



Implementation of CPPB-IRT in Fish Smoking Groups Using Liquid Smoke in Langgam Village, Pelalawan, Riau

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Article History:

Received: Feb 15th 2025

Revised: April 16th 2025

Accepted: May 30th 2025

Keywords: CPPB-IRT; Baung fish; Catfish; Selais fish; Laban wood; Fish smoking

Abstract: Fish smoking in Langgam Village is a traditional practice using fuels like laban wood, coconut shells, and corn cobs. The fishery group faces challenges due to a lack of knowledge about Good Food Production Methods for Home Industry (CPPB-IRT). This community service activity, applying the Service Learning approach, aimed to address these issues by involving students in training the community on CPPB-IRT and selecting optimal fuels for processing. Students collaborated with the group to apply pyrolysis technology for improved fish processing. The results showed that group members gained a better understanding of CPPB-IRT and learned about the best fuels for smoking fish. As a result, the community was empowered with the skills to improve product quality and expand their market reach. The Service Learning approach allowed students to apply their academic knowledge while helping the community develop practical skills for sustainable growth.



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Introduction

Langgam District is a district in Pelalawan Regency. Geographically, Langgam District has a very strategic geographical location located between 1010 30' 30" East Longitude - 1010 36' 0" East Longitude and 00 05' 36" North Latitude - 00 09' 21" North Latitude. Langgam District has an area of 179,906 Ha. Langgam District has a typical processed fishery product, smoked fish, which is the potential of the community in this area. Smoked fish is fish processing by smoking which aims to maintain the quality of the fish or maintain the value of the fish so that it lasts longer. Smoked fish is the result of traditional fish preservation, the process of which is a

combination of salting and smoking so that it gives a distinctive taste¹.

The development of the production and use of liquid smoke in food products is very rapid, this can be seen from the many studies on the production of liquid smoke from various raw materials for smoke sources, such as the use of multiple types of wood such as coconut shells and sawdust², corn cobs³, oil palm fronds⁴, etc. One of the application technologies developed for utilizing coconut shell waste is to process it into liquid smoke. Liquid smoke has commercial value because it can be processed into products with better selling value.

Some recent studies highlighted different kind of liquid smoke applied in fish products, such as rainbow sardine⁵, catfish and tuna sausages⁶, catfish and snapper surimi-based chikuwa⁷, and Indian traditional smoked and dried fishery⁸.

The pyrolysis process is the thermal decomposition of biomass without oxygen. The pyrolysis process can convert plantation waste into materials that have a selling value, with a fairly good conversion. The results of this pyrolysis process are bio-charcoal, tar, and grade 3 liquid smoke. Liquid smoke consists of grade 3, grade 2, and grade 1, the classification of this liquid smoke is based on the number of hazardous compounds in the liquid smoke, thus affecting the function of the smoke.

Grade 3 liquid smoke is liquid smoke from pyrolysis that has not undergone

¹ Sri Wahyuni, Sri Umiyati, Susi Ratnawati, Titiék Indhira Agustin, Djoko Siswanto. Pelatihan Pengasapan Ikan dengan Pengawet Alami dan Permodalan Syariah di Desa Penatarsewu Kecamatan Tanggulangin Kabupaten Sidoarjo. *Jurnal Abdidas*, (2023), 4(2): 148 - 161 –DOI: <https://doi.org/10.31004/abdidas.v4i2.777>

² Sahrum RP., Zulfikar S., & Al-Ghazali.. Uji Kualitas Asap Cair Tempurung Kelapa Dan Serbuk Gergaji Kayu Metode Pirolisis. *Saintis*, 2(2), (2021): 72-78.

³ Putra B.A., Dwi P., Budi S.. Desiminasi Pembuatan Alat Asap Cair Dengan Pemanfaatan Asap Pembakaran Tongkol Jagung. *Jurnal PolBangTan*. (2023):204-207.

⁴ Lukmana M., Baimy A., & Herry I.. Perancangan Alat Pirolisis Portable Untuk Pembuatan Asap Cair Dari Limbah Pelepeh Kelapa Sawit. *EnviroScientiae*, 18(1), (2022): 13-18.

