

Marketing Trends on Tempeh-based Products between 2018 and 2025

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Abstract

Tempeh sales in Indonesia experienced significant fluctuations and decline from 2018 to 2024 driven by rising soybean prices and shifting youth preferences toward foreign cuisine. This trend negatively impacts MSME profitability and contradicts national food sovereignty missions known as Asta Cita. Consequently, this study aims to analyze market trends and the research landscape regarding tempeh derivatives and their marketing aspects. The study employed bibliometric analysis following PRISMA 2020 guidelines. Data were retrieved from Web of Science and Google Scholar databases resulting in a final dataset of 2,095 articles analyzed using VOSviewer software. The findings indicate that Indonesia is the leading contributor to scholarly output with IPB University as the dominant institution. Research themes are anchored on raw tempeh followed by tempeh chips and tempeh flour. SWOT Analysis is the most utilized marketing method with Price and Product Quality as the primary variables. The dominant market segments are plant-based meat followed by plant-based protein and healthy food. Geographically Malang alongside Semarang and Surabaya are identified as the primary productive regions. These insights provide an empirical foundation for MSMEs to develop product innovations targeting the plant-based meat and healthy food segments thereby supporting the green economy and national food sovereignty goals.

Keywords: Tempeh-based Products; Tempeh Marketing Trends; Bibliometric Analysis; PRISMA 2020.

1. Introduction

Indonesian [Central Bureau of Statistics, \(2025\)](#) reported fluctuating tempeh sales in Indonesia during the 2018–2024 period, with notable year-on-year declines: a 2.82% reduction between 2020 and 2021, followed by a more pronounced 4.09% decrease from 2023 to 2024. When evaluated against alternative protein sources during the same period, tempeh sales in West Java Province demonstrated competitive disadvantages: 2.3-fold lower than commercial chicken eggs, 3% of broiler chicken meat sales volume, and consistently trailing tofu sales within the legume product category by an average margin of 2% ([Central Bureau of Statistics, 2024](#)). [Hadi et al. \(2024\)](#) employed multiple forecasting methodologies (Naïve, Moving Average, Single Exponential Smoothing, and ARIMA) to analyze tempeh sales trends. Their results indicate: (1) large-format tempeh sales declined between periods 15-16 before stabilizing through period

26, (2) medium-format tempeh exhibited periodic fluctuations while maintaining stability around the mean value, and (3) aggregate profits for both product types during periods 15-26 reached IDR 142,399,816, yielding a mean periodic profit of IDR 11,866,651.

This downward trajectory reflects both rising soybean prices in domestic markets and decreased buying interest in tempeh and tempeh-based products, as evidenced by recent market studies ([Pribadi & Putri, 2022](#); [Ula & Regina, 2022](#); [Gunawan, 2024](#)). The soybean price increase is partially attributable to limited cultivation land availability compared to hydroponic systems (as an alternative agricultural business model) that can be implemented in urban settlements. This is particularly relevant with NFT (Nutrient Film Technique) systems capable of accelerating hydroponic growth cycles to 15-21 days ([Suryaningprang et al., 2021](#)). While upstream challenges (soybean price volatility affecting tempeh production costs) have seen mitigation through multiple interventions - including alternative legume substitution, optimization of fallow land, and Indonesian government subsidies - downstream issues concerning declining consumer preference for tempeh and its derivatives remain an active research focus among Indonesian scholars ([Caesaria & Kasih, 2022](#); [Maryam, 2022](#); [Pratama & Floresti, 2023](#); [The Business Research Company, 2025](#)).

The decline in tempeh consumption can be partially attributed to Indonesian youth's growing preference for foreign cuisine over traditional foods ([Khoiri, 2022](#)). From a market perspective, tempeh-based products demonstrate lower commercial viability compared to rice-based alternatives, such as rice packaging products, which benefit from established market segments due to rice's status as a daily staple food in Indonesia ([Firmansyah et al., 2021](#)). This finding contrasts with ([Febryan & Ali, 2024](#)) A study demonstrating the significant influence of green marketing on consumer purchase decisions suggests that marketing tempeh-based products as sustainable alternatives should represent a commercially viable strategy. This trend raises significant cultural concerns, as tempeh represents an important part of Indonesian culinary heritage and should ideally serve as a national symbol of cultural pride. Declining sales and consumer demand have significantly reduced profit margins for Micro, Small, and Medium Enterprises (MSMEs) in the food sector, particularly for tempeh producers. This trend contradicts two of the eight key missions (Asta Cita) of President Prabowo Subianto's administration, which explicitly prioritize MSME advancement and foster national self-reliance in food sovereignty through green economy principles as mandated in Presidential Regulation of the Republic of Indonesia Number 139 of 2024 Concerning the Structuring of Duties and Functions of the State Ministries of the Red and White Cabinet for the 2024-2029 Period ([Korniawan, 2024](#); [Suryaningprang, 2024](#); [Prasetyo et al., 2025](#)).

Given the aforementioned challenges, a comprehensive market remapping study of tempeh-based processed products since 2018 is imperative to establish an empirical foundation for developing targeted marketing strategies for MSME stakeholders. This research specifically aims to analyze market trends of tempeh derivatives over the 2018-2025 period. The practical implementation of research outcomes will support the development of evidence-based marketing frameworks to propose market segmentation for tempeh-based products in the future, and, further, for MSMEs in the tempeh processing sector, and, further, to foster a green economy, aligning with the Asta Cita initiative of the Indonesian President.

2. Literature Review

2.1 Tempeh

Tempeh is characterized as a widely consumed Indonesian fermented-cultured food product,

comprising tender-cooked soybeans or alternative substrates such as legumes, seeds, cereal grains, or coconut ([Shurtleff & Aoyagi, 2001](#); [Romulo & Surya, 2021](#)). These ingredients are cohesively bound by a dense, cotton-like mycelial network of *Rhizopus* mold, forming a solid, compact structure. Tempeh has been characterized by its distinctive flavor and texture, often likened to "Southern fried chicken," "savory veal cutlets," or "seafood fillets." Its appealing, mildly sweet aroma evokes descriptors such as "nutty," "cheese-like," "reminiscent of mushrooms," or "yeasty, akin to freshly baked bread." Tempeh was first documented in the Javanese manuscript *Serat Centhini* (1815) as "*kadhele tempe*" (soybean tempeh), recognized as a traditional Javanese staple ([Shurtleff & Aoyagi, 2020, 2022](#)). The earliest microbiological study on tempeh was conducted by Prinsen Geerligs in 1895, whose work - alongside complementary historical sources - suggests that tempeh originated from soybeans introduced through Chinese trade networks, combined with pre-existing Javanese tape (fermented cassava) yeast fermentation techniques ([Kubota et al., 1996](#); [Pitt & Hocking, 2022](#)). During the colonial era, tempeh was introduced to Europe, and following Indonesian independence, the initiation of systematic tempeh research by prominent institutions including LIPI (Indonesian Institute of Sciences), IPB University (Bogor Agricultural University), and Cornell University, and further, this scholarly attention culminated in tempeh's 2021 nomination for intangible cultural heritage status at the Indonesian Intangible Cultural Heritage Determination Session, though ultimately only tempe mendoan (one of tempeh-based product) received official recognition ([Kusumah et al., 2008](#); [Sudaryantiningih & Pambudi, 2017](#); [Andayani & Hambali, 2018](#); [Mutiah, 2021](#)).

[Farid et al. \(2025\)](#) describe the tempe production process from soybeans as beginning with manual sorting to remove damaged, moldy, or contaminated beans, along with foreign materials such as pebbles and small twigs. The selected beans are then soaked in clean water for 8–16 hours. Subsequently, the beans are steamed (or boiled) until they reach optimal tenderness, with temperature carefully controlled to prevent fungal growth during fermentation. The cooked and cooled beans are uniformly mixed with tempe starter culture containing *Rhizopus* mold spores, then wrapped in banana leaves, perforated plastic, or specialized paper, and allowed to ferment for 24–48 hours at ambient temperature (approximately 25–30°C). A comparative dry-weight analysis indicates that tempeh exhibits a markedly enhanced micronutrient and fiber profile compared to soybeans, highlighted by substantial increases per 100 grams in dietary fiber (3.7 g to 7.2 g), calcium (254 mg to 347 mg), and vitamin B12 (0.2 mcg to 3.9 mcg). Despite these functional shifts, core macronutrient concentrations remain highly conserved, with protein (46.2 g versus 46.5 g) and fat (19.1 g versus 19.7 g) demonstrating negligible variance between the two commodities ([Astuti et al., 2000](#); [Aryanta, 2023](#)).

