

Tempeh as Source of Halal Food for Thailand's Java Mosque Congregation

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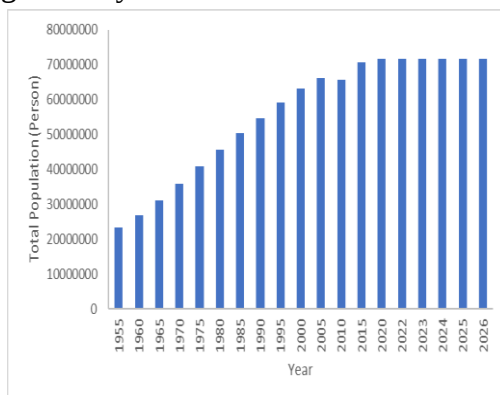
Abstract.

International community service held on Masjid Java, Bangkok Thailand. The activities following by 30 members consist of women and men Java Mosque Congregation, Muhammadiyah brand of Thailand, Ngajikok, and Indonesian Diaspora in Thailand. The activities held on 2nd June 2026. The activities consist of two part. In the first part presenter done presentation about tempeh as source halal food in Thailand. In the second session practice how to making tempeh and cooking class based on tempeh. The steps for making tempeh as much as 2 kg of soy bean soaked for 24 hours, soy bean epidermis cleaned until relatively cleaned, soy bean boiled in the water for 30 minutes. The soy bean boiled waiting until cooled. The 2 kg of soy bean added 2 coffe spon (approximately 3 g of yeast). The soy bean mixed in the tray with yeast until mixed sempurna. The soy bean packed by plastic klip or leaf. Plastic or leaf stabbed with a toothpick. The soy bean will be fermented for 48 hours in the room temperature. The soy bean fermented layed in the floor or table with coted by paper or plastic. The international community service can impart the skills and information needed to make tempeh from soy beans. The pre-test average score rose from 57.39 to 77.39.

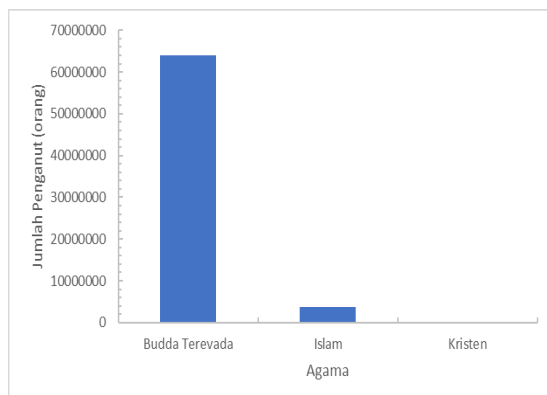
Keywords: soy_beans, fermentation, tempeh and halal_food.

I. INTRODUCTION

The ability to comprehend, identify, and implement halal principles in daily life in the domains of food, finance, cosmetics, and lifestyle is known as halal literacy. Thailand's population grew from 59,098,232 in 1995 to 71,619,863 in 2025, according to statistical data (Fig 1a). <https://www.worldometers.info/id/populasi-dunia/populasi-thailand/>. The population of Thailand makes up 0.86% of the global population. In terms of population, Thailand is ranked 21st out of all the countries and dependent territories. In Thailand, there are 140 people per square kilometer (363 people per square mile). 510,890 square kilometers (197,256 square miles) make up the entire land area. Urban areas are home to 54.27% of the population (38,836,778 in 2026). In Thailand, the median age is forty-one.



(a) Population of Thailand over 30 years



(b) Data on religious adherents in Thailand in the year of 2026

Fig 1. Thailand's population and religious followers

Although Islam is a minority religion, Buddhism is the official religion of Thailand. The Halal Standard Institute of Thailand and the Halal Science Center Thailand are two halal research organizations. In the meanwhile, the Central Islamic Council of Thailand (CICOT), which is backed by the Institute of Food Research and Product Development (IFRPD) of Kasersart University and the Halal Science Center (HSC) of Chulalongkorn University, is the organization authorized to grant halal certification [1]. Founded in 1997, this organization is the top body that represents Muslims (BE 2540). <https://www.cicot.or.th/en/chularatchamontri/detail/27>.