⁵ Rakhmayeni, D. A., Yuniarti, T., & Sukarno, S. (2020). Application of liquid smoke from coconut shell in Tandipang (Dussumeiria Acutta) smoked fish to extend shelf life. *Journal Ilmiah Perikanan Dan Kelautan*, 12(2), 315–323. <https://doi.org/10.20473/jipk.v12i2.20790>

⁶ Filho, P. R. C. d. O., de Araújo, I. B., Raúl, L. J., Maciel, M. I. S., Shinohara, N. K. S., & Gloria, M. B. (2021). Stability of refrigerated traditional and liquid smoked catfish (*Sciades herzbergii*) sausages. *Journal Of Food Science*, 86, 2939–2948. <https://doi.org/10.1111/1750-3841.15811>; Nithin, C. T., Ananthanarayanan, T. R., Yathavamoorthi, R., Bindu, J., Joshy, C. G., & Srinivasa Gopel, T. K. (2015). Physico-chemical changes in liquid smoke flavoured yellowfin tuna & (*Thunnus albacares*) sausage during chilled storage. *Agricultural Research*, 4, 420–427. <https://doi.org/10.1007/s40003-015-0189-z>

⁷ Swastawati, F., Agustini, T. W., Riyadi, P. H., Purnamayati, L., Prasetyo, D. Y. B., Setiaputri, A. A., & Sholehah, D. F. (2022). Characteristics of chikuwa with the addition of liquid smoke as an antibacterial agent. *Food Research*, 6, 76–83. [https://doi.org/10.26656/fr.2017.6\(5\).544](https://doi.org/10.26656/fr.2017.6(5).544)

⁸ Nithin, C. T., Joshy, C. G., Chatterjee, N. S., Kumar Panda, S., Yathavamoorthi, R., Ananthanarayanan, T. R., Mathew, S., Bindu, J., & Gopal, T. K. S. (2020). Liquid smoking - a safe and convenient alternative for traditional fish smoked products. *Food Control*, 113, Article 107186. <https://doi.org/10.1016/j.foodcont.2020.107186>.

a purification process. Grade 3 liquid smoke is not used as a food preservative but is used in rubber processing, deodorizing, and wood preservatives to make it resistant to termites. Grade 2 liquid smoke is for food preservatives as a substitute for formalin with smoked taste (smoked meat or smoked fish). Grade 1 liquid smoke is used as a food preservative such as meatballs, noodles, tofu, and barbecue spices. The compound responsible for the preservation process is the phenol compound. The presence of phenol with a high boiling point in smoke is a highly antibacterial substance so that it can prevent the process of destruction by bacteria.

Total titrated acid Acidic compounds in liquid smoke have antimicrobial properties. These antimicrobial properties will increase if organic acids are present together with phenolic compounds. Acidic compounds are formed from the pyrolysis of wood components such as hemicellulose and cellulose at certain temperatures. The phenol quality of coconut shell liquid smoke is 14.96%². This waste has useful carbon and hydrogen content, such as carbon elements of 43.42% and hydrogen of 6.32%⁹. Corn cob waste can be processed into liquid smoke through the pyrolysis process. Liquid smoke is the result of condensation from the combustion vapor of materials containing carbon, cellulose, hemicellulose, and lignin.

According to Haji¹⁰ solid palm oil waste consists of hemicellulose, cellulose, lignin, ash, and other components. Based on these components, waste handling by piling and burning is not the right and effective method. One alternative technology in processing solid palm oil waste is the Pyrolysis Technique. According to Haji, this technique can process solid palm oil waste quickly. Through the pyrolysis technique, biomass can produce charcoal and smoke¹¹. The smoke released is condensed into condensate called liquid smoke. Pyrolysis aims to release the volatile matter components contained in biomass¹².