Empirical research by [Pinasti et al. \(2020\)](#) revealed tempeh's substantial nutritional composition, particularly its rich iron content, folate levels, and cobalamin (vitamin B12) concentration, which collectively contribute to its anti-anemic properties. Recent research by [Teoh et al., 2024](#) has empirically validated tempeh's multifunctional health benefits, including: (1) anti-diabetic properties through glycemic regulation, (2) neuroprotective effects enhancing cognitive performance, (3) hypocholesterolemic action promoting cardiovascular health, (4) oncostatic activity with antitumor potential, (5) cellular senescence retardation exhibiting anti-aging effects, (6) blood pressure modulation via antihypertensive mechanisms, and (7) dual probiotic and psychobiotic actions improving gut microbiota and mental health. Despite its documented health benefits, tempeh has been scrutinized for its high isoflavone content. These phytoestrogenic compounds have been controversially associated with potential testosterone reduction in male consumers (M. Astuti et al., 2000; Dillingham et al., 2005).

However, recent evidence from [Reed et al. \(2021\)](#) contradicts these claims, demonstrating no significant physiological impact of soy-derived isoflavones on endocrine parameters. Their comprehensive meta-analysis revealed null effects across all measured outcomes, with sub-analyses of dosage duration and isoflavone concentration similarly showing no biologically relevant alterations.

While tempeh itself represents a processed soybean product, it serves as a base material for numerous secondary derivatives within Indonesian cuisine. Notable processed tempeh products include *tempe mendoan* (battered fried tempeh), *cireng tempe* (tempeh fritters), tempeh-based vegetable dishes, *peyek tempe* (tempeh crackers), *keripik tempe* (tempeh chips), *tempe bacem* (Javanese-style braised tempeh), tempeh nuggets, tempeh-chocolate blends, and *perkedel tempe* (tempeh patties) - with continuous innovation driven by culinary creativity ([Lestari et al., 2024](#); [Perdana et al., 2022](#)). For daily consumption, Indonesians predominantly prepare tempeh through shallow frying, making *tempe goreng* (fried tempeh) the most ubiquitous preparation method in household cooking ([Kristian, 2007](#)).



(a)



(b)



(c)

Figure 1. Tempeh: (a) Raw Tempeh; (b) Fried Tempeh; (c) *Tempe Mendoan*
Source: Farid et al. (2025), documented by Authors (2025).

2.2 Marketing

Marketing constitutes a dynamic socio-managerial process involving value creation through product development, distribution, promotion, and pricing strategies, facilitating mutually

beneficial exchange relationships with customers and stakeholders in evolving market environments ([Kotler & Keller, 2016](#); [Tjiptono & Diana, 2020](#)). Contemporary marketing theory rests on three foundational pillars: (1) consumer motivation factors (needs, wants, and demands), (2) strategic market approach (segmentation, targeting, and positioning), and (3) competitive dynamics. Market segmentation employs four key dimensions: geographic, demographic, psychographic, and behavioral characteristics, while effective targeting requires segments to meet five criteria: measurable size, substantial profitability, accessibility, differentiation potential, and actionable strategy. Positioning strategies may utilize attribute-based, usage-application, user-category, product-class, competitive, price-quality, or value-based approaches. [Porter \(1980\)](#) five forces analysis further evaluates market attractiveness through industry competition, new entrant threats, substitute availability, buyer power, and supplier influence.

In marketing theory, there is marketing mix concept that originated with [Borden \(1964\)](#) foundational work presented to the American Marketing Society, later crystallized into the seminal 4P framework (Product, Price, Place, Promotion) in 1960. Subsequent theoretical expansions include service marketing 7P model (adding People, Process, Physical Evidence), customer-centric 4C paradigm (Customer, Cost, Convenience, Communication), and digital-era adaptations like 4V model (Valued Customer, Value to Customer, Value to the Marketer, Value to Society) and 4E framework (Experience, Everywhere, Exchange, Evangelism) with later models recognized as complementary rather than substitutive to core 4P theory ([Booms & Bitner, 1981](#); [Lauterborn, 1990](#); [D. Perreault Jr. & McCarthy, 2002](#); [Londhe, 2014](#); [Epuran et al., 2015](#)). From a media typology perspective, marketing strategies can be fundamentally categorized into two distinct paradigms: traditional/conventional marketing and digital marketing. Modern marketing research has progressively bifurcated into behavioral science paradigms (examining marketing mix, service quality, consumer decision pathways, etc.) and brand-centric inquiries (brand image, brand personality, brand loyalty, etc.) ([Prasetyo & Akbar, 2025](#); [Prasetyo & Ali, 2025](#)).

3. Research Method

This study employs bibliometric analysis supplemented by in-depth examination to establish appropriate marketing frameworks for tempeh-based products. Bibliometric analysis constitutes a quantitative methodology that examines bibliographic data to delineate emerging patterns, trends, and conceptual relationships within scientific literature ([Irawan, Elvina, et al., 2025](#); [Irawan, Nuradina, et al., 2025](#)). Although still within the literature review category, this method differs from Systematic Literature Review (SLR), which represents a methodologically stringent approach encompassing the systematic identification, critical appraisal, and synthesis of extant scholarly works ([Alamsyah et al., 2024](#); [Prasetyo & Rahayu, 2025](#)).

Following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analysis) 2020 guidelines, the review process utilizes Web of Science and Google Scholar databases to examine publications from January 2018 to June 2025 (a 7+ year timeframe), employing some keyword combinations in English and Indonesian such as “tempeh marketing,” “tempeh-based products,” “pemasaran tempe,” “produk olahan tempe,” “tempe marketing,” and “tempe-based products.” The January 2018 starting point was selected to align with the base year of Indonesian Central Bureau of Statistics (BPS) tempeh sales records (2018-2024), enabling asynchronous comparative analysis between this study's findings and official statistical data. June 2025 was designated as the cutoff date because the research was conducted during this

period, preceding subsequent publications on tempeh-based products and their marketing implications. For database selection, Web of Science was prioritized for its established credibility and comprehensive metadata. Google Scholar was also used to identify locally relevant studies, given tempeh's status as an Indonesian cultural staple. This dual approach incorporated accredited national journals (e.g., Garuda and SINTA-indexed publications) to ensure thorough representation of domestic research on tempeh product marketing. The synthesis of these databases provides both methodological robustness and contextual completeness for analyzing tempeh's commercial landscape.

Table 2. Articles Database

Keywords String	Web of Science	Google Scholar
tempeh marketing*	18	8.300
tempeh-based products*	3	249
pemasaran tempe*	0	13.700
produk olahan tempe*	0	12.800
Tempe marketing*	1.234	17.000
Tempe-based products*	42.217	212
Total	43.472	52.261

Note: The asterisk symbol (*) at the end of every second word is used to ensure that the different diction variations across articles are captured.