CICOT's responsibilities include advising the government, certifying halal products, translating documents into Arabic and English, certifying marriages and divorces, certifying conversions to Islam, responding to religious concerns, offering da'wah and promoting Islam through radio, television, and journals, diagnosing, and mediating. adjudicate conflicts between organizations in accordance with the law. CICOT issued a number of fatwas pertaining to halal food, such as the following: imported meat will receive a halal logo if it is slaughtered by a Muslim slaughterer and approved by an organization accredited by CICOT; vegetarian food ingredients are halal if they are free of impure elements and haram ingredients; and gelatin from pork is haram even though it has undergone a chemical process [2]. <https://www.cicot.or.th/en/chularatchamontri/detail/27>. Compare to Indonesia, there is a special institution in Indonesia that authorize selecting and auditing food products consumed by Muslims to ensure halal aspects. This institution is called the Institute of Supervision and Distribution of Drugs and Food-Indonesian Ulama Council (LPPOM-MUI) [3].

Thailand offers a wide range of culinary treats in traditional markets, restaurants, and shopping centers. Kra pao mao, a dish made from minced pork; moo ping, a fragrant pork satay; khao kha mo, a dish topped with pork seasoned with sweet soy sauce, spices, cinnamon, and garlic; laab mo, minced pork topped with fish sauce, chili powder, lime, and mint leaves; nam took mo, a grilled version of lab moo, thinly sliced and seasoned with chili, lime, shallot, and cilantro; and toom sab mo, a specialty of Northeastern Thailand [4]. In Thailand, Islam is a minority religion [5]. Islam forbids pork, while Buddhism, the predominant faith in Thailand, does not. Traditional markets sell a variety of meats, including as pig, edible insects [6], crocodile meat [7], and frog meat [8]. These meats are available from street sellers, traditional markets, and shopping centers. Crocodile meat is utilized for livestock and is sold for its low cost and high protein content. In this nation, frogs are also sold. In Thailand, tofu is a cuisine that is frequently found in local markets and huge supermarkets. While tofu or fermented soy sold in local marketplaces lacks a halal logo, it is available in supermarkets like Makro.

The history of tempeh began in Java, Indonesia, around the 16th or 17th century. This food arose from the limited resources of rural communities who processed tofu dregs and leftover soybeans, then naturally fermented them with mold. The word "tempeh" is rooted in Old Javanese, meaning "tumpi" (white food). 2. The exploration of tempeh's long journey in the archipelago is summarized through the following historical notes:

Oldest Record Evidence (19th Century) 1814: The word "tempe" was first documented in writing in the ancient manuscript Serat Centhini. The record mentions past tempe dishes, such as "Brambang Jahe Santen Tempe" and "Kadhele Tempe Serundengan" in the Java region. Region of Origin Historical evidence shows that tempeh was first made and consumed in the Bayat, Klaten, Central Java, and surrounding areas (such as Yogyakarta and Surakarta) [9]. Unlike tofu, tempeh is the only traditional fermented soybean food that is purely Indonesian and not influenced by Chinese or Japanese culture. Spread and Go International along with the migration (transmigration) of Javanese people to various parts of the archipelago, the technique of tempeh fermentation also spread until it became a staple food for people throughout Indonesia. Immigrants from Indonesia

also introduced tempeh to Europe (such as the Netherlands and Germany) around 1946. Summary history of tempeh can be seen in the Table 1.

