



## Opportunities and Challenges in the Tempeh Industry: Strategies for Sustainability and Growth

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### Abstract

The tempeh business is one of the micro and small business sectors with great potential in Indonesia's economy. Tempeh, as a traditional Indonesian fermented soybean product, is increasingly popular both domestically and internationally due to its high nutritional value and affordable price. However, amidst changing times and increasingly tight market competition, many producers face challenges such as the rising price of imported soybeans, limited capital, and shifting consumer behavior driven by modern lifestyle trends. This article explores the opportunities and challenges of the tempeh business to ensure its sustainability and growth in the modern era. Based on recent news analysis, it was found that product innovation, including flavored variants and practical packaging, the use of digital technology for marketing, and improvements in production quality and hygiene, are key factors to maintain the sustainability of tempeh enterprises in Indonesia. Moreover, government support through training, access to affordable capital, and market access assistance also plays an important role in keeping the business competitive in both domestic and international markets. With these strategic steps, the tempeh business can continue to grow and become an important part of Indonesia's cultural and economic heritage.

**Keywords:** *Tempeh business, business opportunities, economic challenges, MSMEs, product innovation*

**Abstrak:** Bisnis tempe merupakan sektor usaha mikro dan kecil dengan potensi yang signifikan dalam perekonomian Indonesia. Tempe, produk kedelai fermentasi tradisional Indonesia, semakin populer di pasar domestik dan internasional karena nilai gizinya yang tinggi dan harganya yang terjangkau. Namun, di tengah perubahan zaman dan persaingan pasar yang semakin ketat, banyak produsen tempe menghadapi tantangan seperti kenaikan harga kedelai impor, keterbatasan modal, dan perubahan perilaku konsumen yang dipengaruhi oleh tren gaya hidup modern. Artikel ini mengkaji peluang dan tantangan bisnis tempe untuk memastikan keberlanjutan dan pertumbuhannya di era modern. Berdasarkan analisis berita terkini, ditemukan bahwa inovasi produk, seperti varian rasa dan kemasan praktis, penggunaan teknologi digital untuk pemasaran, serta peningkatan kualitas produksi dan kebersihan, merupakan faktor kunci dalam menjaga keberlanjutan bisnis tempe di Indonesia. Selain itu, dukungan pemerintah melalui pelatihan, akses modal yang terjangkau, dan bantuan akses pasar juga berperan penting dalam menjaga daya saing



bisnis tempe di pasar domestik dan internasional. Dengan langkah-langkah strategis tersebut, bisnis tempe dapat terus berkembang dan menjadi bagian penting dari warisan budaya dan ekonomi Indonesia.

**Kata Kunci** : *Bisnis tempe, peluang bisnis, tantangan ekonomi, UMKM, inovasi produk*

## **INTRODUCTION**

Tempeh is a traditional food product that holds a special place in Indonesian society. Made from fermented soybeans, tempeh is known not only for its high protein content and health benefits, but also for its cultural values deeply embedded in Indonesian daily life. Tempeh has become a symbol of local wisdom, simplicity, and creativity in processing food into nutritious, affordable meals. In many regions, tempeh production has even become the primary source of livelihood for many families, especially Micro, Small, and Medium Enterprises (MSMEs). (Sundari et al., 2025)

Despite tempeh's widespread popularity and relatively stable demand, tempeh producers face various challenges in maintaining their businesses. One major issue is dependence on imported soybeans, whose prices fluctuate and are difficult to predict. When soybean prices rise, production costs also increase, making it difficult for many producers to maintain stable selling prices without sacrificing quality. This situation has caused some small businesses to experience declining profits and even temporarily halt production. Furthermore, limited capital and access to modern technology also hinder the development of tempeh businesses. (Permana et al., 2024)