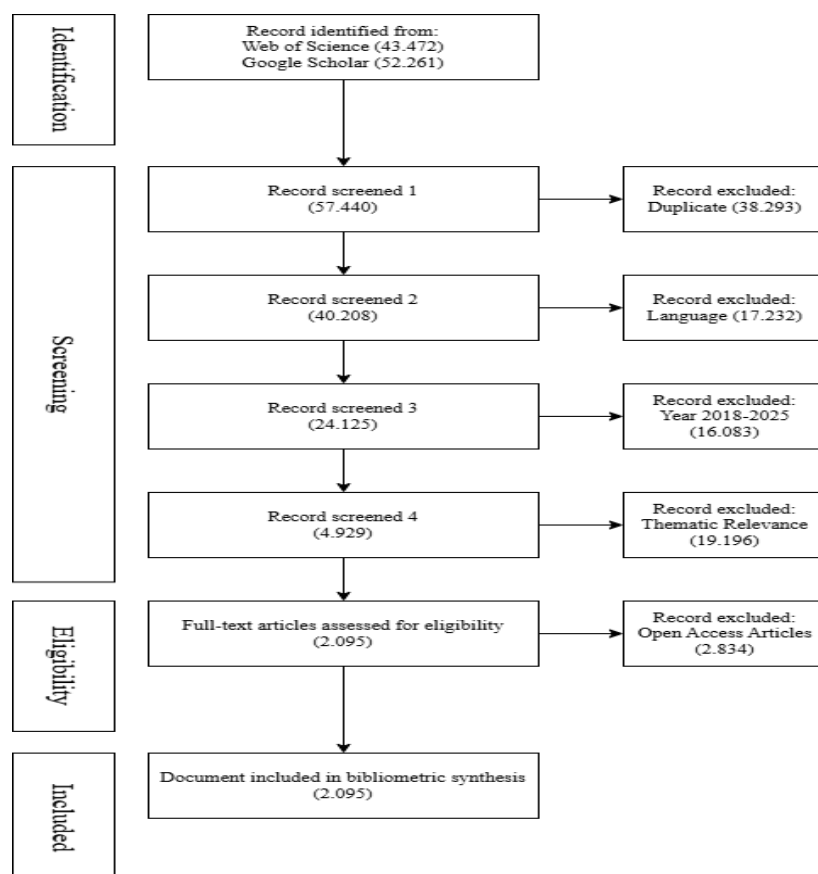


Figure 2. Data retrieval and selection of articles

The screening process illustrated in Figure 2 yields a final selection of 2.095 articles, confirming

the study's methodological thoroughness and representative scope ([Haddaway et al., 2022](#)). The screening process was conducted based on the following criteria: file duplication, language availability (English and Indonesian), publication year (2018-2025), thematic relevance to the research objectives, and open-access availability. The research consequently centers on examining scholarly works addressing market trends and comprehensive marketing strategies for tempeh-based products. The research employed Microsoft Excel for primary data cleansing and processing operations, while network visualization analysis was conducted using VosViewer software.

4. Findings and Discussions

4.1 Number of Publications of Marketing on Tempeh-based Products between 2018-2025

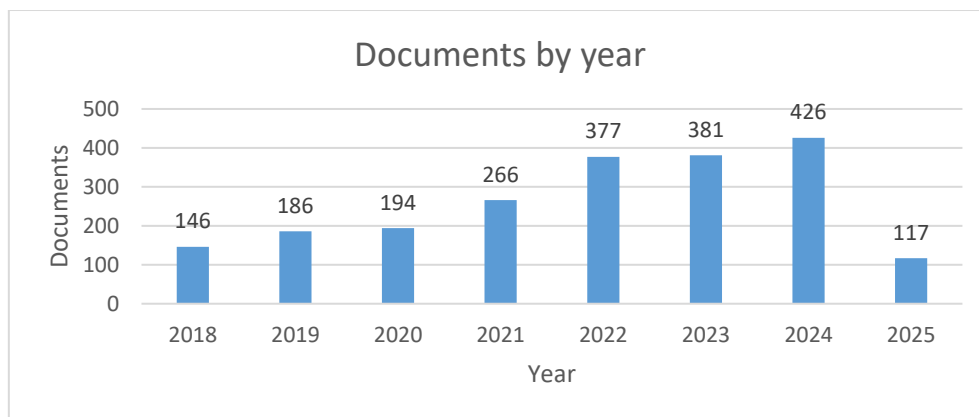


Figure 3. Publications quantity (year to year)

Source: data processed by Authors (2025).

As illustrated in Figure 3, research output examining tempeh and tempeh-based products and their marketing implications has demonstrated consistent annual growth. The publication count rose from 146 studies in 2018 to 426 in 2024, with 117 additional studies recorded between January and June 2025. This upward trajectory suggests that scholarly interest in this field will likely continue expanding through the end of 2025 and potentially beyond.

4.2 Distribution Across Global Regions of Marketing on Tempeh-based Products between 2018-2025

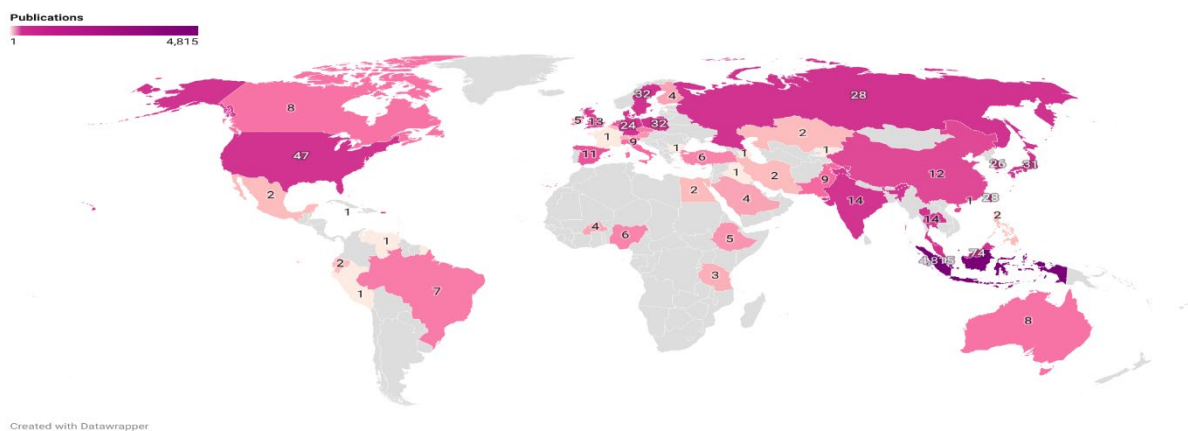


Figure 4. Map of countries contributing to this research

Source: data processed by Authors (2025).

Table 2. Ranking of countries contributing to this research.

Country	Quantity
Indonesia	4.815
Malaysia	74
United States of America	47
Poland	32
Sweden	32
Japan	31
Russia	28
Taiwan	28
South Korea	26
Germany	24
Denmark	16
India	14
Thailand	14
United Kingdom	13
China	12
Netherlands	11
Spain	11
Italy	9
Pakistan	9
Singapore	9
Australia	8
Canada	8
Brazil	7
Czechia	7
Nigeria	6
Turkey	6
Austria	5
Ethiopia	5
Ireland	5
Burkina Faso	4
Finland	4
Saudi Arabia	4
Belgium	3
Puerto Rico	3
Switzerland	3
Tanzania	3
Ecuador, Egypt, Iran, Kazakhstan, Mexico, Philippines,	2
Azerbaijan, Venezuela, Bulgariam France, Hong Kong, Iraq, Jamaica, Kyrgyzstan, Palestine, Peru	1

Source: data processed by the authors (2025).

As illustrated in Figures 4 and Table 2, Indonesia dominates scholarly output on tempeh-based

products and their marketing implications, with 4,815 studies published between January 2018 and June 2025. This predominance aligns with tempeh's status as a traditional Indonesian staple. Malaysia ranks as the second most prolific contributor (74 studies) which reflects its close geographical and cultural ties to Indonesia in exploring tempeh. Interestingly, the United States holds the third position (47 studies) where the research focus is primarily directed toward green marketing and the consumer behavior of legume-derived goods including tempeh-based products. This trend is presumably linked to the fact that in 2018 Indonesia relied heavily on the United States for its raw material supply, importing approximately 89% of the soybeans required for tempeh production from the country (Susilowati & Kirana, 2018). Poland and Sweden (32 studies each) follow by largely investigating the potential of plant-based meat alternatives, specifically tempeh and its derivatives. The significant output from Japan (31 studies) is primarily attributed to longstanding collaborative frameworks involving Japanese universities and food industries along with Indonesian academic institutions, particularly IPB University, in the field of tempeh-based product development. In the fifth tier, Russia and Taiwan (28 studies each) exhibit distinct research priorities. Russian studies emphasize the health benefits of plant-derived diets, including tempeh, while Taiwanese research is more grounded in agricultural technology related to tempeh-based products. Further contributions are observed from South Korea (26 studies) and Germany (24 studies) that focus on functional health properties and meat analogues, respectively, with a specific interest in tempeh. Denmark (16 studies) similarly concentrates on the meat-substitute sector, including tempeh and tempeh-based products. Meanwhile, India and Thailand (14 studies each) prioritize agricultural perspectives and the cultivation of tempeh-based raw materials. The remaining scholarly landscape includes the United Kingdom (13 studies), China (12 studies), and the Netherlands and Spain (11 studies each) which all contribute to the global discourse on tempeh. Other nations contributing fewer than ten publications generally explore specific niches in the marketing and food science of tempeh-based products.

