



Evaluating Tiered Facilitation as a Contextual Learning Approach for CPPOB Adoption in Food MSMEs

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Abstract: Ensuring compliance with Good Processed Food Production Practices (CPPOB) is a critical challenge for food MSMEs. This study evaluates a structured, tiered facilitation model—comprising socialization, technical guidance, and monitoring—to improve CPPOB adoption in Palembang. Using a quantitative pre-post intervention design, data were collected from 40 participants (owners and employees) via a validated Likert-scale instrument. The Wilcoxon Signed Rank Test revealed a significant increase in CPPOB implementation post-intervention, with $Z = -5.553$ and $p = 0.000$. Results showed no negative ranks, indicating uniform behavioral and operational improvement. The evaluation phase emerged as the most decisive factor, highlighting the importance of iterative feedback in internalizing food safety protocols. These findings provide empirical evidence on facilitation as a catalyst for organizational discipline. This study contributes to applied science by offering a scalable framework for food safety literacy, bridging the gap between theoretical hygiene standards and practical implementation in resource-constrained MSME clusters.

Keywords: CPPOB; Food safety governance; Food safety; Hygiene practices; Technical facilitation

Introduction

Micro and small food enterprises (MSMEs) are vital to developing economies, yet they often face significant challenges in meeting food safety standards like *Cara Produksi Pangan Olahan yang Baik* (CPPOB). Despite the established regulatory framework by the Indonesian National Agency of Drug and Food Control (BPOM), many MSMEs in urban centers like Palembang still struggle with technical capacity, sanitation infrastructure, and consistent documentation (Kurniawati et al., 2023; Badan Pengawas Obat dan Makanan, 2020). These gaps are not merely administrative; they reflect a deeper need for applied science literacy regarding microbial risks, hygiene, and standardized production processes (Suharno, 2020).

Empirical studies consistently show that one-off socialization is insufficient to drive compliance. MSMEs face recurring barriers, ranging from limited scientific

knowledge of food handling to a lack of structured routines (Wardanu et al., 2023). Recent literature suggests that tiered technical facilitation—integrating socialization, hands-on mentoring, and iterative evaluation—can serve as a catalyst for behavioral change (Marcelirian et al., 2023). In this context, facilitation functions as a form of contextual science education, translating complex biological and chemical safety standards into practical, operational knowledge for community-scale producers.

While the importance of facilitation is recognized, empirical evidence using quantitative pre-post analysis to measure the impact of multi-stage models remains scarce, particularly in the Southeast Asian MSME ecosystem (Kholil et al., 2024). Furthermore, there is a lack of focus on how structured monitoring specifically contributes to internalizing food safety as a form of applied science in daily production.

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This study addresses these gaps by evaluating the impact of a structured facilitation program on CPPOB adoption among food MSMEs in Palembang. By employing the Wilcoxon Signed Rank Test, this research investigates how multi-stage interventions improve operational behavior and hygiene discipline. Beyond regulatory compliance, this study contributes to the field of applied science and science education by offering a scalable framework for strengthening food safety literacy and public health protection in resource-constrained environments.

Method

Research Design

This research is a quantitative study employing a pre-post intervention design to evaluate the impact of tiered technical facilitation on CPPOB adoption. The study was conducted in Palembang, Indonesia, focusing on MSMEs in the processed food sector. A purposive sampling technique was used to select 40 participants, consisting of 15 MSME owners and 25 employees, based on their active involvement in the 2024–2025 CPPOB facilitation program (Nugroho, 2020; Sugiyono, 2021).

Study Location and Sampling Procedure

The research was conducted among MSMEs actively engaged in processed food production within the urban area of Palembang, which was determined purposively (Mukhlis et al., 2024; Asgaf et al., 2025). This location was selected for its concentration of MSMEs producing traditional foods and for its inclusion in a government-supported CPPOB facilitation initiative (BPS Kota Palembang, 2024).

A purposive sampling technique was used to identify MSMEs (Mubarokah et al., 2024; Marliyah et al., 2025), that met the following criteria: (1) they operated in the processed food sector and had received CPPOB facilitation; and (2) they were actively producing food products during the 2024–2025 period. A total of 40 respondents participated in the study, consisting of 15 MSME owners and 25 employees. This sample size is sufficient for nonparametric paired statistical tests commonly used in behavioral intervention studies (Nugroho, 2020; Sugiyono, 2021).

