

Community development in the production of concentrated flour high in amino acids made from a combination of eel and tempe

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ABSTRACT

Introduction and Objectives: To date, there are no known supplement products made from a combination of eel and tempe. The development of concentrate from eels in combination with tempe (ETF) aims to create supplements containing the essential amino acid L-arginine, which has many proven health benefits.

Methods: The community empowerment was held from June to July 2023 at Cangkringan, Sleman, Yogyakarta. The main agendas consisted of ETF training production and the cooking creation of ETF-based food. Aside from that, there were several secondary agendas such as food halal socialization, accessories design training, patchwork utilization training, computer and Microsoft Office training, English language education, public speaking class, Al-Qur'an and miscellaneous education for children, community service, mutual cinema, and competitions for the community.

Results: The community development program in the production of high-amino acid concentrated ETF flour has succeeded in achieving the three main objectives of the program, namely functional product innovation, empowerment of micro, small, and medium enterprises and local communities, as well as increasing demand for local commodities, showing the importance of collaboration between the government, community, and private sector in supporting the development of local products that are economically and health-beneficial and can be used as examples to share similar initiatives in other areas.

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KEYWORDS

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INTRODUCTION

Today, there are many supplement products on the market in capsule form of tablets. However, to date, there are no known supplement products made from a combination of eel and tempe made from soybeans. This combination aims to create supplements containing the essential amino acid L-arginine. Essential amino acids are a type of amino acid that cannot be synthesized by the body and must be obtained through the consumption of foods containing protein (Lopez & Mohiuddin, 2023). Amino acids have an important role in the human body. Its functions include the repair of tissues damaged by wounds, burns, postoperative, muscle building, protection of the liver from various toxic substances, drop blood pressure, regulation of cholesterol metabolism, stimulation of growth hormone secretion, as well as reduction of ammonia levels in the blood (Rose, 2019).

Eels are one type of freshwater fish that have the potential to be developed as a business technology in the field of fisheries and are widely consumed by the public because it is relatively easy to get and affordable (Miah et al., 2015). Eels are a type of freshwater fish that are often found in rice field areas. Eel fish has a high content of nutrients, including protein, omega-3, amino acids, collagen, vitamins A, B, C, phosphorus, and calcium (Herawati et al., 2018). Currently, there is still little use of processed products derived from eels for health purposes. In the Special Region of Yogyakarta, many markets provide eel and tempe; there are even special markets that focus on sales of eel in the

Godean area (Godean Eel Culinary Market, Jl. Ngapak – Kentheng KM 10, Sidoagung, Godean District, Sleman Regency, Special Region of Yogyakarta, 55264).

Tempe is a traditional Indonesian food produced through the fermentation of soybean seeds by the fungus *Rhizopus sp.* (Astawan et al., 2013). Tempe has various positive benefits for human health, such as reducing symptoms of flatulence and diarrhea, inhibiting the production of cholesterol in the liver, protecting LDL from oxidation, lowering the level of total cholesterol and triacylglycerol, increasing the activity of the antioxidant enzyme SOD, and reduce the risk of cancer in the rectal, prostate, breast, and colon (Astuti et al, 2000). Tempe made from soybeans is a traditional food product in Indonesia has several health benefits, especially as a source of vitamin B complex which has a crucial role in the body’s metabolism (Ahnan-Winarso et al., 2021). In addition, tempe from soybeans also contains vegetable protein and calcium and has been investigated by many researchers for its potential as an antioxidant that fights free radicals.

Development of the formula of L-arginine concentrate from eels (*Monopterus albus*) with the addition of tempe made from soybeans aims to create supplements containing the essential amino acid L-arginine, which has health for benefits burn patients, postoperatively, and in muscle-building. Community-based commercial implementation of these patents has become crucial. In addition, it is expected that this implementation can increase the economic value of eel-tempe products and also increase the income of eel farmers. This community development activity has several objectives that want to be achieved: (1) Downstream of functional flour product innovation; (2) Empowering MSMEs in Wukirsari Eel Cultivation Yogyakarta and the community; (3) Increase demand for local commodities in the form of eel and tempe.