4.3 Leading Authors in Marketing on Tempeh-based Products between 2018-2025



Figure 5. The most contributing authors to this research

Source: data processed by Authors (2025).

Figure 5 reveals the 15 most prolific contributors to tempeh marketing and tempeh-based product research from January 2018 to June 2025, comprising 14 Indonesian researchers and one Japanese scholar (Eiichiro Fukusaki). The scholarly landscape is led by Made Astawan, who has authored 17 studies, establishing a significant benchmark in this field. This is followed by a group of prominent researchers including Maria Erna Kustyawati and Tutik Wresdiyati, who have contributed 9 studies each. Furthermore, the research output is bolstered by Diana Nur Afifah, Sastia Prama Putri, and Samsul Rizal, with each scholar credited for 8 studies. The contribution of Eiichiro Fukusaki is also notable with 7 studies. Finally, a collective of researchers, namely Tati Barus, Siti Harnina Bintari, Hardinsyah, Diana Lo, Reggie Surya, Antonius Suwanto, Andika Wisnujati, and Ferriawan Yudhanto, have each produced 6 studies, further diversifying the academic discourse on this subject.

The leading position of Prof. Dr. Ir. Made Astawan, M.S. (17 studies) as a professor at IPB University in the fields of Food, Nutrition, and Health is highly anticipated ([Admin AlumniIPBPedia, 2022](#)). His academic career is marked by significant advocacy for tempeh, including the 2017 proposal to recognize it as a UNESCO Intangible Cultural Heritage. His research frequently involves strategic partnerships with Dr. Sastia Prama Putri, S.Si., M.Eng. (8 studies) from the Bandung Institute of Technology and Prof. Eiichiro Fukusaki, B.Eng., M.Eng., Ph.D. (7 studies) from Osaka University ([Admin AlumniIPBPedia, 2022](#)). These collaborations have established them among the top fifteen most prolific scholars investigating tempeh and tempeh-based products from 2018 to 2025. Within IPB University, Prof. Dr. Ir. Made Astawan, M.S. actively collaborates with other senior faculty members such as Prof. drh. Tutik Wresdiyati, Ph.D. (9 studies), Prof. Dr. Ir. Hardinsyah, M.S. (6 studies), and Prof. Dr. Ir. Antonius Suwanto, M.Sc. (6 studies).

4.4 Leading Affiliates in Marketing on Tempeh-based Products between 2018-2025

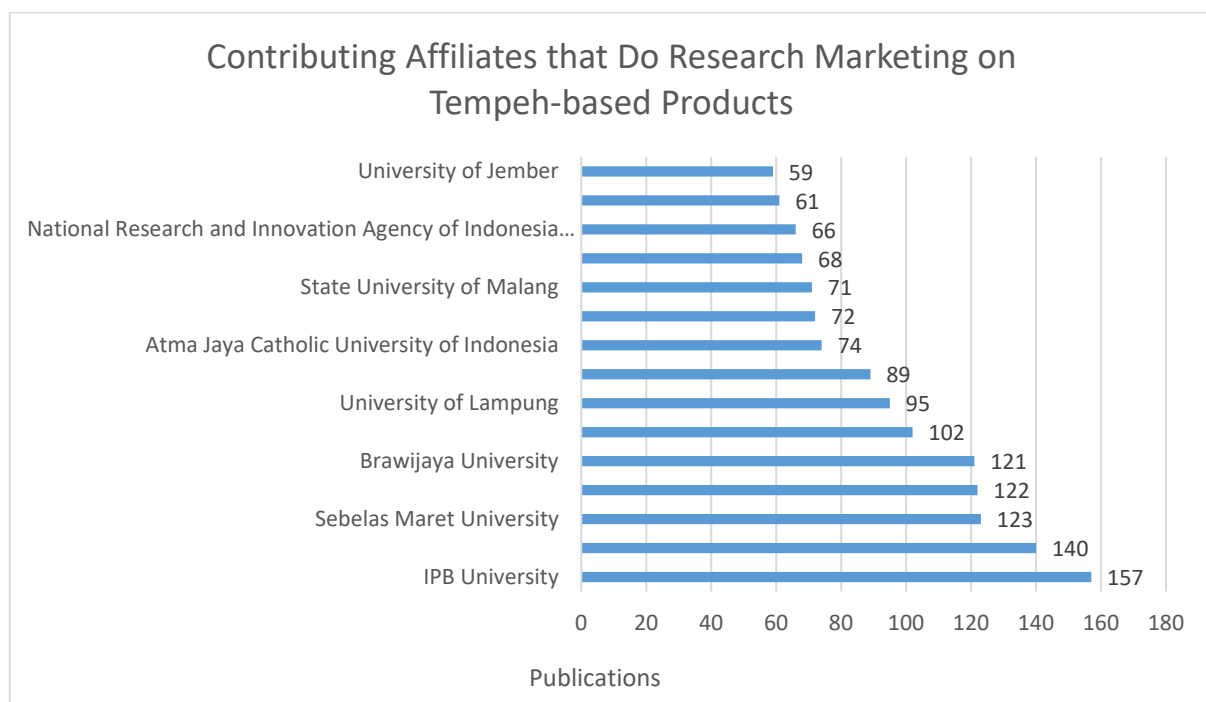


Figure 6. The most contributing affiliations to this research
Source: data processed by Authors (2025).

Based on the data presented in Figure 6, it is evident that the fifteen leading affiliations involved in the study of tempeh and tempeh-based products particularly regarding marketing aspects are entirely situated in Indonesia. This trend is considered highly reasonable because tempeh represents a traditional Indonesian food that is currently being advocated for recognition as a UNESCO Intangible Cultural Heritage. Among these top fifteen organizations, fourteen are academic institutions, including universities, institutes, and polytechnics. The remaining entity positioned at the thirteenth rank is the National Research and Innovation Agency of Indonesia which is the official governmental body for research under the Republic of Indonesia. IPB University holds the first position with 157 publications. This outcome is consistent with the previously mentioned findings in Figure 5, which highlighted a high concentration of individual researchers from IPB University specializing in tempeh. A notable discovery in this analysis involves Gadjah Mada University and Sebelas Maret University which occupy the second and third positions with 140 and 123 publications respectively. It is particularly interesting to note that neither of these two universities has a single individual researcher represented in the top fifteen list from Figure 5. This indicates that the research landscape for tempeh at Gadjah Mada University and Sebelas Maret University is exceptionally divergent and balanced. Such a pattern suggests that the production of knowledge on tempeh-based products at these institutions is distributed across a wide array of scholars rather than being centered on a few dominant figures.

