

## Okara Probiotic Drink as An Innovative Product from Tofu By-Product: Community Counselling for Young Tofu Craftsmen

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**Abstract.** Tofu production produces a large amount of by-product, known as okara. It is estimated that 60% of the soybeans used in tofu processing turns into okara. Thus far, okara is used for cattle feed. Utilization of okara for probiotic drink can potentially increase economic value of okara. The community service activity (PKM) was undertaken in Semanan tofu production centre, which is one of the largest tofu production sites in Jakarta. The service activity aimed to increase knowledge among tofu craftsmen towards the utilization of okara for probiotic drink. The PKM activity was carried out by means of online counselling and training activities. Twenty-seven tofu craftsmen took part in the sharing program. Four stages of activities were conducted to implement the sharing program, comprised of needs and field assessments, recruitment of participants, preparation of online materials, and online counselling. Pre- and post-tests were conducted to evaluate participants' knowledge. The mean pre- and post-tests were  $51.4 \pm 22.3$  and  $76.9 \pm 25.8$ , indicating a significant improve in the knowledge about okara, probiotic drink, and okara-based probiotic drinks due to community service activity. The counselling activity succeeded to raise the knowledge about okara probiotic drink among participants.



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## INTRODUCTION

Tofu is a popular food and consumed on daily basis in Indonesia. Tofu has a high protein content and is therefore used as a substitute for meat. One of the largest tofu/tempe production centers is in the Semanan area, Semanan Village, Kali Deres, West Jakarta. The center was built in 1992 in a 12-hectare area and has been home to more

than 1400 people. Around 95% of its residents work in the sector or related to it. There are around 7 main production groups in the area, most of which affiliated to Koperasi produsen tempe tahu Indonesia (KOPTI) Semanan.

One of the problems in tofu production is the high quantity of by-product it generates, known as okara. On average, 60% of the soybeans used in the production turns into

okara. Solid okara still has high nutrition value. Okara contains dietary fiber (50%), protein (25%), lipid (10%), and other nutrients and minerals (Li, Qiao, & Lu, 2012). Protein and lipid in soybeans are of good quality and present in high quantity. Soybean protein contain all essential amino acids in the quantity approximately required by humans. The soybean oil contains high amount of unsaturated fatty acids, such as oleic acid, linoleic acid, and linolenic acid (Medic, Atkinson, & Hurburgh, 2014). In addition to proximate content, soybeans contain various secondary metabolites, such as isoflavone derivatives and tocopherols (Jankowiak, Kantzas, Boom, & van der Goot, 2014). These metabolites were reported to have important bioactivities such as antioxidant, anti-inflammatory, and anti-enzyme activities (Niamnuy, Nachaisin, Laohavanich, & Devahastin, 2011). Recent report also found that fermentation such as what is occurring in probiotic making did not affect the nutrition content (Riciputi et al., 2016). Despite its highly nutritious content, okara is still under-utilized. So far, okara is sold and used as cattle feed. Product innovation based on okara can potentially increase the economic value of okara.

Tofu producers in Semanan have been considerably affected by the COVID-19 pandemic. The producers have suffered a significant decrease in production scale due to a decrease in demand. One of the weaknesses in tofu production is low product innovation. Okara is the potential to be further utilized as main ingredient to make various products. One of which is used as a substrate to make probiotic drinks. this is especially relevant during the COVID-19 pandemic, as probiotic drink has been reported to increase immunity and has been suggested for the prevention and treatment for COVID-19 (Kurian et al., 2021). Thus, daily consumption of okara probiotics may have an impact in health, in addition to providing alternative for family income.

The aims of this community service activity were to share knowledge about utilization of okara to make probiotic drink. Thus, participants were encouraged to make okara probiotic drink at home.

## **METHOD**

The implementation of community service activity was divided into four stages, namely field observation, participant recruitment, preparation, and counselling activity. Online meetings were carried out. The activities took place during the COVID-19 pandemic, thus online meetings were undertaken to avoid virus transmission.