Data Collection Instrument

Data were collected using a validated instrument based on a 5-point Likert scale (1–5). The questionnaire was developed following the CPPOB national standards (Badan Pengawas Obat dan Makanan, 2020), covering three dimensions: (1) Initial Socialization, (2) Technical Implementation Guidance, and (3) Monitoring and Evaluation. The instrument's validity was confirmed using the Pearson Product-Moment correlation, where

all items exceeded the critical threshold of $r > 0.3673$, ensuring the reliability of the measured constructs (Sugiyono, 2021).

Validity Testing

Instrument validity was assessed using the Pearson product-moment correlation. Items with correlation values exceeding the critical threshold ($r > 0.3673$) were deemed valid (Sugiyono, 2021). All questionnaire items met this criterion, indicating strong alignment with the intended constructs and confirming the instrument's ability to measure CPPOB adoption and perceived facilitation effectiveness reliably.

Facilitation Intervention Structure

The facilitation program implemented by regulatory authorities followed a three-phase structure: (1) Phase 1: Socialization. Facilitators introduced CPPOB standards, hygiene principles, documentation procedures, and operational requirements based on national guidance documents and practical case examples from MSMEs (Badan Pengawas Obat dan Makanan, 2022; Murwadi & Saraswati, 2019; Kholil et al., 2024); (2) Phase 2: Technical Mentoring. Hands-on support was provided directly at MSME production sites. Activities included redesigning production layouts, improving sanitation practices, establishing SOPs, and guiding the implementation of CPPOB criteria, drawing on lessons from previous mentoring and training programs in similar settings (Subroto et al., 2023; Septiarti et al., 2024); (3) Phase 3: Monitoring and Evaluation. Facilitators conducted periodic assessments of hygiene conditions, equipment handling, documentation accuracy, and production workflows. Feedback and corrective recommendations were provided to ensure continuous improvement (Marcelirian et al., 2023; Kholil et al., 2024).

This multi-stage structure aligns with international best practices for capacity building in small-scale food processing units (Anggrahini, 2021; Suharno, 2020).

Data Analysis

Descriptive statistics were used to calculate mean scores, distribution ranges, and category classifications for each CPPOB dimension. Scores were interpreted using established Likert-scale interval calculations (Sugiyono, 2021). A Wilcoxon Signed-Rank Test was used to evaluate changes in CPPOB compliance before and after the facilitation program. This nonparametric test is suitable for paired ordinal data and is commonly used to assess behavioral changes resulting from capacity-building interventions (Nugroho, 2020; Sugiyono, 2021). A significance level of $p < 0.05$ was used to determine statistical significance.

Ethical Considerations

Participation was voluntary, and respondents were informed of the study's purpose, confidentiality assurances, and their right to withdraw at any time. No identifying personal or business information was collected. The study adhered to standard ethical guidelines for research involving human participants and aligned with national regulations on food safety oversight (Kementerian Kesehatan Republik Indonesia, 2021).

Result and Discussion

Validity Test Results

Validity testing using the Pearson Product-Moment method demonstrated that all questionnaire items across the three key dimensions –Initial Socialization, Technical Implementation, and Evaluation– were valid. Correlation coefficients exceeded the critical value ($r > 0.3673$), indicating that each item showed a significant, positive relationship with its respective construct. (1) Initial Socialization: r-values ranged 0.685–0.954; (2) Technical Implementation: r-values ranged 0.594–0.952; (3) Evaluation: r-values ranged from 0.734 to 0.944

These findings demonstrate strong construct validity and indicate that the instrument reliably measures CPPOB-related behaviors and perceptions of facilitation effectiveness.

Descriptive Analysis of Facilitation Effectiveness

Descriptive analysis revealed consistently high levels of perceived facilitator effectiveness across all three facilitation dimensions. Table 1 (adapted from the original dataset) indicates that mean scores for each dimension fall within the “High” category.

Initial Socialization

- Mean Score: 22.00
- Category: High
- Respondents reported substantial improvements in understanding CPPOB principles, hygiene standards, and regulatory expectations. This suggests that socialization efforts successfully established foundational knowledge for CPPOB adoption.