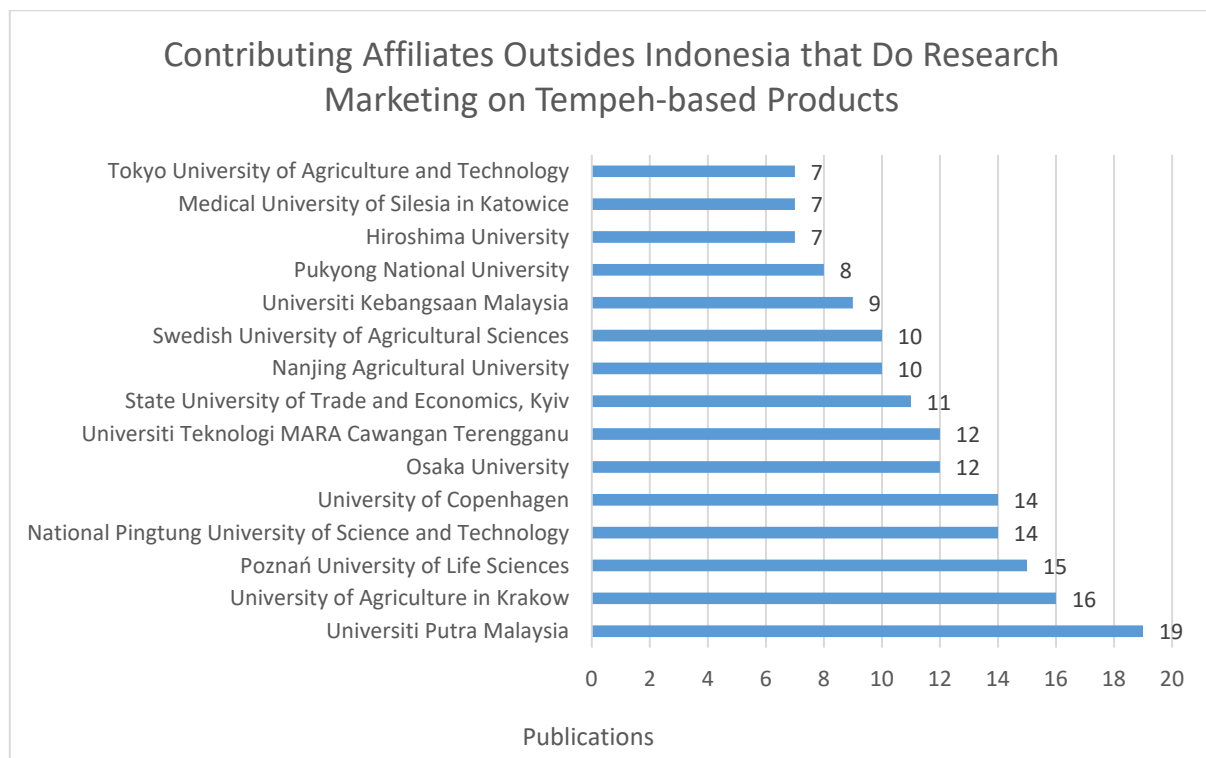


Figure 7. The most contributing affiliations outside Indonesia to this research

Source: data processed by Authors (2025).

According to the data illustrated in Figure 7, the fifteen leading international affiliations investigating tempeh and tempeh-based products alongside their marketing dimensions can be categorized into three primary geographical clusters. The first cluster comprises Southeast

Asian institutions, specifically from Malaysia, which includes Universiti Putra Malaysia (19 publications), Universiti Teknologi MARA Terengganu Branch (12 publications), and the National University of Malaysia (9 publications). This significant contribution is highly anticipated, given that Malaysia ranks second globally in tempeh-based product research. The second group is represented by East Asian affiliations. This cluster is led by the National Pingtung University of Science and Technology in Taiwan (14 publications), followed by a strong Japanese presence, including Osaka University (12 publications), Hiroshima University (7 publications), and the Tokyo University of Agriculture and Technology (7 publications). Additionally, notable outputs are observed from Nanjing Agricultural University in China (10 publications) and Pukyong National University in South Korea (8 publications).

The final cluster involves European academic institutions with a strong emphasis on food science and agriculture. Poland emerges as a major contributor within this region through the University of Agriculture in Krakow (16 publications), the Poznan University of Life Sciences (15 publications), and the Medical University of Silesia in Katowice (7 publications). Furthermore, other significant European contributions are identified from the University of Copenhagen in Denmark (14 publications), the State University of Trade and Economics in Kyiv, Ukraine (11 publications), and the Swedish University of Agricultural Sciences in Sweden (10 publications). A particularly striking finding in this analysis is that although the United States ranks as the third most productive nation in this research domain, not a single American affiliation appears among the top fifteen institutions, as shown in Table 1. This phenomenon suggests that the scholarly output concerning tempeh and tempeh-based products, along with their marketing strategies within the United States, is exceptionally decentralized. Rather than being concentrated within a few dominant organizations, the research initiatives are distributed evenly across a diverse range of affiliations throughout the country.

4.5 Network Analysis and Conceptual Structure of Marketing on Tempeh-based Products between 2018-2025

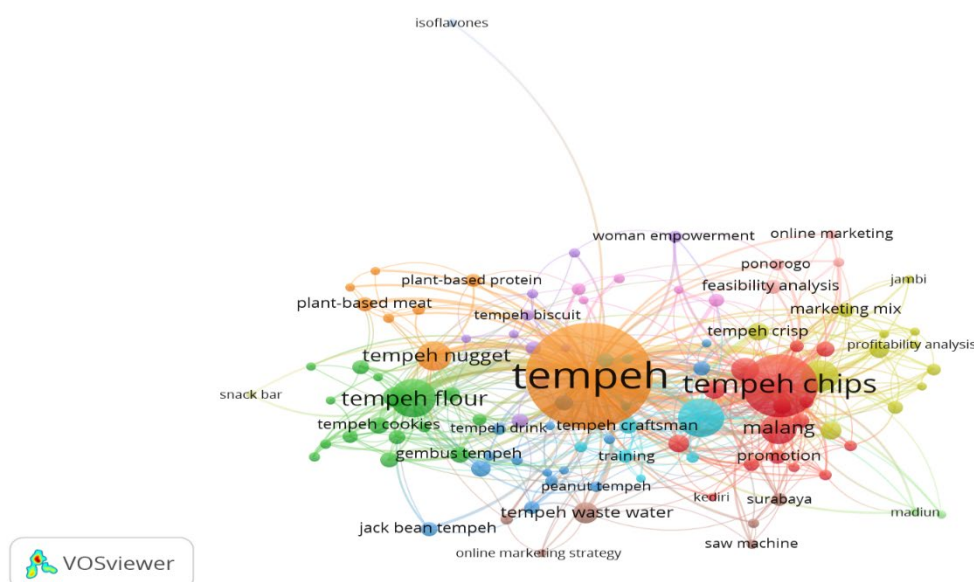


Figure 8. Bibliographic mapping by the co-occurrence of keywords.

Source: data processed by the authors (2025).

The bibliographic mapping results show ten colors (orange, red, green, purple, pink, blue, light

blue, brown, and yellow), which the standard threshold of 10 colors ([Van Eck & Waltman, 2010](#)). This indicates that studies related to this research are at an optimal threshold, confirming the topic's importance without being over-researched. As illustrated in Figure 8, the study maintains a tightly focused scope on tempeh without thematic divergence, demonstrating methodological rigor in research quality. Figure 8 illustrates the centrality of 'tempeh' within the research landscape, depicted as the largest node anchoring the network. This configuration confirms its role as the foundational subject of studies conducted between 2018 and 2025. The visualization further categorizes the field into distinct product derivatives and economic actors. Various processed forms are highlighted by specific clusters: orange correlates with tempeh nuggets and market segmentation; red represents tempeh chips; green signifies tempeh flour as an innovative intermediate ingredient; purple denotes tempeh biscuits; blue focuses on jack-bean tempeh as a non-soy alternative; and brown identifies tempeh wastewater as a distinct processed product. In terms of the economic ecosystem, the pink node targets the "healthy food" market segment, while the light blue and yellow clusters designate MSMEs and home industries, respectively, as the primary entities responsible for manufacturing and marketing these tempeh-based commodities.

4.6 Tempeh-based Product Innovations between 2018-2025

Table 3. Ranking of tempeh-based product innovations between 2018-2025.

No.	Tempeh-based Product	Quantity
1	Tempeh	768
2	Tempeh Chips	295
3	Tempeh Flour	116
4	Tempeh Nugget	62
5	Tempeh Wastewater	35
6	Tempeh Ice Cream	30
7	Tempeh Crisp	25
8	Tempeh Chocolate	22
9	Gembus Tempeh	21
10	Red-bean Tempeh	21
11	Tempeh Cookies	21
12	Tempeh Inoculum	21
13	Tempeh Sausage	18
14	Kelor-leaf-soybean Tempeh	17
15	Sago Tempeh Chips	17
16	Tempeh Milk	16
17	Jack-bean Tempeh	15
18	Koro-bean Tempeh	15
19	Black-bean Tempeh	13
20	Tempeh Biscuit	11
21	Tempeh Brownies	11
22	Peanut Tempeh	10
23	Tempeh Drink	10
24	Tempeh Meatball	8
25	Tempeh Protein-Energy Bar	8
26	Tempeh Yoghurt	8
27	Leaf-covered Tempeh	7