Method

The methods used in this community service activity are socialization, counseling, FGD (Focus Group Discussions), training/mentoring, application of technology and innovation, evaluation, and a sustainability plan. This activity

^{9 10}Amin A., Sitorus, S., & Yusuf, B. Pemanfaatan limbah tongkol jagung (*Zea mays* l.) Sebagai arang aktif dalam menurunkan kadar amonia, nitrit dan nitrat pada limbah cair industri tahu menggunakan teknik celup. *Jurnal kimia mulawarman*, (2016)13.

¹⁰ Haji, A. G.. Komponen kimia asap cair hasil pirolisis limbah padat kelapa sawit. *Jurnal Rekayasa Kimia & Lingkungan*, 9(3), (2013): 109-116.

¹¹ Fauziati, F., & Haspiadi, H. 2016. Asap cair dari cangkang sawit sebagai bahan baku industri. *Jurnal Riset Teknologi Industri*, 9(2): 177-186

¹² Nuryati, N., Jaya, J. D., & Meldayanoor, M. 2016. Perancangan dan aplikasi alat pirolisis untuk pembuatan asap cair. *Jurnal Teknologi Agro-Industri*, 2(1):15-23.

follows the Service Learning approach, which emphasizes academic learning through real-world community involvement.

Planning and Goal Setting.

Before beginning the community service activity, we conducted an initial meeting with community members to discuss the planned activities and better understand the specific challenges they faced. This collaboration ensured that the project was aligned with their needs, and the participants were actively involved in the goal-setting process.

Implementation.

The activity commenced with the socialization, counseling, and FGD stages. During these phases, the research implementer, supported by students, conducted training on Good Food Production Methods for Home Industry (CPPB-IRT), proper fishery product handling using pyrolysis equipment, and the process of making liquid smoke. Students learned by applying their academic knowledge to solve real community problems and contributed to enhancing local industry practices.

Reflection and Application of Technology.

At the stage of technology and innovation application, the students actively participated in the handover of the pyrolysis equipment to the partner community and assisted in the trial run of the pyrolysis smoking equipment. The team helped produce liquid smoke on fishery products such as smoked Selais fish, smoked nuggets, and smoked meatballs. This hands-on experience allowed the students to connect their academic learning in technology and innovation with the practical needs of the community.

Evaluation and Sustainability.

After the activities were implemented, we conducted an evaluation of the community service efforts and the impact of the training and equipment. This was followed by the creation of a sustainability plan to ensure that the community can continue utilizing the new technology independently. Students were involved in the evaluation process, reflecting on their experiences and the project's overall success.

Sustainability and Continued Involvement.

Community members were included in both the planning and decision-making processes throughout the activity. This collaboration ensured that the knowledge transfer was mutual and allowed for a long-term partnership. Students continued to mentor the community members, helping them to build the capacity to sustain the new practices and technologies beyond the initial intervention.

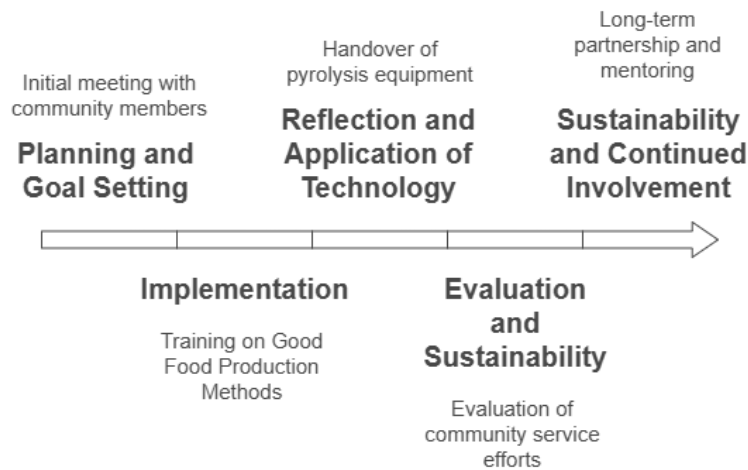


Figure 1. The stages in the service learning approach

Result

CPBB-IRT Training

A training session on proper food processing techniques for home industries was successfully conducted with the local processing group in Langgam Village. The focus of the training was on *Cara Produksi Pangan yang Baik untuk Industri Rumah Tangga* (CPPB-IRT), or Good Food Production Practices for Home Industries.