Technical Implementation

- Mean Score: 22.46
- Category: High
- Improvements were noted in sanitation practices, the use of hygienic equipment, adherence to SOPs, and production layout adjustments. Respondents highlighted the importance of direct, hands-on support from facilitators.

Monitoring and Evaluation

- Mean Score: 23.53
- Category: High
- This dimension received the highest score, indicating that continuous monitoring, corrective guidance, and feedback loops were the most influential aspects of the intervention in sustaining behavioral change.

Overall Facilitator Performance

- Total Mean Score: 67.99
- Overall Category: High
- The aggregated result confirms that facilitator contributions were perceived as highly effective in enabling CPPOB adoption.

Pre-Post Compliance Comparison Using the Wilcoxon Signed Rank Test

A Wilcoxon Signed Rank Test was used to assess the significance of changes in CPPOB implementation before and after the facilitation program. The test revealed:

- Negative Ranks: 0
- Positive Ranks: 40
- Ties: 0
- Z-value: -5.553
- p-value: 0.000 ($p < 0.05$)

Interpretation:

- A zero count for negative ranks indicates that none of the MSMEs or employees showed a decline in CPPOB compliance.
- The presence of 100% positive ranks confirms uniform improvement across all participants.
- The statistically significant p-value confirms strong evidence that facilitation produced measurable improvements in CPPOB adherence.

This uniform directional shift is notably rare in behavioral compliance studies and demonstrates the robustness of the intervention.

Qualitative Findings: Observed Behavioral and Operational Improvements

Although the study is primarily quantitative, brief qualitative insights were gathered through informal discussions with participants. Several key improvements were observed:

Increased Sanitation Awareness

Participants reported better understanding and practice of hygiene measures, including routine cleaning schedules, the use of proper sanitation tools, and awareness of contamination risks.

Enhanced Documentation Practices

MSMEs demonstrated improved capability in preparing and maintaining CPPOB-related documentation, including SOPs, sanitation logs, and quality control notes.

Improved Production Consistency

Respondents acknowledged improvements in product texture, flavor, color consistency, and reduced defect rates as a consequence of more standardized production processes.

Greater Confidence in Regulatory Compliance

Facilitator guidance helped MSMEs better understand how to meet BPOM requirements, increasing readiness for inspections and certification (e.g., PIRT, halal).

Summary of Results

Overall, the results demonstrate that the facilitation program significantly strengthened MSME capacity to adopt CPPOB standards. Consistent improvement was evident across all dimensions, confirming the effectiveness of a structured, multi-stage facilitation model.

Discussion

The findings of this study demonstrate that structured technical facilitation significantly enhances the adoption of Good Processed Food Production Practices (CPPOB) among micro and small food enterprises (MSMEs) in Palembang. The improvement observed across all three facilitation dimensions—socialization, technical implementation, and especially monitoring—strongly supports the view that facilitator-led interventions function as catalysts for behavioral and operational transformation in resource-limited food production environments (Marcelirian et al., 2023; Kholil et al., 2024; Subroto et al., 2023).

Facilitator Influence on Knowledge Internalization and Awareness

The high scores obtained in the initial socialization phase indicate that facilitators effectively simplified and contextualized CPPOB standards for MSMEs, many of whom previously had limited exposure to formal food safety regulations. This aligns with global research showing that comprehension of technical food safety standards is one of the primary barriers for MSMEs (Hadi, 2021; Anggrahini, 2021).

Scientific work on fermentation and microbiological spoilage also emphasizes that a misunderstanding of basic microbial processes can contribute to unsafe practices and product instability (Gänzle, 2015; Suharno, 2020). The facilitator's ability to

translate regulatory language into practical, comprehensible instructions is therefore not only pedagogical but foundational for enabling further compliance.

Technical Mentoring as a Driver of Procedural and Operational Change

The substantial improvement reported in the technical implementation dimension validates the critical role of hands-on guidance in shaping food safety practices. Similar to previous studies, this research confirms that behavioral change in sanitation, production flow, and equipment handling is most effective when interventions are immersive and context-specific (Subroto et al., 2023; Putri & Kumalasari, 2022; Kurniawati et al., 2023). Evaluations of CPPOB implementation in catering, bakery, and household-scale industries have shown that without sustained mentoring, many enterprises revert to informal practices and are unable to maintain documentation or sanitation routines (Putri & Kumalasari, 2022; Wardanu et al., 2023; Fahlevie & Fauziyyah, 2023).