Another equally important challenge is changing consumer behavior and the dynamics of the modern market. In the era of globalization and digitalization, people increasingly prefer instant, hygienic, and attractively packaged food products. This requires tempeh entrepreneurs to innovate in product form, flavor, and marketing methods to remain relevant to today's market needs. Meanwhile, competition from other processed food products that employ modern marketing strategies also adds pressure on the sustainability of traditional tempeh businesses. (Naelis & Novindra, 2017)

However, despite these challenges, there are significant opportunities for tempeh producers to continue growing. Increasing public awareness of healthy eating and the growing trend toward plant-based foods have created new opportunities for tempeh to become better known as a superior local product with high nutritional value. The use of social media and digital platforms also provides opportunities for tempeh entrepreneurs to expand their market and introduce their products more widely, without geographical boundaries. Innovations such as modern packaging, flavor variations, and halal certification and product hygiene can provide added value that strengthen competitiveness in both national and international markets. (Najib & Zuhriyah, 2023)

In addition to internal factors from business actors, external support from the government and relevant institutions is also essential. Entrepreneurship training programs, capital assistance, and local product promotion can help tempeh entrepreneurs become more competitive. The government is expected to create a business ecosystem that supports the sustainability of tempeh production, both as a cultural heritage and as a strategic economic commodity. Thus, tempeh will become more than just a traditional food, but also an icon of national pride with the potential to penetrate the global market. (Imam et al., 2025) (Purnawan et al., 2024)

Based on this background, this article aims to explore in-depth the various opportunities and challenges faced by tempeh entrepreneurs in Indonesia. The analysis will focus on economic, social, and innovation aspects, which play a crucial role in maintaining the existence and driving the development of tempeh businesses amidst modernization and global competition. It is hoped that this discussion will provide new insights for readers and serve as a reference for developing more sustainable tempeh business strategies in the future. (Purnawan et al., 2024)

## **METHOD**

This research uses a descriptive qualitative approach with a case study method. This approach allows researchers to conduct an in-depth exploration of the dynamics of the tempeh business in factories or home industries, particularly regarding the business opportunities that can be exploited and the economic challenges faced by tempeh MSMEs. The case study was chosen to allow researchers to explore the details of the socio-economic context, production processes, and product innovation holistically.

The research location was a tempeh factory in Perbaungan sub-district, representing the variety of scales and models of tempeh businesses in Indonesia. The research subjects consisted of the factory owner and employees directly involved in the tempeh production process, as well as several customers and distributors, to gain a comprehensive perspective on the tempeh business value chain.

Data analysis was conducted qualitatively using thematic analysis techniques. Interview and observation data were coded to identify key themes related to business opportunities, economic challenges, product innovation, and strategies for survival and growth. Data triangulation was used to compare interview and observation results to enhance the validity of the findings. The analysis results are presented in a comprehensive narrative describing the state of the tempeh business and providing strategic recommendations.

This method allows for a holistic exploration of the complexities of the tempeh business from various perspectives, exploring product innovations relevant to modern market needs, and understanding the economic challenges

hindering the development of tempeh MSMEs. Thus, the research findings are expected to provide scientific and practical contributions to the development of strategies for tempeh businesses that exist and grow sustainably.

## **RESULTS AND DISCUSSION**

### **Opportunity Tempeh Business**

Opportunity business business tempeh owned by Mr. Dragon in the District Smelling show very promising prospects Because height request consumer to tempeh as a healthy , cheap , and easy source of vegetable protein accessible to all layer society . Tempeh has long been an important part of daily household consumption in Indonesia, so demand for this product is relatively stable and even increasing as public awareness of the importance of a nutritious diet increases. In the Perbaungan area, this consumption pattern is clearly visible in the high turnover of tempeh products in traditional markets, small stalls, school canteens, and even modern retail stores . (Masahid, 2016)

The main advantage of tempeh businesses in Perbaungan lies in the relatively small capital required but the ability to generate a fairly good profit margin. This aligns with the characteristics of home-based food businesses, which don't require significant investment in equipment or buildings, making them more accessible to the public as a business opportunity. Furthermore, tempeh offers flexibility in processing, allowing for various innovations such as braised tempeh, tempeh nuggets, tempeh chips, crispy tempeh, and even ready-to-eat tempeh-based products. This flexibility opens up more choices for consumers and expands market potential. (Soehardi et al., 2021)