METHOD

Design of the Event

This community service program by UIN Sunan Kalijaga Yogyakarta was held for 1 month, from June 19 – July 15, 2023, in Sabrang Wetan Hamlet, Wukirsari Village, Cangkringan District, Sleman Regency, Yogyakarta. All work programs implemented had gone through several stages namely the interview, observation, preparation, planning, and implementation stages.

The interview process was carried out to determine the work program that will run. Interviews were conducted with Sabrang Wetan Community Leader, Head of Sabrang Wetan Hamlet, Head of PKK Mothers, Chairman of Youth Sabrang Wetan Hamlet, eel cattle owners, and other representatives of the whole community. The interview was done to get information regarding field conditions while also discussing and consulting plans and work programs that have been created to get optimal outcomes.

The observation process is carried out to collect data to be used as a reference in the preparation of work programs. In addition, this process is also used to identify and analyze potential and problematic problems located in Sabrang Wetan Village, Wukirsari Village, Cangkringan District, Sleman Regency, Yogyakarta.

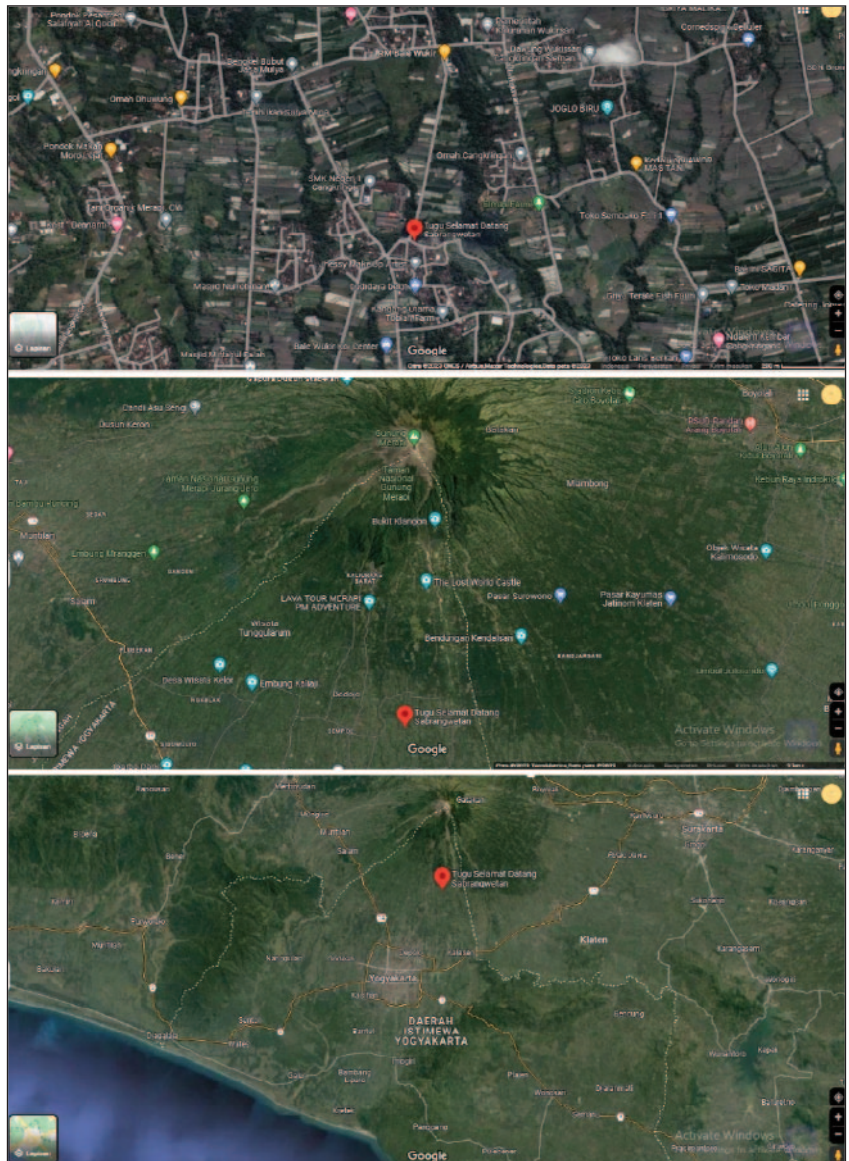


Figure 1. The Location and Geographical Condition of Sabrang Wetan Hamlet

Work program planning can be done after understanding the conditions and problems encountered during the interview process and observation in the field. The work program to be prepared is expected to help improve and address problems as well as create some of the work needed to progress Sabrang Wetan Hamlet. A work program was created focusing on fostering the community of Sabrang Wetan Hamlet in making flour and developing the potential that exists in Hamlet.

Implementation Mechanism

The mechanism for implementing the work program used includes planning, socialization, implementation, documentation, and reports. The planning stage is carried out to draw up the relevant work program by taking into account the time, cost, and resources that will be needed so that the work program can be carried out properly. Preparation of work programs conducted after going through the process of observation and interview in Sabrang Hamlet Wetan. In the next step, the work program that has been prepared is then consulted first with supervisors, then socialized to Hamlet residents Sabrang Wetan and related parties so that there is no misunderstanding later on and the cooperation that will be carried out later can run well.