Table 1. The historical of tempeh [10]

Year	Activities
1815	This document was first cited for its early reference to tempe in History of Tempeh, by Shurtleff & Aoyagi then in The Book of Tempeh. The story in the manuscript is set in the reign of Sultan Agung (1613-1645) and the descriptions purport to be of that time, so it is possible that tempeh existed in Java in the early 1600s. A more detailed explanation and translation was given by Astuti.
1875	European appears in the Javaansch-Nederduitsch Handwoordenboek, by J.F.C. Gericke and T. Roorda.
1895	Two articles by the Dutchman H.C. Prinsen Geerligs (who lives in Java) usher in the era of scientific research on tempeh by European microbiologists and food scientists
1896	1896 It is also the first to give the name of the tempeh mold as <i>Rhizopus Oryzae</i> .
1990	The Dutchman Dr. P.A. Boorsma, who lives in Java and did original laboratory tests, publishes the first detailed description (in Dutch) of the traditional Indonesian process for making Tempe kedeleh (soybean tempeh).
1902	The earliest known tempeh recipes in any Western language are published in a Dutch-language cookbook by Johanna Catenius van der Meijden. Tempe is called for in four recipes. The book, <i>Nieuw Volledig Oost-Indisch Kookboek</i> , is published in the Dutch East Indies.
1905	Dr. Kendo Saito, a professor in the Plant Physiology Laboratory of the Botanical Institute at Tokyo Imperial University, first describes (in German) and illustrates what is today considered to be the main tempeh microorganism, <i>Rhizopus oligosporus</i> . He did not, however, mention tempeh.
1912	Dr. Ryoji Nakazawa, the great Japanese microbiologist, is the first Japanese to study tempeh. He asks a person from Southeast Asia to bring him samples of tempeh and oncom (ontjom, made from peanut presscake); he analyzes their microorganisms. He was working at the Taiwan High Commissioner's Office Central Research Laboratory at the time.
1926	Dr. Nakazawa takes a research trip to Java and Sumatra, where he collects 22 samples of soy tempeh and oncom from various markets and small manufacturers. He and Takeda analyze the microorganisms used and in 1928 publish "On the filamentous used to make ontjom and tempeh in the South Pacific," in Japanese in <i>Nihon Nogei Kagakkai Shi</i> .
1931	The first English-language information about tempeh appears in <i>Vegetables of the Dutch East Indies</i> , by J.J. Ochse. He describes the tempeh-making process in detail and says that the mold used is <i>Aspergillus oryzae</i> .
2008	The Indonesian Tempe Forum (ITF) is established. Its goal is to revitalize tempeh, enhance its image, and improve the condition and production of traditional tempeh makers in Indonesia.
31 Dec 2013	Noble Bean of McDonalds Corners, Ontario, Canada (founded in 1975 by Allan and Susan Brown, the tempeh pioneers in Canada) is sold to Aux Vivres of Montreal, Quebec, Canada.

Currently, tempeh is recognized worldwide as a source of vegetable protein that is very nutritious, high in fiber, and has become a favorite food of global vegetarians. In the meanwhile, neither traditional markets nor supermarkets in Thailand now sell tempeh, a food high in protein.

Tempeh quality requirements that generally apply in Indonesia is based on the Indonesian National Standard (SNI 3144 : 2015) can be seen in the Table 1.

Table 2. Indonesian National Standard of Tempeh

Test criteria	Unit	Requirements
Condition		
Texture	-	Compact, if sliced intact (not easy to fall)
Color	-	White evenly on the centre surface
Aroma	-	Typical smell of tempeh without smell of ammonia
Water content	%	Max 65
Fat content	%	Min 7
Protein content	%	Min 15

Crude content	filter	%	Max 2.5
Metal contamination			
Cadmium		mg/kg	Max 0.2
Lead (Pb)		mg/kg	Max 0.25
Tin (Sn)		mg/kg	Max 40
Mercury (Hg)		mg/kg	Max 0.03
Arsenic		mg/kg	Max 0.25
contamination			
Microbes		mg/kg	
contamination			
Coliform			Max 10
Salmonella sp			Negative / 25 g

Many researcher have been doing community service about making tempe such as [11] in Patipi Pasir, Teluk Patipi District, Fakfak Society, West Papua, elementary school in Yogyakarta [12], Al Islah Jenggawah Jember [13], Kelapa Dua Depok, Indonesia [14]

According to this description, partners require instruction on how to make tempeh as a halal and high-protein food source, as well as instruction on the many stages of the manufacturing process, familiarity with the equipment and supplies utilized, and encouragement of an entrepreneurial mindset.