Tempeh business own prospects bright Because material standard soya bean easy obtained and the production process relatively Simple . This is one reason why the home-based tempeh industry in Perbaungan District continues to grow year after year. Supported by public awareness of healthy food consumption and affordable prices, tempeh businesses have managed to survive amidst the onslaught of instant foods and other modern products . Business Soybean tempeh in Perbaungan is quite profitable, with a profit ratio of up to twice the initial investment. The analysis emphasizes the importance of stable raw material management, especially given the volatile price of soybeans. In addition to raw material management, business owners are also advised to implement hygienic fermentation technology and improve product quality to compete in a wider market. The tempeh business development strategy involves more varied product innovations, such as tempeh nuggets, various flavored tempeh chips, and ready-to-fry seasoned tempeh. This innovation is crucial for attracting a wider consumer segment, including the younger generation who are more interested in practical and modern products. Thus, the tempeh business opportunity in Perbaungan continues to grow and becomes increasingly competitive. (Muliadi et al., 2024)

## **Economic and Operational Challenges**

Despite its significant potential, Mr. Naga's tempeh business in Perbaungan District faces several economic challenges that could impact its sustainability. The primary challenge is the rising price of imported soybeans, the primary raw material for tempeh production. Dependence on imported soybeans is a significant problem because global soybean prices frequently fluctuate due to international market conditions, changes in producing countries' policies, and fluctuations in foreign exchange rates. Rising soybean prices can increase production costs by up to 19–20%, significantly reducing profit margins. When soybean prices rise, tempeh producers are forced to increase working capital or reduce production volume, both of which negatively impact revenue and business sustainability. In some cases, some small-scale producers have even been forced to temporarily close their businesses due to their inability to cover the rising production costs. (Mohd. Harisudin, R. Kunto Adi, 2021)

In addition to economic challenges, competition among tempeh producers in Perbaungan is also quite intense. The large number of local producers makes the market more competitive, requiring entrepreneurs to maintain product quality while maintaining affordable prices. Meanwhile, declining consumer purchasing power due to inflation also worsens sales conditions. From an operational perspective, the main challenge lies in the traditional fermentation process, which is still carried out manually and often lacks hygiene. This process is highly sensitive to temperature, humidity, environmental cleanliness, and yeast quality. If conditions are not ideal, tempeh can easily fail to ferment, leading to production losses. Obtaining halal quality yeast is one of the factors that hinders the productivity and quality of tempeh. Furthermore, production infrastructure, such as drying racks and fermentation rooms, is largely rudimentary and does not meet hygienic standards. Product distribution is also hampered by a long supply chain, particularly for sending tempeh to markets outside the sub-district. The lack of halal certification or other official permits can hinder tempeh sales in modern markets such as supermarkets. Seasonal labor issues also pose a challenge, as workers untrained in modern fermentation technology often lead to unstable production. Uncertain labor availability means the production system does not always run optimally. (Naelis & Novindra, 2017)

## **Product Innovation and Its Impact on Marketing**

In an effort to increase competitiveness, the tempeh business in Perbaungan District has experienced significant growth through various product innovations and improvements to production equipment. The implementation of modern production equipment, such as stainless steel soybean boilers and large-capacity soybean crackers, has been proven to

improve tempeh quality and double productivity compared to older, less hygienic methods. Packaging innovation also plays a crucial role. Packaging labels with nutritional information, expiration dates, PIRT permits, and halal certification add value to the product. This information not only increases consumer confidence but is also a key requirement for entering modern markets such as supermarkets and e-commerce platforms. Tempeh products with attractive and hygienic packaging have a greater opportunity to penetrate a wider market. (I Kadek Andre Dwiane et al., 2025)