No.	Tempeh-based Product	Quantity
28	Probiotic Tempeh	7
29	Sword-bean Tempeh	7
30	Tempeh Powder Drink	7
31	Tempeh Stick	7
32	Tempeh-based Noodle	7
33	Corn Tempeh	6
34	Legume-bean Tempeh	6
35	Organic Tempeh	6
36	Soy Protein Isolate Tempeh	6
37	Tempeh Extract	6
38	Tempeh Yeast	6
39	Vitamin B12-rich Tempeh	6
40	Benguk Tempeh	5
41	Lamtoro Tempeh	5
42	Overfermented Tempeh	5
43	Rubber-seed Tempeh	5
44	Tempeh Cracker	5
45	Tempeh Fritters	5
46	Velvet-bean Tempeh	5
47	Cassava Tempeh	4
48	Cowpea Tempeh	4
49	Edamame Tempeh	4
50	Non-GMO Tempeh	4
51	Overripe Tempeh	4
52	Pumpkin-seed Tempeh	4
53	Sorgum-seed Tempeh	4
54	Spiced Tempeh	4
55	Tempeh Burger	4
56	Tempeh Jadah	4
57	Tempeh Paste	4
58	Tempeh Tortilla	4
59	Tempeh-based Porridge	4
60	Faba-bean Tempeh	3
61	Green-bean Tempeh	3
62	Gude-bean Tempeh	3
63	Lupin Tempeh	3
64	Mini Tempeh	3
65	Mix-grain Tempeh	3
66	Mix-grain Tempeh Flour	3
67	Moringa-seed Tempeh	3
68	Nutrient-enhanced Tempeh	3
69	Rice bran-based Tempeh	3
70	Tempeh Mosaccha	3
71	Tempeh Oncom	3
72	Tempeh Patty	3
73	Tempeh Pudding	3

No.	Tempeh-based Product	Quantity
74	Tempeh Rendang	3
75	Tempeh Steak	3
76	Tempeh-based Nata de Soya	3
77	Yellow-soybean Tempeh	3
	Bungkil Tempeh, Wan Tempeh, Cacao-soybean Tempeh, haracter-Illustrated Tempeh, Dried Tempeh, Durian-seed Tempeh, Flaxseed Oil-cake Tempeh, Fried Tempeh, Lotus-seed Tempeh, Mallika-black-soybean Tempeh, Pasteurized Tempeh, Red-algae-based Tempeh, Red-bean Tempeh Flour, Red-kidney-bean Tempeh, Scent-enhanced Tempeh, Senegalia-erythrocalyx-seeds Tempeh, Spelt-wheat Tempeh, Steamed Tempeh, Sunflower-seed Tempeh, Tempeh Dim Sum, Tempeh Floss, Tempeh Gelato, Tempeh Hydrolysate, Tempeh Perkedel, Tempeh Powder, Tempeh Sacha Inchi, Tempeh-based Frozen Food, Tempeh-based Soy Sauce, Tempeh-based Supplement, Tempeh-based White Bread, Wan Tempeh	2
78	Acidic Lotus-seed Tempeh, Adzuki-bean Tempeh, African-yam-bean Tempeh, Algae-based Tempeh, Almond-bean Tempeh, Amaranthaceae-bean Tempeh, Angkak Tempeh, Anjasromo Soybean Tempeh, Antioxidant-rich Tempeh, Banan-leaf-covered Tempeh, Bongkreng Tempeh, Brown-eye Tempeh, B-Star (Banana and Tempeh Nastar), Butterfly-pea-flower-petals Tempeh, Chicken Roll Tempeh, Chickpea Tempeh, Dried-peeled-soybean Tempeh, Edamame Tempeh Flour, Fabeaceae-bean Tempeh, Gramineas-bean Tempeh, Groundnut-based Tempeh, High-moisture-textured Tempeh, Indian-bean Tempeh, Kecambah-bean Tempeh, Kedawung-seed Tempeh, Kelakai Tempeh, Klabet-seed Tempeh, Kratok Tempeh, Lawi-lawi Bread based Tempeh, Lebui-bean Tempeh, Menjes Tempeh, Mete-bean Tempeh, Micro Tempeh, Mlanding-bean Tempeh, Mungur-seed Tempeh, Nangka-seed Tempeh, Oat-seed Tempeh, Peptides Tempeh, Pigeon Pea Tempeh, Rejuvenated Tempeh, Saccharomyces-modified Tempeh Saga-seed Tempeh, Sago Tempeh Flour, Semangit Tempeh, Soaking Tempeh, Soybean-cake Tempeh, Tempeh Bagong Tempeh Basiah, Tempeh Coffee, Tempeh Eggroll, Tempeh Galantine, Tempeh Gufron, Tempeh Hygiene, Tempeh Juice, Tempeh Keluwak, Tempeh Liquid Broth Tempeh Lupis Cake, Tempeh Matcha Cake, Tempeh Nagaton, Tempeh Oil, Tempeh Oyster, Tempeh Pentol, Tempeh Quiche, Tempeh Rainbrow, Tempeh Raos, Tempeh Rapeseed Cake, Tempeh Sorbet, Tempeh Starter, Tempeh Surabi, Tempeh Tartlet Tempeh Weduk, Tempeh-based Artificial Meat, Tempeh-based Bioethanol, Tempeh-based Cheese Stick, Tempeh-based Chicken, Sempol, Tempeh-based Dendeng, Tempeh-based Dragon Fruit, Tempeh-based Emergency Food, Tempeh-based Enteral Nutrition,	1
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No.	Tempeh-based Product	Quantity
	Tempeh-based Gepuk, Tempeh-based Gluten-free Paste, Tempeh-based Modisco III, Tempeh-based Sports Drink, Tempeh-based Taco, Tolo Tempeh, Trembesi-seed Tempeh, Tunggak-bean Tempeh, Turis-bean Tempeh, Waru-leaf Tempeh, White-bean Tempeh, White-jack-bean Tempeh	

Source: data processed by Authors (2025).

Table 3 indicates that tempeh remains the preeminent research subject, likely due to its processing simplicity and versatility as a fundamental base for various end products ([Farid et al., 2025](#)). Among processed derivatives, tempeh chips characterized by SNI 2602:2018 as crispy, thin-sliced soybean cakes prepared via frying or drying, dominated scholarly attention from 2018 to 2025 (Indonesian National Standard 2602:2018). Tempeh flour emerged as the second most studied derivative. Produced through specific drying techniques, this ingredient is utilized to substitute wheat flour, thereby enhancing the protein profile of the final goods ([Astuti & Sulistiani, 2025](#); [Yudhistira & Nugraheni, 2024](#)). Consequently, the application of tempeh flour facilitates the development of diverse value-added products, including nuggets, noodles, and ice cream ([Alaydrus, 2022](#); [Maryam, 2022](#); [Novida et al., 2024](#)).

4.7 Marketing Methodologies and Variables for Tempeh-Based Products between 2018-2025

Table 4. Ranking of marketing methodologies and variables for tempeh-based products between 2018-2025.

No.	Marketing Strategy/Variable	Quantity
1	SWOT Analysis	111
2	Price (Marketing Mix)	53
3	Product Quality	52
4	Promotion (Marketing Mix)	51
5	Place (Marketing Mix)	35
6	Product (Marketing Mix)	32
7	Social Media Marketing	29
8	Feasibility Analysis	25
9	Purchase Decision	24
10	Islamic Economic Perspective	23
11	Packaging (Marketing Mix)	19
12	Supply Chain Analysis	19
13	Cost of Goods Sold	18
14	Online Marketing	18
15	Household Perception	16
16	Product Development	14
17	Productivity Enhancement	14
18	Women's Empowerment	13
19	Tempeh Demand	12
20	Syariah Marketing	11
21	Tempeh Buying Interest	11
22	Analytical Hierarchy Process	10
23	Customer Satisfaction	10

No.	Marketing Strategy/Variable	Quantity
24	Innovation Capacity	10
25	Community Empowerment	9
26	Halal Label	9
27	Consumer Preferences	8
28	Marketing Channel Analysis	8
29	People (Marketing Mix)	8
30	Physical Evidence (Marketing Mix)	8
31	Process (Marketing Mix)	8
32	Profitability Analysis	8
33	Value Chain Analysis	8
34	Business Plan	7
35	Consumer Perception	7
36	Green Marketing	7
37	Brand Image	6
38	Consumer Loyalty	6
39	Marketing Efficiency Analysis	6
40	Full Costing Method	5
41	Fuzzy FMEA	5
42	Instagram Marketing	5
43	Marketing Performance	5
44	Service Quality	5
45	Six Sigma Method	5
46	Value Added Analysis	5
47	Word of Mouth	5
48	Business Model Canvas	4
49	Cognitive Enhancement by Presentation	4
50	Customer Loyalty	4
51	Customer Relationship Management	4
52	Food Security	4
53	Islamic Student Empowerment	4
54	Seven Tools Method	4
55	Target Costing	4
56	WhatsApp Marketing	4
57	Biopreneurship	3
58	Contract Marketing	3
59	Cost Analysis	3
60	Cost Production Analysis	3
61	Design Expert Method	3
62	Economic Order Quantity	3
63	Entrepreneurial Marketing	3
64	Facebook Marketing	3
65	Islamic Business Perspective	3
66	Margin Analysis	3
67	Marketing Risk Management	3
68	Mobile Marketing	3
69	Simplex Method	3