The session was attended by 15 enthusiastic participants, all of whom showed a keen interest in the material presented. The chief executive delivered an engaging explanation of the CPPB-IRT guidelines, which was met with high levels of attentiveness and curiosity from the attendees.

Throughout the training, participants remained actively involved, asking insightful questions and engaging in discussions, reflecting their commitment to improving the quality and safety of their food processing practices.



Figure 2. CPPB-IRT Training for Smoked Fish Processing Group

Use of Different Fuels in Making Liquid Smoke

In this community service activity, the implementers introduced pyrolysis technology as a method for producing liquid smoke using various biomass fuels such as coconut shells, oil palm fronds, and corn cobs. Pyrolysis involves the thermal decomposition of organic materials in the absence of oxygen, resulting in the production of liquid smoke—a solution rich in antimicrobial and preservative compounds.

Liquid smoke is obtained from the direct or indirect combustion of carbon-containing materials like wood, coconut shells, oil palm waste, and sawmill byproducts. This environmentally friendly product has significant applications in food preservation, particularly in fish processing.

By using liquid smoke produced through pyrolysis, local fish processors can enhance the shelf life, flavor, and safety of their products without relying on synthetic preservatives. This technology supports the development of more sustainable and value-added fish processing practices in the community.

Implementation of Liquid Smoke Technology on Fishery Products

Trial of pyrolysis smoking device to obtain liquid smoke on fishery products such as smoked selais fish, smoked nuggets, and smoked meatballs. The flavor of smoked meatballs and nugget products is the totality of taste and aroma felt during food consumption. Phenolic compounds that play a role in the formation of smoked flavor are guaiacol, 4-methyl guaiacol, and 2,6-diamethoxy phenol. Phenolic compounds that play a greater role in the formation of smoked aroma are syringol.

The application of *Cara Produksi Pangan yang Baik untuk Industri Rumah Tangga* (CPPB-IRT), or Good Food Production Practices for Home Industries, plays a crucial role in ensuring food safety and enhancing product quality, particularly in the implementation of liquid smoke technology on fishery products in Langgam

Village.

In this community-based initiative, liquid smoke—produced using pyrolysis from agricultural biomass such as coconut shells, palm fronds, and corn cobs—is introduced as a natural preservative and flavoring agent for processed fish. However, the effectiveness of this technology in delivering safe, high-quality products is closely linked to the implementation of CPPB-IRT principles.

CPPB-IRT provides a comprehensive framework that guides home-scale food processors in maintaining hygiene, sanitation, equipment standards, proper labeling, and documentation throughout the production process. In the context of fish processing using liquid smoke, CPPB-IRT contributes in the following ways:

1. Ensuring Safe Handling of Raw Materials.

Fish, being highly perishable, requires careful handling from the moment it is caught or received. CPPB-IRT emphasizes the importance of cleanliness, temperature control, and separation of raw and cooked products to prevent contamination.

2. Standardizing Liquid Smoke Application

The method and concentration of applying liquid smoke to fish must be consistent to ensure product safety. CPPB-IRT encourages the use of standardized procedures and proper measurements, minimizing risks of under- or over-treatment.

3. Maintaining Sanitation in the Production Environment

The processing area, tools, and equipment used in fish smoking must meet hygiene standards to prevent microbial contamination. CPPB-IRT offers clear guidelines for cleaning protocols and facility layout to support this.

4. Promoting Quality Assurance Practices

By incorporating monitoring and evaluation steps, CPPB-IRT helps processors maintain consistency in taste, texture, color, and aroma—key indicators of quality in smoked fish products.

5. Supporting Consumer Trust through Proper Labeling

CPPB-IRT requires clear labeling of ingredients, processing dates, and expiration dates. This transparency not only builds consumer confidence but also supports traceability and accountability.