The aim of the community service to give information to tempeh as the source of halal food for Thailand's Javaness Congregation and to practice how to making tempeh from soy beans.

II. METHODS

On 2nd June 2026 thirty people participated in the International Partnership Community Service, which was conducted at the Javanese Mosque with partners from the Javanese Mosque Congregation, Sathorn, Bangkok.

1. Pre-Community Service Stage of International Partnership

In order to prepare for this community service project, PCIM Thailand, a partner in Bangkok's Kampung Jawa, was contacted. The activity's time and venue, participants, theme, program schedule, and a translator—since the participants could only speak Thai and not English—were all discussed. For the community service program and its scheduled phases to run smoothly, the preparatory phase is essential.

2. Phases of International Partnership Implementation Service to the Community

The two sessions of the international partnership community service implementation stage were practice and material presentation. A demonstration on preparing tempeh as a halal food source kicked off the first community service project. Making tempeh was practiced during the second session. Soybeans are used to make tempeh. Two kg of soybeans are steeped for a full day. The soybeans are cooked for 30 minutes [15] after the peel is removed. Toothpicks are used to penetrate the soybeans while they are enclosed in plastic. Two coffee spoons, or around three grams, of yeast are added to the soybeans. The soybeans were perforated with toothpicks and put in plastic bags. After that, they were covered with paper or plastic and left in the air. For 48 hours, the soybeans underwent fermentation. A closing ceremony and a group photo of the participants and the community service team marked the end of the activity.

3. Phases of Activity Effectiveness Evaluation

Activities are conducted in order to assess their degree of success. Pre-test and post-tests were used in this community service to assess participants' comprehension of the subject matter. Seven multiple-choice questions were answered as part of the evaluation process. The improvement in post-test scores can be used to gauge community service success.

III. RESULT AND DISCUSSION

1. Preparation of International Community Service Stage

Preparation for international community service done by bought Indonesian soy bean and Prolima (yeast) and plastic.

2. Community Service Implementation Stage

International community service done on 2nd June 2026. The activities followed by 30 members of Java Mosque Congregation, Muhammadiyah Brand of Thailand, and Ngajikok. These activities were carried out at the Javanese Mosque for $\pm$ 4 hours. The series of community service activities consists of opening, greeting, pretest, presentation of material, practice, posttest, and closing. The activities started from greeting ceremony from Imam of Java Mosque, Leader of Muhamamdiyah Broad of Thailand, and Leader of International Community Servise. The first presenter was Emi Erawati, S.T., M.Eng. spoke about soy bean as source of halal food in Thailand. In the first session presense about history of tempeh, nutritional content of tempeh and steps for making tempeh. The first step for making tempeh was preparing for equipments and raw materials. Tempeh raw materials consist of yeast and soy beans. Equipements used for making tempeh such as pan, plastic, spon, toothpick, and trays.



(a) Soy beans



(b) Yeast

Fig 2. Tool and Equipments of International Community Service

The steps for making tempeh as much as 2 kg of soy bean soaked for 24 hours, soy bean epidermis cleaned until relatively cleaned, soy bean boiled in the water for 30 minutes. The soy bean boiled waiting until cooled. The 2 kg of soy bean added 2 coffe spon (approximately 3 g of yeast). The soy bean mixed in the tray with yeast until mixed sempurna. The soy bean packed by plastic klip or leaf. Plastic or leaf stabbed with a toothpick. The soy bean will be fermented for 48 hours in the room temperature. The soy bean fermeted layed in the floor or table with coted by paper or plastic. (Gambar 2).



Fig 3. Tempeh as a Product of International Community Service

3. Evaluation Steps for Effectiveness of Activities

Evaluation for international community service done by doing pretest dan posttest equations. Pretest done by answering 7 multiple choice questions. The questions can be seen in the Table 2.