Next, after the work program is socialized to the residents of Sabrang Wetan Hamlet, the work program that has been prepared will be carried out by taking into account the concept, objectives, and implementation time, and considering the importance of the work program to be implemented. This activity will involve cooperation with many local community leaders and some youth so that all levels of society can be actively involved. All work programs implemented are documented as a form of depiction of activities that have taken place so that they can be used as

as supporting evidence that the work program has been implemented. Reports are prepared systematically and purposefully in accordance with the guidebook which is used as reference material. The report is in the form of a soft file containing several stages ranging from site survey to implementation of work programs.

RESULTS AND DISCUSSION

Implementation of KKN in Sabrang Wetan Hamlet, Wukirsari, Cangkringan, Sleman, Yogyakarta is a work program activity carried out in groups. Activities carried out by all group members with the person in charge of each work program. Based on the work program plan, there are the main work program is the manufacture of high-amino acid concentrate flour from eels and tempe paired with the cooking creation of ETF-based food. Additional work programs are the result of discussions from members of the community service group together with community leaders and residents. Here are the main work programs and activities designed to support community service programs related to consideration of the results of discussions and analysis of the situation on the spot:

Production of High Amino Acid Concentrate Flour with a Combination of Ingredients from Eel and Tempe

The community service activity with the theme "Production of High Concentrate Flour Made from a Combination of Eel and Tempeh" aims to introduce the local community to the innovation of functional food products by utilizing local commodities in the form of eel and tempeh. The production results are expected to empower Wukirsari eel cultivation MSMEs and the surrounding community. At the stage of implementation, the activities carried out include observation,



Figure 2. Activities for Production of High Amino Acid Concentrate Flour with Combination of Eel and Tempe

discussion forums between members accompanied by supervisors related to research from UIN Sunan Kalijaga Yogyakarta about the use of high-amino acid concentrate flour derived from eel and tempeh, discussions with community leaders, and approaches with local communities through daily activities and several additional work programs proposed by residents. This implementation requires a fairly long process so it takes a long time, with limited equipment it is necessary to set the right timeline, besides that increased communication needs to be done regarding the readiness of tools and materials.