6. Encouraging Waste Management and Environmental Awareness

CPPB-IRT also promotes environmentally responsible practices, aligning well with the use of liquid smoke from renewable agricultural waste, thus making the fish processing both safe and sustainable.

Discussion

Food safety is an important thing in a product so as not to endanger consumer health. One effort to improve the safety of quality and halal products is by implementing Good Food Production Methods for Home Industries (CPPB-IRT) by the Regulation of the Head of the Food and Drug Supervisory Agency (BPOM) Number HK.03.1.23.04.12.2206. CPPBIRT is a standard that contains requirements that must be met by business actors to produce processed food that is safe, quality, and suitable for consumption¹³. If these standards have been met and implemented, business actors will obtain a distribution permit in the form of a Home Industry Food Production Certificate (SPP-IRT)¹⁴.

By combining liquid smoke technology with CPPB-IRT principles, fish processors in Langgam Village can produce high-quality, safer fishery products that meet regulatory standards and appeal to a broader market. This synergy not only improves public health outcomes but also enhances the competitiveness and reputation of local food industries.

The making of liquid smoke starts from the raw material of old coconut shells which are put into a special furnace, after burning for about 5 hours, raw liquid smoke is produced. To get better results, the raw liquid smoke is then distilled again/redistilled until the color becomes clear.

Coconut shells are part of the coconut fruit in the form of endocarps, are hard, and are covered by coconut fiber. Coconut shells are usually used as materials for crafts, fuel, and briquettes. Coconut shells have a chemical composition similar to wood and contain lignin, hemicellulose, and cellulose. Coconut shells are usually used as the main ingredient for making charcoal and activated charcoal. This is because coconut shells are materials that can produce a calorific value of around 6,500 - 7,600 Kcal / g.

Solid waste from plantations and the palm oil industry generally contain high organic materials so they have the potential to pollute the environment if not handled properly. One alternative technology in processing solid palm oil waste is the Pyrolysis Technique. The process of making liquid smoke is, oil palm frond waste is cut into small pieces and dried first in the sun for 4-5 days. Then put into the pyrolysis reactor, Liquid smoke from oil palm fronds begins to drip at a pyrolysis temperature of 90-98°C. As the pyrolysis temperature increases, the liquid smoke

¹³ Ali, D. Y., Widjanarko, S. B., Yuwono, S. S., Fibrianto, K., & Mubarok, A. Z.. Penerapan CPPB-IRT dan Perbaikan Produksi Sari Buah di Bumdesa Makmur Abadi. *JPPM (Jurnal Pengabdian dan Pemberdayaan Masyarakat)*, 5(2), (2022): 343-352. <https://doi.org/10.30595/jppm.v5i2.5846>.

¹⁴ Yulianti, M. D., & Mustarichie, R.. Tata Cara Registrasi Untuk Pangan Olahan Industri Rumah Tangga (PIRT) Dan Makanan Dalam Negeri (MD) Dalam Rangka Peningkatan Produk Yang Aman dan Bermutu di Bandung Jawa Barat. *Farmaka*, 15(3), (2018): 57-64. <https://doi.org/10.24198/jf.v15i3.14749>.

drops that flow increases.

Research Majid et al., shows that pyrolysis of oil palm fronds lasts for 5 hours and ends when the liquid smoke no longer drips. And obtained a yield of liquid smoke from oil palm fronds of 2.5% with 10 kg of material at an average temperature of 400°C.¹⁵ The pyrolysis process with oil palm frond raw materials is relatively short compared to Galam wood and rubber wood raw materials because the structure of oil palm fronds is not a main wood, with fragile and light properties.

Corn cobs are the inner part of the female organ where the grains sit attached. This term is also used to refer to all parts of the female corn (corn fruit). Corn cobs are wrapped in corn husks (corn husks). Morphologically, corn cobs are the main stalks of modified panicles. Male organ panicles in corn can produce grains under certain conditions. Young corn cobs can be eaten and used as vegetables. Old cobs are light but strong. The processing of corn cob biomass waste by simultaneous pyrolysis produces charcoal and liquid smoke (liquid smoke) by reaching 40% liquid smoke with the characteristics of a reddish yellow liquid product, a distinctive odor of corn cob liquid smoke, pH 1.9, specific gravity 1.008 g / mL. The characteristics of this liquid smoke meet the criteria of the Indonesian National Standard (SNI), therefore it can be used as a fish preservative.