### **Field Observation**

The field observation aimed to identify problems, conditions, and needs of tofu craftsmen in the community service location. At this initial stage, Ukrida team visited the tofu processing site in Semanan. Ukrida team met with several tofu producers and the manager of KOPTI Semanan. Meetings and discussions with tofu craftsmen were conducted on several occasions, to observe and gather information related to tofu production and okara. Ukrida team was also welcomed by the youth organization (Karang Taruna) in the Semanan site, which then agreed to be involved in the community sharing program.

### **Recruitment of The Participants**

Participants were recruited by the field coordinator, which is the coordinator of the youth organization in KOPTI Semanan. All participants lived in the PIK (Pemukiman Industri Kecil/small industrial estate) complex in Semanan tofu centre. All of the participants involved in the tofu production. Most of them were members of the youth organization (Karang Taruna) of PIK complex in Semanan tofu centre. All participants agreed to participate in the program and each signed an informed consent form.

### **Preparation of Online Materials**

Materials for online counselling were prepared, consisting of videos and digital poster, i.e: (1) Information video about okara (what is okara, nutrition content of okara, various food product from okara); (2) Information video about probiotic drink (what is probiotic drink and their health benefits); (3) Tutorial video about how to make probiotic drink from okara; (4) Digital poster containing graphical information about okara, probiotic drink, and okara based probiotic drink.

### Online Counselling

Due to the COVID 19 pandemic, counselling to the community was carried out online through digital media to heed health protocol. Close contact and crowd gathering were avoided to minimize virus transmission. Several online activities were conducted, i.e: (1) Online discussion through a zoom meeting on August 8th 2021 at 16.30 – 18.00. In this activity, all participants gathered in a zoom meeting. Guided discussion was carried by the team. Topics were focused on okara, probiotic drink, and okara-based probiotic drink; (2) Online discussions via WhatsApp group (August 9th – 18th 2021)A WhatsApp group was created involving the Ukrida team and all participants. Using this means, the team posted the prepared videos and digital poster. Each material was posted on different day. Following the posting of each material, discussions were ignited by asking questions and giving answers. Explanations were repeated to ensure participants' understanding.

### Data Collection and Analysis

The effectiveness of the transfer of knowledge was evaluated by conducting pre- and post-tests. Pre-test was intended to evaluate initial knowledge of the participants before commencing the counselling program, whereas post-tests aimed to determine the knowledge level after finishing the program. Pre-test was distributed to all participants one day before the counselling program started,

whereas post-test was conducted at the end of the program (2 weeks after the zoom meeting). Analysis of t-test was conducted to measure the differences between pre- and post-tests, using SPSS v.25 for windows.

## RESULTS AND DISCUSSION

### Field Observation

Based on discussion and onsite observation, Ukrida team identified that okara, the by-product from tofu processing was produced in high abundance. Solid okara was sold for cattle feed, whereas liquid okara was processed in waste processing site, to further separate the solid from the liquid wastes. The latter was then discarded to the waterways. The tofu producers focused on tofu production, and did not have time to further utilize the okara. This suggests low innovation on okara product. Therefore, this community service aimed to share knowledge with tofu craftsmen on the utilization of okara for innovative probiotic drink.

### Participant Profiles

Table 1 shows the demographic profile of the participants. Twenty-seven people, 17 – 28 years old, participated in the sharing program. All the participants were young, mostly between 21-25 years old and they have involved in tofu industry for several years, with most of them have worked for less than 5 years.

Table 1. Participants involved in the community sharing program.

The number of participants		n = 27	%
Gender	Female	13	46.4
	Male	14	53.6
Age	< 20	8	28.6
	21-25	16	57.1
	26-30	3	10.7
Length of work in tofu industry (years)	< 5	16	59.3
	5-10	7	25.9
	10-15	4	14.8

### Online Counselling Meeting and Material

As has been said previously, due to the pandemic situation, the sharing of knowledge

to all participants was carried out online. The online learning was divided in two stages.