use modern packaging has a big influence perception consumer to quality product . With Thus , the innovation carried out by Mr. Naga in Perbaungan potential increase mark sell , extend shelf life products , and open opportunity export small scale . Diversification products — such as fried tempeh in flour , chips tempeh spicy , peyek tempeh , and tempeh bacem — also makes it easier business enter new market segments , especially generation young people looking for snack healthy and nutritious . Products processed tempeh own Power save longer than tempeh raw , so that more easy marketed and distributed . Innovation This impact significant in marketing . Packaging attractive and quality well -maintained products increase loyalty customers , expanding network distribution , and increase sales volume . The use of social media and digital platforms such as WhatsApp, Facebook, and online marketplaces can introduce product to regional and overseas markets area . Turnover business tempeh can increased by 30–50% with implementation innovation products and digital marketing strategies, while income businessman increase up to 25%.. (Perdana et al., 2022)

### **Strategy for Facing Challenges And Exploits Opportunity**

Mr. Dragon's Factory in the District Smelling overcome challenge fluctuations price soya bean import with buy soya bean superior in a way routine in small volumes For guard stock local stable without depend on supply far , and sell equipment production simple like stainless steel boiler and breaker manual seeds to neighboring MSMEs For addition income daily . For reduce cost operational due to the fermentation process vulnerable traditional failed , factory apply protocol hygienic base like use of masks, gloves hands , and space fermentation closed simple to make tempeh No rotten for 36-48 hours, while train 5-10 workers local seasonal to stay efficient without need power expert from outside sub-district . This strategy minimize loans and pressure loss production up to 15-20% in the middle competition with 20-30 craftsmen tempeh Home in Perbaungan . ( Revita Sari & Randy Harmedia, 2022)

Mr. Dragon's Factory utilizes local market opportunities Smelling with develop 4-5 variants processed tempeh simple like fried tempeh in flour , chips tempeh spicy , tempeh braised and peyek tempeh for sale direct to stalls as well as morning markets in the sub-district , extending the shelf life up to 2

days without refrigerator big . Innovation packaging plastic simple with name tag factory and basic info nutrition increase trust buyer neighbors , open sale to 10-15 traders around as well as canteen school local , so that the daily volume increases by 20-30% from 200-300 kg of tempeh Raw . Marketing is conducted via WhatsApp groups for Perbaungan residents and banners along the main roads in the district to reach 500-1,000 regular consumers without the need for a national online platform. In addition to producing tempeh, Mr. Naga's factory also sells simple production equipment to neighboring MSMEs to supplement its income. This diversification strategy is quite effective in maintaining the business's financial stability, especially when soybean prices rise. To maintain production hygiene, the factory implements standard protocols such as the use of masks, gloves, and clean work tools. This has reduced the fermentation failure rate by up to 20%. The factory also trains seasonal workers and provides basic education on fermentation, ensuring consistent production quality despite frequent workforce changes.

### **Socio-Economic Impact of Tempeh Business**

Mr. Naga's tempeh factory in Perbaungan District is an example of a local food MSME that has managed to survive and thrive amid fluctuating raw material prices, intense competition among artisans, and the capital constraints common to home-based industries. With imported soybean prices fluctuating every few months, the factory has taken adaptive measures by prioritizing regular purchases of high-quality soybeans in small volumes. This decision is not without reason; large purchases are often risky when prices are high or when imported stocks are stuck at the port. Furthermore, the factory's limited storage capacity demands efficient inventory management. By purchasing soybeans three to four times a week from nearby local suppliers, Mr. Naga can maintain a stable stock without relying on more unpredictable long-distance supply chains . This small-scale purchasing strategy also helps the factory reduce storage costs and prevent raw material spoilage. High-quality soybeans purchased fresh make the soaking and boiling processes more efficient, minimizing the risk of contamination that could cause tempeh fermentation failure. Furthermore, the factory conducts regular manual inspections of the soybeans received. check the color, dryness level, and integrity of the seeds to ensure that incoming raw materials truly meet minimum production standards. This simple practice, while not technologically advanced, is quite effective in maintaining the consistent quality of factory-made tempeh. Amidst uncertain soybean prices, Mr. Naga's factory isn't just relying on raw tempeh production, but also sees an additional revenue opportunity by selling simple production equipment to neighboring MSMEs. This equipment includes small- to medium-sized stainless steel steamers, manual nut crackers, sieves, and food-grade plastic fermentation pans. Despite its simplicity, demand for this equipment is quite stable, as many