No.	Marketing Strategy/Variable	Quantity
70	Statistical Quality Control (SQC) Method	3
71	Consumer Behavior, Consumer Motivation, Consumer Motivation, Consumer Satisfaction, Consumption Behavior, Cost Efficiency, Cost Structure Analysis, Data Envelopment Analysis, Differential Cost, Effect Analysis, E-Marketing, Farmer Empowerment, Financial Performance, Healthy Lifestyle, Human Resources Management, Interest Marketing, Kaizen Costing, Kansei Engineering, Life Cycle Assessment, Marketing Communication Strategy, Negotiation Strategy, Supply Chain Operation Reference (SCOR) Model, Visual Element Analysis	2
72-93	Activation Analysis, Adaptation Strategy, Adaptation Strategy, Archetype System Modelling, Balanced Scorecard, Bioeconomy, Boston Consulting Group, Branch and Bound Method, Bruce Archer, Business Capacity, Collaborative Networking, Competitive Advantage, Consumer Acceptance, Consumer Characteristic, Consumer Acceptance, Consumer Evaluation Criteria, Consumers' Willingness to Pay Tempeh, Cooperative Service, Corporate Social Responsibility, Cost Behavior Analysis, Creative Economy, Customer Behavior, E-Commerce Application, Email Marketing, Employee Performance, Equation Theory Analysis	
94-166	Fish Bone Diagram, Food Safety, Fuzzy FTA, Green Productivity Analysis, Green Quality Function Deployment II, Health Belief Model, Healthy Eat Lifestyle, Human Resources Empowerment, Information Technology-based Marketing, Interpretive Structural Modeling, Kano Model, Marketing Public Relations, Monte Carlo Simulation, Non-Sensory Perception Personality Types, PIECES Analysis, Position (Marketing Mix) Possibility (Marketing Mix), Price Perception, Programming (Marketing Mix), Proximate Quality Value, Purchase Intention Quality Cost Reduction, Quality Gap Analysis, Quality Improvement, Quantile Regression Analysis, Rational Product Design Method, Religious Identity Perspective, Revenue Analysis, Ribbon Screw, Scaling Analysis, SOAR Analysis, Social Capital, Social Commerce, Social Empowerment, Social Support, SOSTAC Method, Statistical Process Control (SPC) Method, Teacher Empowerment, Technology Management, Theory of Planned Behavior, TOPSIS Method, Total Quality Control Method, Tourist Behavioral, Tourist Buying Interest, Tourist Perception, Value Engineering, Visual Media Literacy, Voice of Customer (VoC)	1

Source: data processed by the authors (2025).

Table 4 highlights that SWOT Analysis is the most frequently applied research method for

marketing tempeh and its derivatives. This technique evaluates internal and external factors influencing processes by identifying strengths, weaknesses, opportunities, and threats ([Kartika et al., 2025](#)). Studies on tempeh products often utilize this framework to formulate marketing strategies for MSMEs focusing on items like tempeh chips ([Putri et al., 2025](#); [Wardhana et al., 2025](#)). Price ranks second as a fundamental variable within the marketing mix commonly found in marketing literature. ([Kotler & Keller, 2016](#)) define price as the amount of money charged or the sum of values exchanged by customers to gain the benefits of a product or service. According to these authors, the variable comprises five indicators involving list price, discounts, allowances, payment period, and credit terms. Research often treats Price as an independent variable to determine its influence on purchasing decisions for tempeh products ([Musrarofah et al., 2025](#); [Setiawan, 2024](#)). The third position belongs to Product Quality as a common variable in marketing science, particularly for food items. [Garvin \(1987\)](#) describes product quality as a multidimensional concept requiring evaluation based on various objective and subjective characteristics. This framework identifies eight dimensions for measuring quality including performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Studies frequently analyze Product Quality as an independent variable affecting purchasing decisions for tempeh products ([Fiman & Taufiqurahman, 2024](#)) or apply it directly to enhance product standards within MSMEs ([Januariyansah et al., 2025](#)).

4.8 Marketing Segmentation for Tempeh-Based Products between 2018-2025

Table 5. Ranking of marketing segmentation for tempeh-based products between 2018-2025.

No.	Marketing Segmentation	Quantity
1	Plant-based Meat	20
2	Plant-based Protein	17
3	Healthy Food	16
4	Indonesian Local Food	14
5	Stunting-prevention Snacks	14
6	Vegan Food	11
7	Indonesian Fermented Food	10
8	Pre-diabetic Diet Food	10
9	Toddler-supplementary Food	10
10	Isoflavone-based Food	7
11	Vegetarian Food	6
12	Indonesian Superfood	5
13	PEM-supportive Food	5
14	Plant-based Food	5
15	Pregnancy-safe Alternative Snack	5
16	Vegetable Protein	5
17	Digestible Protein	4
18	Healthy Snack	3
19	High Protein Food	3
20	Phytoestrogen-rich food	3
21	Dietary Fiber Food	2
22	Lactation-supportive Snack Alternatives	2
23	Plant-based Milk	2
24-43	Anemia-prevention Food, Anti-Alzheimer Food, Anti-inflammation Food, Antioxidant Food,	1

No.	Marketing Segmentation	Quantity
	Athletes Snack, Autism-friendly Snack Alternatives, Elementary-school Snacks, Flexitarian Food, Grain-based Food, Healthy Drink Healthy Desert, Indonesian Traditional Food, Menopause-safe Alternative Food, Pandemic- resilient Alternative Food, Pea-based Food, Plant- based Burger Patties, Plant-based Nugget, Plant- based Product, Ready-to-Eat Convenience Food, Sperm-boosting Food	

Source: data processed by Authors (2025).

Table 5 identifies "plant-based meat" as the dominant market segment for tempeh derivatives, positioning tempeh derivatives as functional substitutes that mimic the sensory profile of animal protein. This category has established a dedicated consumer base in regions such as Italy ([Andreani et al., 2023](#)), Sweden ([Mayer Labba et al., 2022](#)), United Kingdom ([Rödl, 2019](#)), and the United States ([Wilson et al., 2024](#)). The second tier is occupied by "plant-based protein," a segment largely concentrated in European markets, including Denmark ([Aaslyng & Hojer, 2021](#)) and Belgium ([Degieter, 2024](#)). In contrast, the third position belongs to the "healthy food" category, which remains most prevalent within the Indonesian domestic market ([Barus et al., 2022](#); [Hartanti et al., 2018](#); [Hizni, 2018](#)). These findings offer strategic implications for future development by suggesting that product innovation should align with these three primary consumer preferences.

4.9 Region focusses on tempeh and tempeh-based products research between 2018-2025.

Table 6. Ranking of region focus on tempeh and tempeh-based products research between 2018-2025

No.	Region focuses on Tempe Research	Quantity
1	Malang	84
2	Semarang	25
3	Surabaya	23
4	Jember	22
5	Bandar Lampung	21
6	Jambi	17
7	Ponorogo	17
8	Grobogan	16
9	Bogor	15
10	Ngawi	13
11	Deli Serdang	13
12	West Jakarta	11
13	Mataram	10
14	Metro	10
15	Banjarbaru	9
16	Bantul	9
17	Cirebon	9
18	Madiun	9
19	Medan	9