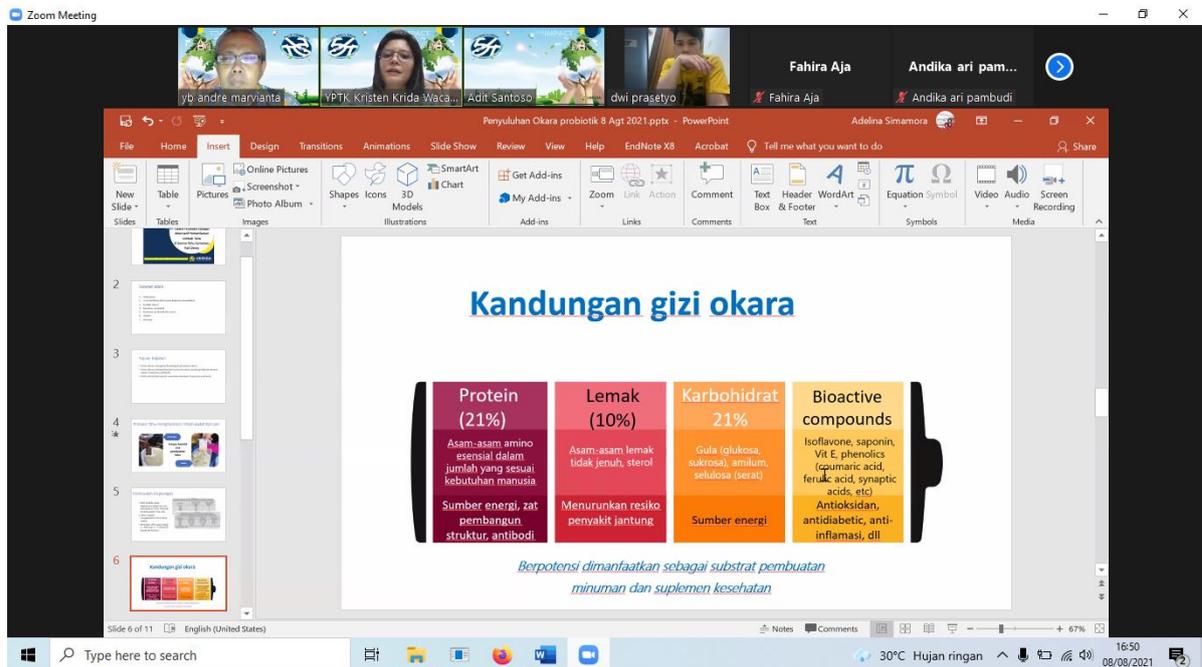


Figure 1. Online meeting between Ukrida team and participants by a zoom meeting

### Stage 1 Sharing Program by A Zoom Meeting

Twenty-seven participants (17 – 28 years old) took part in the zoom meeting on August 8th 2021. Participants were all part of the youth organization in the Semanan tofu centre. The selection of young participants has several benefits. They are the future of tofu industry. The sharing of knowledge is intended to expose them to innovative development of tofu products. In addition, young participants are more adaptive to online learning, thus the use of online media did not hamper the learning process among the young participants, compared to participants from older generation.

The meeting was started by introducing the Ukrida team and the coordinator from the youth organization. It was then followed by tutorial sessions by facilitators from Ukrida. In accordance with the aims of the program, tutorial sessions were focused on topics about okara and its utilization as a substrate for probiotic drink. The first session discussed about okara and its nutrition benefits. The second session discussed about introduction on how to make

okara-based probiotic drink. Questions and answers sessions were conducted at the end of meeting.

### Stage 2 WhatsApp Group Discussion

It was realized that a single counselling meeting could not effectively improve participants' knowledge. Therefore, a WhatsApp group was created, intended to be a media for follow up discussion and sharing electronic information about okara and probiotic drink.

Several electronic materials were prepared, including a digital poster and a number of information videos.

Digital poster contained graphical information about main ingredients to make okara-based probiotic drink, which are okara, sugar, fruit jam, and starter (bacteria), Figure 2. The benefits of probiotic drink and okara probiotic were also described. Probiotic drink has the advantages of increasing innate immunity (Kechagia et al., 2013), aiding food metabolism in the gut (Kechagia et al., 2013). In addition, non-dairy based probiotics are safe to be consumed by dairy allergic people (Panghal et al., 2018), easy and cheap to make. Digital poster was posted in the

WhatsApp group in order to guide discussion among members. The team asked follow up questions and frequently checking their

understanding by probing questions and providing examples of probiotic drink.

