



Functional Food Innovation of Mekai Leaf (*Alburtisia Papuana* Becc.) Catfish Sticks Based on Community Empowerment in Tuwung Village

Nursiah¹, Norhayani², Maryani^{3*}

Universitas Palangka Raya

Corresponding Author: Maryani maryani@fish.upr.ac.id

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ABSTRAK

The community service program in Tuwung Village, Central Kalimantan, aims to address overproduction and fluctuations in catfish prices through downstreaming and food diversification. The solution offered is the transfer of technology for producing catfish sticks seasoned with natural Mekai leaf (*Alburtisia papuana* Becc.) as an organic, non MSG flavor enhancer. The implementation method involved 20 members of the Family Welfare Empowerment (PKK) group through the stages of pre-test, interdisciplinary extension activities, hands-on practice, introduction of a molding machine and spinner, and post-test. The evaluation results showed a significant increase in the partners' applied knowledge from 5% to 100%. The grant of appropriate technology assets successfully encouraged the establishment of an embryo of a local MSME supporting village ecotourism

INTRODUCTION

The implementation of the Three Pillars of Higher Education (Tri Dharma Perguruan Tinggi) through community service programs requires directed, sustainable collaboration that has a real impact on improving economic welfare based on local potential. Tuwung Village, Kahayan Tengah District, Pulang Pisau Regency, is a strategic assisted village that has become a priority location for the community service program of the Faculty of Agriculture, Forestry, and Fisheries, University of Palangka Raya (FPKP UPR). In terms of regional potential, Tuwung Village has abundant natural resources in the aquaculture and forestry sectors. The fisheries sector is dominated by freshwater fish farming, particularly catfish, which is one of the main sources of livelihood for local residents. Meanwhile, in the forestry sector, the 1,297-hectare Tuwung Village Forest contains high biodiversity, including medicinal plants and natural flavoring plants that have been traditionally used by the Dayak community.

However, the abundance of fresh catfish production in Tuwung Village is often not proportional to local market absorption, resulting in a decline in selling prices when the peak harvest period arrives. This problem is exacerbated by the community's limited knowledge of downstreaming or diversifying processed post-harvest products. So far, the community has only sold catfish in fresh form or as conventional processed products with low economic value and a very short shelf life. On the other hand, modern market trends and the ecotourism sector being initiated by the Tuwung Village Government require unique local souvenirs, which are durable, have high selling value, and possess health characteristics (functional food).

A major opportunity arises from Tuwung Village's non-timber forest products, namely Mekai leaves (*Albertya papuana* Becc.). Mekai leaves are known as local wisdom of the Dayak community and function as a natural flavor enhancer replacing monosodium glutamate (MSG) because of their high glutamic acid content. The integration of the high protein content of catfish and the health benefits of the forest plant can be realized through an innovative food product in the form of Catfish Sticks with Natural Mekai Leaf Seasoning. These stick-shaped snacks are not only crispy and savory, but also serve as a child friendly healthy snack alternative (non MSG) that is rich in antioxidants..

To address the series of upstream-to-downstream problems faced by the Tuwung Village community, the interdisciplinary proposing team from the Forestry and Fisheries disciplines of FPKP UPR offered a comprehensive solution based on post-harvest technology transfer and appropriate mechanization. The first strategic step implemented was the diversification of processed fishery products through training in catfish stick production, as an effort to absorb the abundance of fresh catfish harvests and anticipate declining selling prices in the local market. Through this intervention, catfish meat with low economic value was transformed into a dry snack product with a longer shelf life, high protein content, and a much greater profit margin for the partner group.

The second solution focused on utilizing non-timber forest products (NTFPs) through hygienic extraction techniques for Mekai leaves from the Tuwung Village Forest. The community service team provided assistance

regarding standardization of the mixing ratio of the leaves so that they could be applied as an organic flavor enhancer replacing MSG in catfish stick dough. Finally, to support productivity and the quality of processed products, appropriate technology mechanization was introduced in the form of a mechanical stick molding machine and an oil-draining machine. The use of this technology ensures that the resulting catfish sticks have a very crispy texture, are free from excess oil, free from rancid odors, and meet hygienic functional food product standards.