One of the key achievements of this program is the economic empowerment of the local community. Providing training and resources for the production of high amino acid concentrate flour has created new opportunities for micro, small, and medium-sized enterprises (MSMEs) and residents. In the long run, these products can be innovated and developed into various products (Gunawan et al., 2022). A noteworthy aspect of this initiative is the focus on producing nutritious products. As evidenced by (Ngadiarti et al., 2022), tempe flour enriched with eel flour has good physicochemical and nutrition properties. Furthermore, the "Production of High Amino Acid Concentrate Flour with Combination Ingredients from Eel and Tempe" program in Sabrang Wetan Hamlet, Wukirsari, Cangkringan, Sleman, Yogyakarta, is a testament to the program's commitment to innovation and sustainable community development. It is interesting, as tempe and eel are two local products that can be easily obtained at affordable prices.

This initiative has not only focused on the practical aspects of flour production but has also delved into the science behind it. Researchers and experts have likely explored the nutritional benefits of high amino acid concentrate flour, conducted studies on the optimal combination of eel and tempe ingredients, and assessed the impact on local health and nutrition. Additionally, discussions may have revolved around refining production processes to maximize efficiency and quality. These scientific insights may play a pivotal role in shaping the program's success and ensuring that it continues to empower the community while advancing our understanding of food production and its broader implications for local development.

Creation of Food Products from Eel and Tempe Flour

Activities for making food products in the form of pempek and sempol are follow-up activities of the eel and tempe flour-making program. Products made can later be traded directly or in the form of frozen food. This activity is expected to be able to increase the economic value of eel-tempeh products of the community, especially for local village PKK members as well as the eel farmer's income alone. This activity begins with the determination of time and place accompanied by the needs of materials and tools needed. The main ingredient in making the product is eel flour combined with tempeh flour and then processed with other additives. The produce is then enjoyed together with residents. The implementation of this work program can run well because of



Figure 3. Activities of Making Food Products from Eel and Tempe Flour

the cooperation and participation of each member and the local community. The manufacture of food products from eel and tempe flour – in its implementation – is divided into two products, namely pempek and sempolan. In making pempek the calculation of materials needs to be considered related to the number of workers present, as well as the time of implementation, so that in the process of working more effectively, besides that the formulation in making pempek using tempeh flour and eel flour still needs to be modified and tested organoleptic again. However, in the manufacture of sempol, there is no evaluation.

One of the program's primary achievements is the diversification of the local economy. By riding on the fact that the eel and tempe flour are rich in L-arginine, the economic value of the products can be elevated significantly. By introducing new food products made from eel and tempe flour, it has created entrepreneurial opportunities for residents. Subsequently, sustainability is a critical component of this program. It is essential to explore how the production of food products from eel and tempe flour adheres to sustainable and environmentally friendly practices.

Other Supporting Programs

Due to the various needs of the community, various programs were implemented to improve the capability of the Wukirsari community. Halal socialization activities are planned as additional work programs to assist the community in introducing the halal certification system. In addition, this activity is also carried out to help residents if anyone wishes to register their products to be certified halal. A food product with halal certification will be preferred by the majority of consumers, especially Moeslim consumers (Warto & Samsuri, 2020).

The training activity on making accessories from "mute pasir" (beads) is an additional work program targeting PKK mothers and children. The purpose of this activity is to increase the creativity and skills of PKK mothers in Sabrang Wetan so that they can become a side business to increase income. In addition, this activity can also be a fun play and learning activity for children. In conjunction with that, the patchwork utilization training activity is an additional work program targeting PKK mothers in Sabrang Wetan. In this training, patchwork can be used as brooches, bandanas, and hairpins. The purpose of this activity is to reduce the pile of patchwork waste in Sabrang Wetan, reduce environmental pollution, and hone the creativity of PKK mothers in Sabrang Wetan so that it can become a side business to increase income.