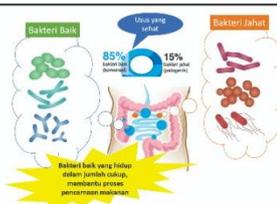
## Okara Drink

Minuman Probiotik berbahan baku Okara



### Tahukah anda :

- Okara adalah produk samping pengolahan tahu
- Okara memiliki kandungan gizi tinggi : Vitamin E Protein Nabati, Lemak Nabati dan Mineral
- Biasanya dimanfaatkan sebagai pakan ternak
- Dapat dibuat menjadi minuman probiotik yang menyehatkan



### Cara Pembuatan Okara Probiotik



### Manfaat Okara Drink

- Mengandung bakteri baik yang hidup
- Aman bagi yang alergi protein susu
- Tahan disimpan lama dalam kulkas
- Membantu melancarkan BAB
- Dapat dibuat sendiri di rumah
- Dapat dibuat berbagai rasa
- Dapat dijual



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Figure 2 The digital poster of okara probiotic drink

In addition to the digital poster, the Ukrida team have also prepared three information videos that have been posted in the WhatsApp group.

1. Video information about okara contained information about okara which is the by-product from tofu processing. The nutrition value of okara was informed which is rich in protein, unsaturated fatty acids, fiber, minerals, and various bioactive compounds (Faisal, Gani, Mulana, & Daimon, 2016). Okara can also be used as ingredient to make cookies and cakes. It was hoped that knowing this detailed information may incite more appreciation

2. Video about probiotic drink contained information about what probiotic drink is. The probiotic drink contained good and live bacteria (e.g. Lactobacillus) which help food digestion process. Therefore, consumption of probiotic drink can help regular bowel movement (Kechagia et al., 2013). This knowledge was expected to expose participants with possible innovation of okara.
3. Tutorial video on how to make okara probiotic. The optimization of okara drink has been reported by the Ukrida team elsewhere (Santoso, Purba, Simamora, & Timotius, 2019). The process of okara drink making was demonstrated in the

video, as follows. In a pan, solid and liquid okara were mixed in a 1:3 ratio. The mixture was cooked in low heat, sugar and strawberry jam were added and mixed well. The mixture was let to cool at room temperature and starter was added. The mixture was poured into a glass jar and tightly closed. The jar was left for 6-8 hours in warm temperature. Okara probiotic was ready to be consumed. Okara probiotic can be served in small containers and chilled in the refrigerator. The ease of okara probiotic making was expected to provide opportunities for participants to diversify tofu production options.

### Program Evaluation

The outcome of the sharing program was evaluated by pre- and post-tests. The pre-test scores were different significantly from the post-test scores. The mean pre-test score was 51.4 with the lowest and the highest scores were 11.1 and 88.9, respectively. Following the sharing program, the mean post-test was increased to 76.9, with the lowest and highest scores were 11.1 and 100, respectively. The paired t-test found significant increase in the score tests,  $p = 0.024$  (Table 2), indicating increase in the knowledge of the participants regarding okara and okara probiotic due to the PKM activity

**Table 2.** Analysis of participants knowledge before and after the program.

Variables	n	Median (minimum-maximum)	Average $\pm$ SD (score of tests)	$P^*$
Knowledge prior to the program	27	55.6 (11.1-88.9)	51.4 $\pm$ 22.3	0.024
Knowledge after to the program	27	88.9 (11.1-100)	76.9 $\pm$ 25.8	

\*Difference was analyzed by paired t-test with  $p < 0.05$  considered significant.

In detail, the number of correct answers for each question in the questionnaire were also increased (Table 3). Questions 1 to 3 checked the understanding of participants about okara. Overall, participants' knowledge about okara prior to the sharing program was good as seen by the number of correct answers about okara. Most of the participants have worked in tofu industry for less than 5 years, which may contribute to their knowledge about okara. Their knowledge was increased after the sharing program. Participants knew what okara is and that okara still has high nutrition value due to the high content of protein. Participants also realized that okara can be made into probiotic drink.

Questions 4 to 6 evaluated participants' knowledge about probiotic drink. Similar to the information about okara, participants also knew about probiotic drink before the sharing program. Participants understood that probiotic drink contained

good bacteria that is good for digestive system. However, this understanding was increased following the sharing program, as seen by the increase in the number of correct answers on questions 4 to 6.