IMPLEMENTATION AND METHODS

This community service activity was conducted in Tuwung Village, Kahayan Tengah District, Pulang Pisau Regency, with the main target being the Tuwung Village PKK women's group. The implementation method applied a participatory, educational, and hands-on approach (learning by doing), followed by continuous mentoring. The stages of program implementation are detailed as follows:

Stage 1: Coordination and Initial Observation

The first stage involved intensive coordination with the Tuwung Village Government and traditional forest managers to establish a common understanding, determine the location, recruit partner participants, and identify the availability of initial facilities and the experience of the farmer group.

Stage 2: Identification of Partner Potential and Problems

The second stage was conducted through interviews, focused discussions, and field mapping. The identification covered upstream fisheries constraints (overproduction), limited post-harvest skills, and the suboptimal utilization of Mekai leaf plants, which had previously been left to grow wild in the forest area.

Stage 3: Extension and Theoretical Preparation

The third stage focused on increasing the cognitive knowledge of partners at the Tuwung Village Hall. The materials presented included the urgency of downstream fishery food products, the biochemical advantages of Mekai leaves as a natural non MSG umami flavoring, and an initial introduction to the operational mechanisms of appropriate technology (TT). Before the materials were presented, participants were asked to complete an initial questionnaire (pretest).

Stage 4: Hands on Training in Product Processing

The fourth stage was carried out through demonstrations and independent work practices by the partner group, covering the preparation of formulation equipment and materials, the upstream to downstream processing flow, dough molding techniques, and controlled frying. The specifications of the equipment and raw material formulations used are presented as follows: Knife, Grinder, Cutting Board, Container/Basin, Steaming Pot, Bamboo Sticks, Stove, Spoon, Spatula, Weighing Scale, Mixer, Stick Molding Machine, and Spinner. The required ingredients consisted of pure catfish meat, tapioca flour, cornstarch,

wheat flour, salt, ground pepper, butter, eggs, baking soda, and kitchen seasonings such as shallots, garlic, onions, and ginger. In addition, local wisdom in the form of non-timber forest products, namely Mekai leaves, was added as a natural flavor enhancer.

The processing procedure began with cleaning the catfish, separating the meat from the bones (filleting), and grinding the fish paste with salt added at the beginning to maintain adhesion. Subsequently, the paste was mixed with butter, eggs, various flours, and finely chopped Mekai leaves until smooth. The dough was molded using a mechanical molding machine, fried in controlled hot oil until golden brown, and then placed in a spinner machine before being packaged in an educationally labeled standing pouch.

Stage 5: Monitoring, Evaluation, and Handover of the Technology Package

The final stage consisted of the completion of a final questionnaire (post test) by 20 participants to measure the success of science and technology transfer. As a form of commitment to sustainability, the implementation team handed over an appropriate technology grant package (stick molding machine and spinner) to representatives of the PKK partner group.

The stages carried out in the application of science and technology consisted of two main stages, namely the Extension Stage and the Training Stage. The extension stage was conducted at the Tuwung Village Hall to establish a common understanding and deliver educational materials regarding the importance of post harvest downstreaming of catfish and the advantages of Mekai leaves as a natural umami flavoring replacing commercial MSG. The training stage was conducted using hands-on practice with the community regarding the processing of naturally seasoned catfish sticks.

RESULTS AND DISCUSSION

Characteristics of Partners and Empowerment Approach

The community service activity initiated by the interdisciplinary team of the Faculty of Agriculture, Forestry, and Fisheries, University of Palangka Raya (FPKP UPR) was conducted participatively in Tuwung Village, Kahayan Tengah District, Pulang Pisau Regency. The strategic target partners actively involved in this technology transfer program were the Family Welfare Empowerment (PKK) women's group, consisting of 20 people. The PKK group was selected as the main driving force for food downstreaming based on local wisdom because of its strategic position in strengthening family food security while also having the potential to develop new Micro, Small, and Medium Enterprises (MSMEs) clusters at the village level.

The empowerment approach was implemented through an integrated method combining classroom-based theoretical delivery, visual demonstrations, provision of instructional modules, and direct processing practice (learning by doing). Practice-based learning was considered much more effective for transferring both gross and fine motor skills in processing fresh catfish raw materials and handling post-harvest Mekai leaves compared with conventional lecture methods.



Figure 1. Opening of the community service activity by the Head of Tuwung Village, accompanied by the Chairperson of the Tuwung Village TP PKK and the Community Service Implementation Team

Quantitative Evaluation of Participant Understanding (Pre-test and Post-test Analysis)

To measure the effectiveness of knowledge transfer, theoretical understanding, and the success of the technology intervention program objectively, the implementation team applied a quantitative evaluation instrument. This evaluation was conducted through the completion of a pre-test questionnaire (before the activity began) and a post-test (after the entire training series was completed), covering critical indicators of functional food products. Based on the empirical data recapitulation, the assessment results showed a very significant and contrasting increase in understanding in the two main indicators tested among the 20 participants.