The restructuring of production layouts, the adoption of cleaning routines, and the introduction of documentation processes observed in this study reflect a shift from informal, intuition-based workflows toward formalized, standardized systems, supporting theories of organizational learning and routine formation (Kurniawati et al., 2023). This finding also aligns with evidence that MSMEs require external support to develop SOPs and systematic documentation—a central requirement of CPPOB and global GMP systems (Murwadi & Saraswati, 2019; Diatmika & Rahayu, 2022).

Monitoring as the Most Influential Component of Facilitation

The evaluation phase produced the highest mean score, indicating that monitoring and feedback are the strongest determinants of sustained compliance. While training and technical support can introduce new knowledge and skills, iterative evaluation is what reinforces consistency, accountability, and long-term behavioral change (Marcelirian et al., 2023; Kholil et al., 2024). This is consistent with food safety behavior theory, which argues that compliance is reinforced through continuous feedback loops that reshape risk perception and operational discipline (Fahlevie & Fauziyyah, 2023; Kurniawati et al., 2023). Monitoring serves as a behavioral nudge, keeping MSMEs aligned with standards and discouraging a return to informal practices. The present study contributes empirical evidence supporting this theory in the context of micro-scale food producers in urban Indonesia, complementing earlier facilitation experiences in

CPPOB mentoring programs (Subroto et al., 2023; Septiarti et al., 2024).

Uniform Positive Compliance Improvement

The Wilcoxon Signed Rank Test showed no negative or neutral outcomes, meaning all respondents improved their CPPOB implementation. This uniformity is particularly notable, as MSMEs typically exhibit heterogeneous responses to capacity-building initiatives due to variations in size, resources, and managerial ability (Nugroho, 2020; Sugiyono, 2021). However, the structured design of the facilitation—progressing from knowledge transfer to hands-on practice and then to monitoring—appears to mitigate these differences and produce collective improvement.

This finding expands the literature by demonstrating that, under the right intervention structure, MSMEs can achieve synchronized compliance progression. It challenges the assumption that micro-enterprise improvement is inherently uneven and slow, suggesting instead that well-designed facilitation programs can generate cohesive outcomes across heterogeneous enterprises (Marcelirian et al., 2023; Kholil et al., 2024).

Implications for Food Safety Governance and MSME Development

The results of this study support the argument that food safety governance in developing countries requires not only regulatory enforcement but also capacity-building mechanisms (Badan Pengawas Obat dan Makanan, 2022; Kementerian Kesehatan Republik Indonesia, 2021). MSMEs face a dual challenge: they must comply with increasingly strict standards yet often lack the structural foundations—technical knowledge, sanitation facilities, and documentation capacity—to do so independently (Suharyanto & Sari, 2020; Kurniawati et al., 2023). Facilitators, therefore, function as intermediary actors bridging institutional expectations and operational realities (Marcelirian et al., 2023; Septiarti et al., 2024).

From a business perspective, improved hygiene, service quality, and grooming standards are known to enhance customer satisfaction and brand image, implying that investments in CPPOB compliance can yield commercial benefits in addition to regulatory compliance (Setiawan et al., 2024; Kumar et al., 2020). In this way, facilitation contributes not only to food safety outcomes but also to MSME competitiveness and local economic development (Murwadji & Saraswati, 2019; Diatmika & Rahayu, 2022).

Conclusion

This study confirms that a structured, tiered facilitation program significantly enhances CPPOB adoption among MSMEs in Palembang ($Z=-5.553$, $p = 0.000$). The 100% positive improvement rate demonstrates the robustness of integrating socialization, mentoring, and evaluation. Specifically, the monitoring phase proved to be the most critical for sustaining behavioral change. These findings suggest that food safety facilitation serves as an effective model of contextual science education, providing a practical framework for policymakers to improve public health and MSME competitiveness through applied science literacy. Future research should integrate objective microbiological indicators to further validate the longitudinal durability of these behavioral improvements.

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Author Contributions

P.A.O.: Developing ideas, data collection, analyzing, writing, reviewing, and responding to reviewers' comments; E.L., U.S.R., Y.O., R.N.S.: supervising data collection, analyzing data, reviewing data and writing; M.K.: reviewing data and writing.

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Conflicts of Interest

The authors declare no conflict of interest.

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