Table 2. Pretest and PostTest Questions

No	Questions	A	B	C	D
1	Based on history, where is tempeh came from? จากประวัติศาสตร์ เทมเป้มีต้นกำเนิดมาจากที่ไหน?	Java, Indonesia/ อินโดนีเซีย	Sumatera, Indonesia/ สุมาตรา อินโดนีเซีย	Kalimantan, Indonesia/ กาลิมันตัน อินโดนีเซีย	Bali, Indonesia/ บาหลี, อินโดนีเซีย
2	How much is ratio between soy bean to water? อัตราส่วนระหว่างน้ำกับถั่วเหลืองคือเท่าไร?	1 : 10	1 : 9	1 : 6	1 : 3
3	How long should We soak the soybeans? ควรแช่ถั่วเหลืองนานแค่ไหน?	2 hours/2 ชั่วโมง	4 hours/4 ชั่วโมง	6 hours/6 ชั่วโมง	24 hours/24 ชั่วโมง
4	The following statements are false, except/ ข้อความต่อไปนี้เป็นจริง ยกเว้นข้อใด	Tempeh's protein content is higher than eggs/ ปริมาณโปรตีนในเทมเป้สูงกว่าไข่	Tempeh's protein content is lower than eggs/ ปริมาณโปรตีนในเทมเป้ต่ำกว่าไข่	The protein content of tempeh is the same as eggs/ ปริมาณโปรตีนในเทมเป้เท่ากับไข่	Tempeh does not contain protein/ เทมเป้ไม่มีโปรตีน
5	To make clean, peeled soybeans soft, sterile, and fully cooked, they are boiled in boiling water for around/เพื่อให้ถั่วเหลืองที่ปอกเปลือกและทำความสะอาดแล้วนุ่ม ปลอดภัยและสุกทั่วถึง จะต้องนำไปต้มในน้ำเดือดประมาณ	20 to 30 minutes/20-30 นาที	60 to 90 minutes/60 to 90 นาที	90 to 150 minutes/90 to 150 นาที	150 to 180 minutes/150 to 180 นาที
6	How many yeasts are needed for every 1 kg of soybeans? ต้องใช้ยีสต์กี่ตัวต่อถั่วเหลือง 1 กิโลกรัม?	4.5 g/4.5 กรัม	4 g/4 กรัม	3 g/3 กรัม	1.5 g/1.5 กรัม
7	After being given yeast, how long will it take for soybeans to become tempeh? หลังจากเติมยีสต์แล้ว ถั่วเหลืองจะกลายเป็นเทมเป้ได้ภายในเวลานานเท่าใด?	4 days/4 วัน	3 days/3 วัน	2 days/2 วัน	1 day/1 วัน

The result from the pretest and post test can be seen in the Fig 3 (a) and post test result can be seen Fig (3b).

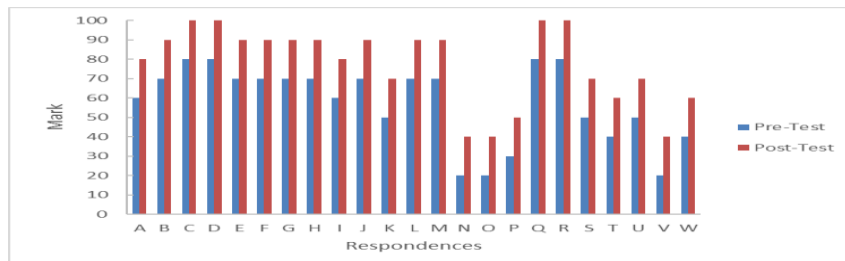


Fig 3. Pretest and Posttest's Mark

After the community services finished, the members of community service do posttest for knowing successfully of community service. A posttest was administered following the conclusion of the activity sessions to assess how well the community service program introduced and trained participants in the preparation of tempeh. The posttest has seven multiple-choice questions, much

like the pretest. The average pretest and posttest score were 57.39 and 77.39 respectively as shown in Fig 3.

IV. CONCLUSION

The congregation was very enthusiastic about participating in the series of international community service. The activities can give knowledge and skills how to making tempeh from soy beans. The average mark of posttest increased from 57.39 to 77.39.

V. ACKNOWLEDGMENTS

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<https://www.cicot.or.th/en/chularatchamontri/detail/27> Accesed on 13 June 2026 1.11 am