Table 1. Distribution of Increased Participant Understanding

No.	Evaluation Indicator	Pre test (%)	Post test (%)	Progres
1	General Function of Mekai Leaves (Flavoring)	40%	100%	+60%
2	Application of Mekai Leaves in Catfish Sticks	5%	100%	+95%

For the first indicator, which examined the general function of Mekai leaves (*Albortisia papuana* Becc.) as a natural flavor enhancer or alternative organic flavoring agent, the initial data (pre test) showed a value of 40% (8 participants) who possessed this knowledge. This initial understanding was generally based on the communal practices of the local Dayak community, which frequently utilizes the leaves of this forest plant in traditional daily vegetable dishes. The community service team then provided a scientific explanation that the savory taste (natural umami) originates from the high natural glutamic acid content in Mekai leaves. This knowledge was intensively developed throughout the training until it reached an absolute value of 100% (20 participants) during the final evaluation (post test).



Figure 2. Implementation of Participant Knowledge Evaluation Through Completion of Pre Test and Post Test Questionnaires Regarding The Utilization of Mekai Leaves in Catfish Stick Products

A much more contrasting and radical change was observed in the second indicator, namely applied knowledge regarding the formulation and application of Mekai leaves specifically for diversifying secondary processed products with high economic value, such as dry catfish stick snacks. Before the community service program began, the participants' level of applied understanding was at a critically low point, namely only 5% (1 participant). Most residents had never imagined that aquatic animal protein commodities such as catfish meat could be harmoniously combined with non-timber forest plants to form a modern, durable dry snack.

The low initial level of knowledge was addressed through visual demonstrations of hygienic Mekai leaf extraction techniques and standardization of the mixing ratio of Mekai leaf powder into the flour and fish meat dough. The combination of visual demonstration methods and direct group-based processing practices successfully eliminated the participants' lack of knowledge, thereby increasing their applied understanding to 100% after the activity was completed. This massive increase of 95% demonstrates that technical knowledge barriers in rural communities can be bridged rapidly through an applicable and interactive mentoring method.



Figure 3. Active participation of the Tuwung Village PKK Participant Group In Following the Extension and Catfish Stick Processing Practices

Introduction of Appropriate Technology (TT) Mechanization and Product Quality

The downstreaming of fishery products in Tuwung Village did not stop at modifying the natural seasoning recipe, but was strengthened through the introduction of appropriate technology (TT) mechanization at the household scale. This mechanization is absolutely necessary to shift slow traditional processing methods toward efficient, hygienic, and competitive production standardization for modern markets. The two main devices introduced in this program were the mechanical stick molding machine and the oil-draining machine (spinner).

The introduction of the mechanical stick molding technology directly solved the problem of product dimension variation that frequently occurs when manually cutting with a knife. The use of this mechanical equipment helps produce much more uniform catfish stick shapes and thicknesses quickly, which in turn ensures an even level of doneness when fried. In addition to the visual aspect of the product, the introduction of the molding machine was able to increase production efficiency. The production time was up to three times faster compared with the manual cutting method, thereby significantly reducing labor operating costs.



Figure 4. Process of Molding and Shaping Catfish Stick Dough Using Appropriate Mechanical Equipment by The Implementation Team Together with Training Participants

Meanwhile, the introduction of the oil-draining machine based on the principle of centrifugal operation plays a very critical role in the food quality control chain. Catfish sticks, which are rich in protein and fat, are highly susceptible to oxidative rancidity due to the interaction between residual frying oil and oxygen in the open air. The spinner machine rotating at a controlled speed is capable of reducing the residual oil trapped in the pores of the sticks after frying to a minimal level. This significant reduction in oil content has been scientifically demonstrated to minimize the risk of oxidative rancidity, maintain the crispy texture of the sticks for a long period, and extend the shelf life of the product without requiring the addition of harmful chemical preservatives.

Program Sustainability and Socio Economic Impact

This series of community service activities triggered a highly positive socio economic impact in Tuwung Village. The ease of operating appropriate technology combined with the savory natural taste of non-MSG catfish sticks has generated strong initial motivation and interest among the partner group to become independent entrepreneurs.

