,000 per unit of product.

The main problems faced are fluctuations in the price of imported soybeans, limited shelf life (2-5 days), manual production equipment, and the influence of weather on the production process (especially tempeh). In addition, most businesses still have limited marketing reach in the Meulaboh area.

3.2. Discussion

The results of the analysis with the Fishbone diagram show that the root of the problem in the soybean production process comes from five main factors:

1. Human (Labor) – the skills of workers that are still limited and the dual role of workers that lead to no work specialization.
2. Machinery/Equipment – the use of manual machines that are not optimal, affecting production capacity.
3. Method – there is no clear standard of production and recording procedures, so the quality of the product depends on the experience of the worker.
4. Materials (Raw Materials) – full dependence on the supply of imported soybeans from Medan which makes the business vulnerable to price increases and distribution delays.
5. Environment – weather and room temperature factors that affect the shelf life of products, especially tempeh and tofu.

The results of Fishbone's identification are strengthened by a SWOT analysis, which illustrates that the business has strength in the form of stable market demand, fresh products at competitive prices, and opportunities for the development of soybean derivative products in line with the increasing trend of plant-based healthy foods. However, the real disadvantages are the short shelf life, limited distribution, and lack of product diversification. Prominent external threats are fluctuations in the price of

imported soybeans, competition between local producers, and the risk of disruption in the supply of raw materials due to global conditions and the pandemic.

Thus, business development strategies need to be directed to:

- a. Production efficiency through tool modernization and machine maintenance.
- b. Diversification of products such as processed tofu/tempeh and soy milk with flavor variants.
- c. Upskilling of the workforce through simple training.
- d. Strengthening marketing outside Meulaboh with more modern packaging.
- e. Reduction of import dependence through the search for alternative local soybean supplies.

4 Conclusion

Based on the results of research conducted on four soybean processing business units (two tofu productions, one tempeh production, and one soy milk production), it can be concluded that there are various internal and external factors that affect the production process. Through analysis using fishbone diagrams, the main causes of problems were identified including limited production equipment, fluctuations in the price of imported soybean raw materials, uneven labor skills, and environmental constraints such as weather that affect product shelf life. The results of the identification were then strengthened by a SWOT analysis, which showed that although these businesses have strengths in the form of stable market demand, fresh product quality, and opportunities for the development of soybean derivative products, they still face weaknesses in the aspects of import dependence, waste management, and distribution limitations. Thus, business development strategies need to be focused on increasing production efficiency, product diversification, utilizing plant-based healthy market opportunities, and efforts to reduce the risk of import dependence through alternative local soybean supply.

References

- [1] Lumbanraja, A., Khairani, F., & Hasibuan, H. (2025). Analisis Supply Chain Management Dalam Meningkatkan Efisiensi dan Daya Saing UMKM. *Jurnal Penelitian Ilmiah Multidisipliner*, 1(02), 113-121.
- [2] Yatminiwati, M., & Ermawati, E. (2021). Analisis SWOT Dalam Menentukan Strategi Pemasaran Dalam Upaya Meningkatkan Penjualan Produk. *JUMPA Jurnal Manajemen Dan Penelitian Akuntansi*, 14(2), 105-114. <https://doi.org/10.58431/jumpa.v14i2.217>
- [3] J. Rachbini, W. (2019). Supply Chain Management dan kinerja perusahaan. *Journal of Business & Banking*, 7(1), 23–30. <https://doi.org/10.14414/jbb.v7i1.1463>
- [4] Crick, J. M. (2019). Moderators affecting the relationship between cooperation and company performance. *Journal of Business and Industrial Marketing*, (Vol. 34, Issue 2, pp. 518–531). J. Rachbini, W. (2019). Supply Chain Management dan kinerja perusahaan. *Journal of Business & Banking*, 7(1), 23–30. <https://doi.org/10.14414/jbb.v7i1.1463>

- [5] Ardianti, F. W., Widyaningrum, S., & Bastomi, M. (2024). Analisis Supply Chain Management Pada Umkm Lalapan Tanamo Menggunakan Matriks SWOT dan QSPM. *GLOBAL: Jurnal Lentera BITEP*, 2(03), 102-115. <https://doi.org/10.59422/global.v2i03.431>
- [6] Ahmad Azwan Ahmad Shukor & Md. Shah Newaz & Muhammad Khalilur Rahman & Azni Zarina Taha, 2020. "Supply chain integration and its impact on supply chain agility and organizational flexibility in manufacturing firms," *International Journal of Emerging Markets*, Emerald Group Publishing Limited, vol. 16(8), pages 1721-1744, July
- [7] Safitri, D., & Siregar, M. A. P. (2023). Etnomatematika dalam Proses Pembuatan Tahu Sebagai Sumber Pembelajaran Matematika. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 7(2), 2026- 2036.
- [8] Harahap, N. (2020). Penelitian Kualitatif. Wal Ashri Publishing.
- [9] Hadi, A., Asrori, & Rusman. (2021). Penelitian Kualitatif Studi Fenomenologi, Case Study, Grounded Theory, Etnografi, Biografi. CV.Pena Persada.
- [10] Sugiono.(2019).Metode Penelitiandan Pengembangan (R&D).Bandung:Penerbit Alfabeta
- [12] Fitriani, N. A. (2019). Analisis Nilai Tambah Pengelolaan Tahu di UMKM Tahu Sutra Miwa- Malang. Univeritas Jember.
- [13] Alvina, A., & Hamdani, D. (2019). Proses Pembuatan Tempe Tradisional. *Jurnal Pangan Halal*, 1(1),1/4.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