The pyrolyzer in this study was designed as a set of tools to produce liquid smoke with the working principle of the smoke gas phase produced in biomass combustion being converted into a liquid phase. This set of tools is made into one series in a table measuring 122 cm x 61 cm x 40 cm which is equipped with 4 wheels. This design makes it easy to transport the device. The portable pyrolysis tool designed in this study has 5 main components, namely the reactor, distribution pipe, condenser, control panel, and furnace/stove. The portable pyrolyzer tool set can be seen in *Figure 2*.



Figure 3. Pyrolysis Equipment

¹⁵ Majid, I. M., Hakim, A., Nugroho, A.. Perbandingan kinerja asap cair dari kayu galam , kayu karet , dan pelepah kelapa sawit sebagai penggumpal lateks pada aspek mutu bahan olah karet. Jurnal Riset Industri Hasil Hutan 11(1), (2019): 23–30.

Pyrolysis is the process of decomposing material in a reactor using heat without involving oxygen in the process. Through the decomposition of material in the pyrolysis process, liquid will be produced¹⁶. The principle of the pyrolysis process is that the biomass in the reactor is heated with little or no oxygen which causes the breakdown of the chemical structure of the biomass into a gas phase. In the gas phase, separation occurs based on the difference in evaporation speed. Then the gas is flowed into a condenser containing water to produce liquid smoke¹⁷. Testing of the pyrolyzer tool is carried out to determine whether the tool can function properly with an indicator that the pyrolysis process is taking place and producing liquid (liquid smoke).

Product timing also needs to be considered for product safety. The production process can meet the criteria according to the CPPB-IRT guidelines throughout the Indonesian people. Several aspects must be met, for example, production sites, production environments, PIRT facilities, production facilities must be clean and hygienic, smooth water supply, pest control, and hygiene from employees in the production process of smoked tilapia processing. The process of packaging and storing products must be controlled, the person in charge of the product is required to record and document training activities for employees¹⁸.

Conclusion

In optimizing the smoked fish processing business in Langgam Village, several aspects need to be considered. Liquid smoke innovation technology has an important role in the development of diverse, highly nutritious, and innovative products. In the production process, it is important to ensure the quality and safety of the product, both in terms of raw materials, production processes, and storage. The smoked fish processing group business in Langgam Village has significant benefits for business actors and local communities, such as economic empowerment, job creation, increased income, and promotion of local culture.

To ensure the long-term success and sustainability of the CPPB-IRT program in Langgam Village and its integration with liquid smoke technology for fish smoking, the following recommendations are proposed: Ongoing Training and Capacity Building, strengthening collaboration with local government and ngos,

¹⁶ Roy, P., & Dias, G. Prospects for pyrolysis technologies in the bioenergy sector: A review. In *Renewable and Sustainable Energy Reviews*, 77, (2017): 59- 69.

¹⁷ Ridhuan, K., Irawan, D., & Zanaria, Y.. Kajian Tekno-Ekonomi Produksi Reaktor Pirolisis dalam Menghasilkan Bioarang dan Asap Cair. *Turbo : Jurnal Program Studi Teknik Mesin*, 8(2), (2020): 219-225.

¹⁸ Suratman, S., Apri A., Teti S. 2025. Business Development Strategy of Smoked Tilapia Processing in Penatarsewu Village, Tanggulangin Sub-District, Sidoarjo District. *International Journal of Advanced Technology and Social Sciences (IJATSS)*. 3(1): 19-32.

improvement of processing infrastructure, and promoting market access and branding.

Acknowledgements

The community service implementer would like to thank the Directorate General of Higher Education, Research, and Technology. Ministry of Education, Culture, Research, and Technology for funding this community service program with contract number 104/E5/PG.02.00/PM.BARU/2024.

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