No.	Region focuses on Tempe Research	Quantity
20	Pekanbaru	9
21	Tangerang	9
22	Bandung	8
23	Banyumas	8
24	Nganjuk	8
25	Palembang	8
26	Rembang	8
27	Wonogiri	8
28	Bekasi	7
29	Surakarta	7
30	Central Lombok	6
31	Karawang	6
32	Manado	6
33	Padang	6
34	Sidoarjo	6
35	Trenggalek	6
36	Banyuwangi	5
37	Blitar	5
38	Depok	5
39	East Lampung	5
40	Kediri	5
41	Klaten	5
42	Kuningan	5
43	Makassar	5
44	Pasuruan	5
45	Pekalongan	5
46	Sleman	5
47	Sukoharjo	5
48	Batu	4
49	Bireuen	4
50	Blora	4
51	Central Lampung	4
52	Denpasar	4
53	Garut	4
54	Gunung Kidul	4
55	Kutai Kartanegara	4
56	Langsa	4
57	Mojokerto	4
58	Palu	4
59	Serang	4
60	Simalungun	4
61	Situbondo	4
62	South Lampung	4
63	South Tangerang	4
64	Tasikmalaya	4
65	Tulungagung	4

No.	Region focuses on Tempe Research	Quantity
66	Balikpapan	3
67	Bojonegoro	3
68	Bondowoso	3
69	Ciamis	3
70	Cilacap	3
71	Dharmasraya	3
72	Great Aceh	3
73	Konawe	3
74	Lumajang	3
75	Magetan	3
76	North Luwu	3
77	Nunukan	3
78	Pematangsiantar	3
79	Salatiga	3
80	Sumedang	3
81	Tanggamus	3
82	Tanjungpinang	3
83	West Bandung	3
84 - 123	Aceh Tamiang, Banjar, Banjarnegara, Banjar, Banjarnegara, Batam, Boyolali, Bungo, Central Bengkulu, Cimahi, Demak, East Aceh, East Oku, Gowa	2
	Gresik, Indragiri, Kendari, Kolaka, Kulon Progo, Labuhan Batu, Langkat, Magelang, Musi Rawas, North Aceh, North Central Timor, North Jakarta, Palangka Raya, Pamekasan, Pasangkayu, Pesawaran, Probolinggo, Purwodadi, Rokan, Samarinda, Solok, Sragen, Sukabumi, Sumenep, Tanah Bumbu, Tebo, Tomohon, Yogyakarta	
124 - 197	BadungBandung, Banggai, Bangka, Bangkinang, Bangun, Banjarmasin, Batubara, Bedugul, Bener Meriah, Bima, Boalemo, Brebes, Bulungan, Buton, Central Manggarai, Central Tapanuli, Cilegon, Dumai, Duri, East Kolaka, East Kutai, East Lombok	1
	East Tanjung Jabung, Empat Lawang, Indramayu, Jepara, Jombang, Kampar, Kisaran, Kotabaru, Kuantan Singingi, Kubu Raya, Kudus, Lamongan, Lhokseumawe, Majalengka, Majene Malaka, Malinau, Mandailing Natal, Nagan Raya, North Lampung, North Lombok, North Tambusai, Pacitan, Palopo, Pati, Pinrang, Pontianak, Poso, Purwakarta, Purwokerto, Purworejo, Purwosari, Sampit, Sanggau, South Bengkulu, South Jakarta, South Konawe, South Oku, Sri Indrapura, Sukorejo, Sumerejo, Tabanan, Tanah Laut, Tanimbar , Archipelago, Tegal, Tidore, Tuban, Way Kanan, West Aceh West Bangka, West Lampung, West Pasaman	

Source: data processed by Authors (2025).

Table 6 reveals that the primary locations for the research and production of tempeh and its

derivatives are predominantly in East Java, specifically in Malang, Surabaya, Jember, Ponorogo, and Ngawi. This cluster is followed by Central Java (Semarang and Grobogan) and West Java (Bogor) while the remaining major contributors are distributed across Sumatra in Bandar Lampung, Jambi, and Deli Serdang. These findings corroborate Indonesian national agricultural data reported by KataData, which identifies East Java as the leading epicenter of soybean cultivation, followed by Central Java, and then West Java ([Muhamad, 2023](#)). Consequently, the substantial volume of raw material production in these provinces directly supports the widespread manufacturing of tempeh, a primary soy derivative.

4.10 Comprehensive discussion on tempeh marketing trends between 2018-2025.

A marketing trend represents a strategic shift or development that changes the market environment, making its analysis a crucial process for understanding consumer behavior patterns and market dynamics that affect an industry ([Zhang & Chang, 2021](#); [Siswanto et al., 2025](#)). To capture these dynamics within the tempeh sector, it is necessary to examine how business strategies have actively adapted over time. Historically, tempeh has been a staple of the Indonesian diet. As detailed by [Astuti et al. \(2000\)](#), the origins of these fermented soybean derivatives were not exclusively indigenous to Indonesia; rather, they were dispersed throughout the 'natto triangle,' a region spanning Nepal, Japan, and Java. The primary differentiator for the Javanese variant was the deliberate application of *Rhizopus* sp. for fermentation, in stark contrast to the *Bacillus* sp. typically utilized in the other regions. Following its emergence in the 16th century, raw tempeh was continually produced and commercialized through established traditional systems before gradually evolving into a broader category of derivative goods.

Extracted bibliometric data indicate that by 2018, the commercial focus had already expanded to include numerous product innovations, ranging from tempeh chips to tempeh-based nata de soya, tempeh inoculum, tempeh flour, tempeh nuggets, etc. During this baseline year, analytical frameworks such as SWOT, value chain, and marketing channel analyses were the predominant methodological strategies, though they were still overwhelmingly applied to the commercialization of raw tempeh. Additionally, the targeted consumer base remained narrowly defined around vegan, vegetarian, and healthy-eating cohorts, with market distribution heavily centralized in Central Java (specifically Semarang and Grobogan) and East Java (notably Malang). The classification of tempeh as 'plant-based meat' initially surfaced in the 2019 literature, specifically within a United Kingdom-based study exploring vegetarian meat alternatives ([Rödl, 2019](#)). From that point forward, this particular segmentation, targeting consumers transitioning away from animal protein, proliferated rapidly across subsequent publications and eventually secured the highest frequency among all identified market segments. In contrast, the 'plant-based protein' framework was not documented until 2021 (Aaslyng & Hojer, 2021), though it later experienced a substantial surge throughout 2024 in research dedicated to raw tempeh ([Degieter, 2024](#); [Puguh et al., 2021](#); [Samad et al., 2024](#); [Teoh et al., 2024](#); [Werdingisih et al., 2024](#)). From this period onward, the market segmentation of tempeh firmly established it as a direct animal protein substitute, strategically capturing vegan, vegetarian, and flexitarian demographics across prominent Western markets, including Italy, Sweden, the United States, and Denmark.

A distinct pivot toward highly diversified market targeting became evident post-2022. Notably, the 'stunting-prevention snack' category gained massive traction during the 2024–2025 period. Within this timeframe, scholarly attention shifted toward formulated innovations such as

Tempeh Cookies ([Bakara et al., 2024](#)), Tempeh Nuggets ([Susianto & Mamlukah, 2024](#)), and Kelor-Leaf-Soybean Tempeh ([Sofiyatin et al., 2025](#)). Yet, even with this extensive expansion in product development, analytical preferences for marketing strategy remained remarkably static. SWOT analysis retained its position as the predominant evaluation tool ([Silitonga & Astuti, 2025](#); [Wardhana et al., 2025](#)), closely trailed by the marketing mix paradigm, where the 'Price' variable consistently served as the primary focal point ([Musrrofh et al., 2025](#)). Ultimately, this seven-year landscape illustrates a market in rapid evolutionary transition; while the product identity of tempeh has dramatically expanded across international and specialized health segments, the strategic methodologies driving its commercialization have remained inherently static.

5. Conclusion

This bibliometric study of 2,095 articles from 2018 to 2025 demonstrates that although tempeh has successfully expanded its market positioning globally as a premium plant-based protein and domestically as a functional health food, the strategic commercialization frameworks employed by MSMEs remain stagnated in basic pricing strategies and conventional SWOT analyses. To reverse declining domestic sales and align with Indonesia's green economy and food sovereignty initiatives, industry stakeholders must transition toward advanced digital marketing and value-driven segmentation. However, the primary limitation of this research is its reliance on secondary bibliometric data, which captures academic discourse and established market trends but may not fully reflect the real-time, undocumented commercial realities currently faced by grassroots tempeh producers. Previously, studies in this domain have primarily provided descriptive evaluations; therefore, future research must expand upon these foundations by employing robust quantitative methodologies, such as Structural Equation Modeling (SEM), to empirically evaluate consumer purchase intentions and the direct impact of modern marketing strategies on the brand equity of tempeh derivatives.

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