home-based tempeh producers in Perbaungan—around 20 to 30—need replacement equipment or want to increase their production capacity. Selling this equipment not only serves as a strategy for diversifying income but also strengthens local business networks. (Herry Nur Faisal & Hajar Prasekti, 2022)

In this aspect production, one of the challenges main for Lots craftsmen tempeh is a fermentation process that is susceptible failed. Fermentation tempeh need condition stable environment, especially in matter cleanliness, temperature, and circulation air. Mr. Dragon's factory overcomes problem This with apply protocol hygienic basic. Although facility factory No technological height, use of masks, gloves hands, aprons, and habit wash hand before enter room production become habit must for all over workers. Fermentation room made simple but closed, using shelves tiered from easy wood and stainless steel cleaned. Steps hygienic This proven can reduce level failure fermentation—which was previously can reach 30% in the season rain—to be only around 15–20%. Protocol this is also supported with consistent education to the workers Seasonal. Every 3–4 months, Father Dragon usually recruit 5 to 10 workers local For help the production process especially when request currently increases, as in the month of Ramadan, season holiday school, or when There is celebration big in society. The training provided covers method wash correct soybeans, techniques break seed without damage protein structure, determination time proper boiling, how to sprinkle tempeh yeast in a way evenly, up to the procedures compilation baking pan fermentation. With training base this, although power Work changes frequently, production quality stability is maintained and work efficiency can continue to increase over time. Meanwhile, Mr. Naga's factory isn't just focused on producing raw tempeh, but is also beginning to recognize the growing market demand for processed tempeh. This MSME has developed four to five simple processed product variants, such as fried tempeh with flour, sweet and spicy tempeh chips, ready-to-eat braised tempeh, tempeh crackers, and crispy balado tempeh. These products have a relatively long shelf life—about two days without extensive refrigeration. that suit local marketing conditions. This allows factories to reach more customers without worrying about product spoilage. This processed product is marketed through local distribution channels, including food stalls, morning market kiosks, and street vendors selling snacks in residential areas. Some product variants have even entered elementary and middle school cafeterias in Perbaungan. Collaborating with 10 to 15 street vendors has been shown to increase daily sales volume by 20–30%, with a total daily production of 200–300 kilograms of raw tempeh. This strategy allows the factory to generate additional income without requiring significant investments in packaging machinery or distribution vehicles.

## **Discussion of Findings in the Context of Theory and Literature**

Findings from Mr. Naga's tempeh factory in Perbaungan District indicate positive socioeconomic impacts, including dozens of local jobs, increased household incomes of up to millions of rupiah per month, and contributions to food security through nutritious tempeh production. Economically, a benefit-cost ratio above 1 confirms the business's feasibility, despite challenges faced by fluctuating soybean prices. Social impacts include reduced unemployment and empowerment of women and village youth.

This finding aligns with the microeconomic theory of small and medium enterprises (MSMEs) proposed by Schumacher in "Small is Beautiful," where locally based industries such as tempeh maximize endogenous resources to create a multiplier effect on income and employment. The theory emphasizes that small-scale enterprises have high efficiency in absorbing labor relative to capital, as seen in the R/C ratio  $>1$  in Perbaungan, which is similar to the study of the tempeh home industry in Oelami, where soybean raw materials have a significant positive effect on production (t-test 5.945  $>$  t-table 1.310). Development economics literature also supports that tempeh MSMEs contribute to income equality through local supply chains, reducing import dependence and increasing regional GDP. (Fitriyana et al., 2025)

From the perspective theory empowerment Freire's society , findings absorption power work and emergence businessman new around Mr. Naga's factory reflects the process of conscientization that builds awareness economy collective among public rural Perbaungan . This is consistent with literature that suggests tempeh plays a role in improving nutritional status, absorbing labor, and equalizing business opportunities, such as in Oelami Village, where the tempeh industry offers economic and social promise. Putnam's social capital theory adds that the economic turnover from this business strengthens communal networks, reduces structural poverty, and supports local food security.