Computer and Microsoft Office training activities are additional work programs targeting teenagers in Sabrang Wetan. The purpose of this activity is to share and hone knowledge with teenagers in Sabrang Wetan about computers and Microsoft Office which will be the basic provisions that will be

needed by everyone to fight and survive in facing a world that has entered this era of globalization. These soft skills training were known to improve economic capabilities and resilience during the digital era (Gunawan & Rachmani, 2022). On the other hand, English language training activities are additional work programs targeting kindergarten to elementary school children in Sabrang Wetan. English is one of the subjects that is rarely taught there, so with the holding of this work program, it is expected to be able to encourage and hone children's knowledge about English which will be the basic provision needed by everyone to struggle and survive in the face of a world that has entered this era of globalization.

Additional learning activities held for children are activities initiated as a forum for sharing knowledge and discussion which is packaged with fun so that the lessons given can be digested by children. This activity aims to make children in Sabrang Wetan Hamlet more studious. This activity is also carried out to help children fill their free time so that children become more productive with useful activities. Qur'an learning activities are also planned as activities for children in Sabrang Wetan Hamlet. The design of activities will be carried out routinely 3-4 times a week, but there are already similar activities that have been carried out, so that activities are only carried out once a week every Friday. This activity is carried out with the aim that children get additional knowledge about Islamic science, especially in terms of reading the Qur'an.

Community service activities are additional work programs carried out voluntarily by KKN members. This activity was carried out around the pavilion and volleyball court of Sabrang Wetan Hamlet. Service work is carried out to maintain cleanliness and a form of service to the surrounding community. This activity is also carried out as a form of responsibility for the place used in carrying out various work programs. Morning exercise activities with mothers are carried out to strengthen friendships with local residents. This activity is expected to continue even though the students of the Sabrang Wetan Hamlet KKN have finished the KKN, the goal is to create a healthy Sabrang Wetan Hamlet community. In addition, this activity is also a good example of being able to maintain a healthy body.

Public speaking is a form of communication and interaction between one party and another party with the general audience. In the process of running public speaking, good communication skills and self-confidence are needed. Based on this, public speaking training was held targeting PKK mothers as a form of training that could be used for future events. Interestingly, "Nobar" or watching together activities are activities designed for children who take part in additional learning activities as entertainment on the sidelines of busy learning. This activity is carried out to reduce the pressure due to learning in children so that they can better absorb the knowledge provided in the future. Lastly, the competition activities carried out were designed as the closing program of

a series of KKN activities. This activity is carried out with the target of mothers and children. Some competitions are carried out individually and in groups with winners in each competition category who will later be provided with prizes as a form of appreciation.

CONCLUSION

The community development program in the production of high-amino acid concentrate flour from the combination of eel and tempe has succeeded in achieving three main objectives, namely functional product innovation, empowerment of MSMEs and local communities, and increasing demand for local products. This success emphasizes the importance of collaboration between government, communities, and the private sector to support the development of local products that have economic and health impacts, and sets an example for similar initiatives in other regions to support community and local economic development.

The evaluations of community service in making tempe flour and eel flour Sabrang Wetan Wukirsari Hamlet are: (1) frequent deterioration of start time, due to delay of participants; (2) some work programs take a little time in its completion; (3) difficulty in collecting the tools used due to the place that far enough away; and (4) lack of communication to village officials. As for the follow-up plan or program sustainability of community service for the people in Wukirsari Village, several plans are proposed: (1) development in the economic sector to create an economy MSMEs to develop flour products from a combination of eel and tempe; (2) development of MSMEs by creating various processed foods that made from tempe eel flour such as sempolan and pempek (if possible, in the future, it is expected in Wukirsari village eel cultivation and tempe eel flour production house will be built more adequately; (3) development of MSMEs in the field of handicrafts, such as the use of cloth patchwork becomes accessories and the manufacture of accessories from sand mute; and (4) further development of the creative economy with business education (Gunawan et al., 2023), marketing food products, and handicraft products.