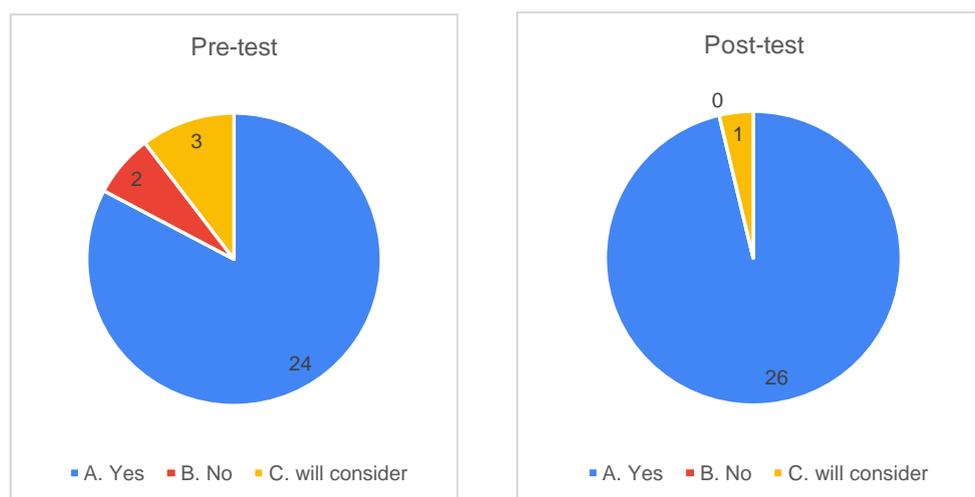
Questions 7 to 9 probed participants understanding about okara-based probiotic drink. It was observed that prior to the sharing program, participants had moderate knowledge about okara utilization for probiotic drink. Significant increase in the knowledge was observed about ingredients, how to make okara based-probiotic drink. Participants understood that probiotic drink that make use of okara as substrate has more advantages over dairy-based probiotic drink, which included longer shelf life, cheaper ingredients, and tolerability for people allergic to dairy products.

The last question in the questionnaire inquired about participants' willingness to be involved in the training to make probiotic drink. The pre- and post-tests suggested that

most of the participants agreed to try (Figure 3).

**Table 3.** The knowledge of the participants (pre- and post-tests) regarding okara, probiotic drink, and okara probiotic (n = 27).

Questions	Correct answers (total respondents=27)		Increase (%)
	Pre-test (n)	Post-test (n)	
1. What is okara?	20	22	7.4
2. Benefits of okara.	17	25	29.6
3. Nutrition content of okara.	23	27	14.8
4. What is probiotic drink?	14	24	37.0
5. Kinds of bacteria in the probiotic drink.	14	23	33.3
6. Benefits of probiotic drink	14	21	25.9
7. Main ingredients to make okara probiotic drink.	7	20	48.1
8. Advantages of okara probiotic drink.	15	23	29.6
9. Steps of making okara probiotic drink.	10	18	29.6



**Figure 3.** Pre-and post-tests responses to a question of whether or not participants agree to be involved in the training of making okara probiotic drink (n=27).

In our assessment, the success of the counselling program is due to several reasons:

- a. Counselling was conducted not only once (through the zoom meeting), but continued in the WhatsApp group discussion. Information sharing by videos and digital poster posted in the group played important role in exposing the participants with a more detailed information about okara and probiotic drink.
- b. All participants were of relatively young age, who were usually more adaptive to online learning than older participants.

The opportunity revealed from this study is the willingness from the participants to learn about innovative product. Challenges remains on how to implement the program. The tofu craftsmen are known for their hour-to-hour busy activities, consisting of tofu production and marketing. In addition, okara probiotic drink product should be further improved regarding the taste, texture, and aroma to improve its market value.

**CONCLUSION**

Results from the pre and post-tests suggest that the community service program

has succeeded in increasing the knowledge of the participants about okara, probiotic drink, and okara-based probiotic drink. The evaluation suggests positive attitude from the participants towards innovative product based on okara, as indicated by their willingness to try. Activities could be followed by hands on training to make probiotic drink and to develop it in to a marketable product.

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