Empirical literature, such as analyses of socioeconomic factors in household tempeh production, corroborates the finding that variables such as production costs and raw materials have a significant impact, although entrepreneur education sometimes negatively impacts production scale due to a preference for cheap labor. Similar studies in various regions of Indonesia demonstrate the holistic impact of tempeh MSMEs on improving living standards, optimizing village economic turnover, and preserving traditional food culture, all of which are directly relevant to the Perbaungan case. Overall, these findings enrich the literature with contextual evidence from North Sumatra.

### **Recommendations for Tempe Business Development**

To develop Mr. Naga's tempeh factory, modern production technologies such as mechanized packaging and drying are implemented to increase efficiency, reduce physical workload, and ensure tempeh quality

meets Indonesian National Standards (SNI) standards through ongoing hygiene training for workers. A participatory approach involving local communities in analyzing soybean raw material needs can stabilize supply and reduce price fluctuations, increasing daily production capacity by up to 50%, as in the case of Parerejo Tempeh Village. This increase also minimizes microbial contamination and extends the product's shelf life. (Laela Sari et al., 2025)

Do coaching source Power man through training technical , managerial , and marketing For businessman as well as workers , including private capital management with support government area like subsidy or KUR. This strategy addresses the weaknesses of weak human resources and limited capital, as recommended for the tempeh industry in Klaten and Palangka Raya, where improving human resource quality to maximize competitiveness is a top priority. Collaboration with banks and the government can provide strong capital for expansion .

Diversify products into processed tempeh products such as crispy fried tempeh, tempeh chips, or fermented tempeh with added nutritional value for regional market expansion, supported by digital marketing via e-commerce and social media to increase consumer loyalty. Maintain the taste and quality of raw materials to overcome competition, similar to the strategy in Montorna Village that uses SWOT analysis for product innovation. Build a marketing network to export markets or local supermarkets to increase sales volume.

Take advantage of government support through MSME development programs, such as improving production infrastructure and capital investment, and implementing environmentally friendly clean production for halal certification and BPOM approval. This recommendation aligns with studies in various regions that emphasize the government's role in fostering and optimizing the tempeh agro-industry. Monitor threats such as rising staple food prices with a holistic strategy for long-term business resilience. (Hermansyah et al., 2025)

## **CONCLUSIONS**

This study concludes that Mr. Naga's tempeh factory in Perbaungan District has promising business opportunities through stable demand for affordable vegetable protein, high profits with a ratio of two times the capital, and the potential for product innovation such as tempeh nuggets and chips that increase sales volume by 30-50% and revenue by 25% through hygienic packaging and local digital marketing. Despite facing economic challenges such as fluctuating imported soybean prices that increase production costs by 19-20%, operational constraints of traditional fermentation, and market competition, adaptation strategies such as regular raw material stocks, hygienic protocols, and diversification of processing have succeeded in

minimizing losses by 15-20% and expanding distribution to local stalls and schools.

The findings of positive socioeconomic impacts, including the absorption of dozens of local workers, increased household incomes of millions of rupiah per month, reduced unemployment, and improved community nutrition, align with Schumacher's theory of MSME efficiency and Freire's theory of empowerment, which is supported by empirical literature on  $R/C > 1$  and the multiplier effect of local supply chains in various regions of Indonesia. Innovations such as stainless steel tools and various flavors strengthen competitiveness, reflecting a proactive entrepreneurial orientation in the face of globalization.

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