In evaluating the implementation of the Conversion KKN in Wukirsari Village, several suggestions have been submitted for Community Service Team students. These suggestions include: (1) strengthening the marketing and promotion of amino acid concentrate flour products by utilizing social media and e-commerce; (2) partnerships with the private sector in product marketing; and (3) ongoing monitoring and evaluation to ensure the success of the program in supporting local communities and economies. These things are expected to support the achievement of economic improvement and a better standard of living for the community.

REFERENCES

- Ahnan-Winarno, A. D., Cordeiro, L., Winarno, F. G., Gibbons, J., & Xiao, H. (2021). Tempeh: A semicentennial review on its health benefits, fermentation, safety, processing, sustainability, and affordability. *Comprehensive Reviews in Food Science and Food Safety*, 20(2), 1717–1767. <https://doi.org/10.1111/1541-4337.12710>
- Astawan, M., Wresdiyati, T., Widowati, S., Bintari, S. H., & Ichsan, N. (2013). Karakteristik Fisikokimia dan Sifat Fungsional Tempe yang Dihasilkan dari Berbagai Varietas Kedelai (Phyco-chemical Characteristics and Functional Properties of Tempe Made from Different Soybeans Varieties). *Jurnal Pangan*, 22(3), 241–252.
- Gunawan, W. Ben, Nisa, S. H., & Gunawan, A. I. (2023). Peningkatan Pengetahuan Strategi Bisnis Usaha Mikro Kecil dan Menengah Kolang-Kaling Di Kelurahan Jatirejo Semarang. *Jurnal Dharma Bhakti Ekuitas*, 7(2), 112–122.
- Gunawan, W. Ben, & Rachmani, M. (2022). Pelatihan soft skill sebagai strategi eskalasi promosi UMKM di desa eko-eduwisata Kandri dan Jatirejo, Kecamatan Gunungpati, Kota Semarang. *Altruis: Journal of Community Services*, 3(2), 34–38. <https://doi.org/10.22219/altruis.v3i2.21009>
- Gunawan, W. Ben, Sari, D. K., & Nashera, A. (2022). Diversifikasi dan Inovasi Produk Berbahan Dasar Kolang-Kaling di Kelurahan Jatirejo, Kecamatan Gunungpati, Kota Semarang. *SEMANGGI: Jurnal Pengabdian Kepada Masyarakat*, 1(2), 111–123. <https://doi.org/10.38156/sjpm.v1i02.128>
- Herawati, V. E., Nugroho, R. A., Pinandoyo, Hutabarat, J., Prayitno, B., & Karnaradjasa, O. (2018). The Growth Performance and Nutrient Quality of Asian Swamp Eel *Monopterus albus* in Central Java Indonesia in a Freshwater Aquaculture System with Different Feeds. *Journal of Aquatic Food Product Technology*, 27(6), 658–666. <https://doi.org/10.1080/10498850.2018.1483990>
- Lopez, M. J., & Mohiuddin, S. S. (2023). Biochemistry, Essential Amino Acids. In *StatPearls [Internet]*. StatPearls Publishing.
- Miah, M. F., Naser, M. N., & Ahmed, M. K. (2015). The freshwater mud eel, *Monopterusuchia*-a review. *Journal of Global Biosciences*, 4(3), 1780–1794.
- Ngadiarti, I., Nurkolis, F., Handoko, M. N., Perdana, F., & Muntikah, M. (2022). Physicochemical Properties and Nutrient Content of Tempe Flour Enriched Eel Flour. *Open Access Macedonian Journal of Medical Sciences*, 10(A), 552–556. <https://doi.org/10.3889/oamjms.2022.8308>
- Rose, A. J. (2019). Amino Acid Nutrition and Metabolism in Health and Disease. In *Nutrients* (Vol. 11, Issue 11). <https://doi.org/10.3390/nu11112623>
- Warto, W., & Samsuri, S. (2020). Sertifikasi Halal dan Implikasinya Bagi Bisnis Produk Halal di Indonesia. *Al Maal: Journal of Islamic Economics and Banking*, 2(1), 98–112.