The Catfish Sticks with Natural Mekai Leaf Seasoning product is considered to have high economic prospects because it can target the market segment for child friendly healthy snacks, whose market continues to grow rapidly.

For fish-farming families in Tuwung Village, this diversification serves as an effective economic safety net when the catfish harvest season arrives, because it can transform a highly perishable fresh commodity into a dry processed product with a much greater profit margin. The Tuwung Village Government also welcomed the results of this community service activity and committed to integrating the Mekai leaf catfish stick product into the village-owned enterprise (BUMDes) network as a leading regional souvenir product to support the development of the local ecotourism sector that is currently being initiated.

CONCLUSION AND RECOMENDATION

The implementation of the community service activity in Tuwung Village successfully achieved its objective of empowering the PKK women's group through the utilization of aquaculture resources and local wisdom involving NTFP plants. The innovation of catfish stick products naturally seasoned with Mekai leaves was proven to significantly increase the participants' applied knowledge from only 5% during the pre-test to 100% after the post-test. The partner group has now mastered the entire structured food processing flow, from fish cleaning, filleting, kneading the dough until smooth, mechanized molding, centrifugal oil draining, to modern standing pouch packaging labeled with local wisdom.

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REFERENCES

Alma, B. (2000). Entrepreneurship. Alfabeta.

Dewi, N. K., & Farida, I. (2026). Diversification of processing and utilization of tuna skin *Thunnus* sp. in Denpasar Bali. Proceedings of the Vocational Seminar on Marine & Inland Fisheries, 3(1), 194–199.

- Endang, S. H. (2013). Traditional fish processing: prospects and development opportunities. Center for Research on Marine and Fisheries Product Processing and Socio-Economics.
- Food and Agriculture Organization of the United Nations. (2024). The state of world fisheries and aquaculture 2024: Blue transformation in action. FAO.
- Indrayanti, A. L., Juwita, D. R., Marni, & Hakim, A. R. (2019). Organoleptic test of Sungkai leaf powder (*Albertisia papuana* Becc.) as a natural flavor enhancer. *Jurnal Daun: Jurnal Ilmiah Pertanian dan Kehutanan*, 6(1), 33-39.
- Ismandari, T., & Amarullah, A. (2026). Response surface optimization of drying conditions for processing *Apa'* leaves (*Albertisia papuana* Becc.) as a plant-based natural flavoring ingredient. *Journal of Applied Agricultural Science and Technology*, 10(3).
- Mayasari, E. (2016). Effect of maturity level of fresh sokai leaves (*Albertisia papuana* Becc.) on free glutamic amino acid content. *Jurnal Ilmiah Teknosains*, 2(1).
- Mulawarman, R. F., & Wahyuni, L. E. T. (2025). Phytochemical screening and antioxidant activity of ethanol extract of Mekai leaves (*Albertisia papuana* Becc.) using the DPPH method. *Journal of Tropical Pharmacy and Chemistry*, 9(2).
- Nugroho, A., Swastawati, F., & Anggo, A. D. (2014). Effect of binding materials and frying time on the quality of mackerel fish stick products (*Scomberomorus* sp.). *Jurnal Pengolahan dan Bioteknologi Hasil Perikanan*, 3(4), 140-149.
- Purwayanti, S., Gardjito, M., Santoso, U., & Supriyadi. (2013). Taste Compound from Crude Extract of Bekkai Lan (*Albertisia papuana* Becc.). *Journal of Food and Nutrition Sciences*, 1(4), 33-37.
- Rahayu, C. (2018). Characteristics of umami taste components of aqueous extract of Sungkai leaves (*Albertisia papuana* Becc.). Thesis. Graduate School, Bogor Agricultural University (IPB), Bogor.
- Saparinto, C. (2011). Fishpreneurship: Variations of processed fishery products at industrial and household scales. Lily Publisher.
- Sihombing, G. E. (2019). Formulation of Mekai leaf extract granules (*Albertisia papuana* Becc.) as a flavor enhancer in food. Undergraduate Thesis. Faculty of Pharmacy, Mulawarman University, Samarinda. Digilib Unmul.

Widyawati, A. T. (2023). Mekai grows wild with immeasurable benefits: Potential utilization of Mekai leaves as a natural Dayak umami seasoning. *Warta Standarisasi Instrumen Pertanian Kaltim*, BPT-04, 12-15.

Winarno, F. G. (2004). *Food chemistry and nutrition*. PT Gramedia Pustaka Utama..