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# OPERATIONAL COST CONTROL STRATEGIES THROUGH COFFEE PULP WASTE MANAGEMENT AND SOP COMPLIANCE FOR COFFEE PROCESSING SMES

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***Abstract***

This community engagement initiative was designed to address critical operational cost challenges faced by coffee processing Small and Medium-sized Enterprises (SMEs) in Indonesia. The program focuses on two key areas: the lack of Standard Operating Procedure (SOP) compliance, which leads to inefficiency, and inefficient coffee pulp waste management, which represents both a disposal cost and a missed revenue opportunity. The target audience comprised 30 coffee processing SMEs in the Garut region, West Java, who often struggle with thin profit margins and inconsistent processing. The implementation methods included participatory workshops, hands-on clinics for SOP development, and practical demonstrations of coffee pulp valorization (e.g., the production of 'cascara' tea and organic compost). The results show a significant improvement in participants' ability to identify cost drivers and implement basic SOPs, leading to reduced processing errors. Furthermore, participants successfully initiated waste-to-value streams, turning coffee pulp from a costly waste product into a potential revenue source. This program underscores that an integrated approach combining process standardization (SOPs) with circular-economy principles (waste

management) is a highly effective strategy for enhancing the financial resilience and sustainability of coffee SMEs.

**Keywords:** *Operational Cost, Waste Management, Coffee Pulp, SOP Compliance, SME, Community Engagement*

## INTRODUCTION

The coffee sector in Indonesia is a vital component of the national economy, with Indonesia ranking among the world's top producers. This industry is dominated by Small and Medium-sized Enterprises (SMEs), which handle the majority of post-harvest processing, from pulping and drying to roasting (BPS, 2024). These SMEs are critical engines for rural employment and local economic development. However, despite their importance, many coffee processing SMEs operate with very low-profit margins, high vulnerability to price shocks, and significant operational inefficiencies.

A primary challenge threatening the sustainability of these SMEs is the poor control of operational costs. Many SME owners lack formal financial or managerial training, leading to a limited understanding of their own cost structures (Rahayu, 2017). Costs are often tracked in a rudimentary fashion, making it difficult to identify and manage sources of financial leakage. This results in reactive decision-making rather than proactive cost management, leaving businesses exposed to fluctuations in raw material prices and processing yields.

One major source of uncontrolled cost is the lack of process standardization. The absence of clearly defined Standard Operating Procedures (SOPs) for critical steps like pulping, fermentation, drying, and sorting leads to high variability in product quality. This inconsistency is a direct source of cost; it results in higher defect rates, product rework, inefficient use of labor and energy, and potential loss of batches due to mold or over-fermentation (Heizer et al., 2020). SOPs are the foundation of operational efficiency, and their absence creates a chaotic environment where costs are inherently difficult to control.

Simultaneously, coffee processing generates substantial amounts of organic waste, most notably coffee pulp (the skin and flesh of the coffee cherry). In the wet processing method, coffee pulp can account for up to 40% of the cherry's total weight. For most SMEs, this pulp is treated as a costly nuisance. It is either left to rot, causing environmental hazards like soil acidification and waterway pollution, or SMEs must pay for its removal and disposal. This transforms a significant by-product into a direct operational cost, further squeezing profit margins.

The paradigm of a circular economy offers a powerful alternative to this linear "take-make-dispose" model (Rizos et al., 2016). Coffee pulp is not waste; it is a resource rich in nutrients, antioxidants, and fibers. It can be "valorized," or transformed into valuable products such as cascara (a dried fruit tea), organic compost, animal feed, or even biofuels (Murthy & Naidu, 2012). Adopting this perspective allows an SME to convert a cost center (waste disposal) into a potential profit center or, at minimum, a cost-saving center (e.g., using compost to reduce fertilizer costs).

This community engagement program was therefore designed to tackle these two problems in an integrated fashion. We hypothesized that operational cost control could be significantly improved by training SMEs in both SOP compliance (to reduce inefficiency costs) and coffee pulp valorization (to reduce disposal costs and create new revenue). This paper details the methodology of this intervention and reports on its outcomes in

improving the operational and financial resilience of coffee SMEs.

## METHOD

The implementation of this community engagement program utilized a participatory and educational approach, designed for high-impact knowledge transfer and practical adoption by SME owners.

1) Location and Target Audience

The program was conducted in the Garut region, West Java, an area renowned for its high-concentration of coffee plantations and processing SMEs. The target audience consisted of 30 owners and operational managers from coffee processing SMEs. Participants were recruited in collaboration with the local Cooperative and SME Office (Dinas Koperasi & UKM), ensuring that the program reached businesses that were actively processing and in need of operational support.

2) Module and Material Development

Educational materials were developed to be highly visual, practical, and in simple language, avoiding complex academic jargon. The modules covered:

a. Basic Operational Cost Tracking: How to identify and log costs (labor, energy, materials, waste).
b. SOP Development: The 'why' and 'how' of simple SOPs. Templates were provided for key processes (sorting, pulping, drying).
c. Waste Valorization Techniques that include cascara production, a step-by-step guide for pulping, cleaning, and drying the pulp for human consumption (tea) and composting, low-cost methods for composting pulp for use as organic fertilizer.
d. Cost-Benefit Analysis: Simple calculations to demonstrate the financial impact of implementing SOPs (reduced waste) and valorizing pulp (new revenue/cost savings).

3) Implementation Stages The program was delivered over two months through a blended approach:

a. Workshop 1: Cost Control & SOP Clinic: A one-day face-to-face workshop focused on identifying cost centers and the importance of SOPs. In the afternoon "clinic" session, participants drafted their own simple SOPs for one critical process in their facility, with guidance from the facilitators.
b. Workshop 2: Waste-to-Value Demonstration: A one-day practical session held at a partner SME's facility. This included hands-on demonstrations of proper cascara drying techniques and building a simple compost pile.
c. Digital Mentoring: A one-month follow-up period where participants could ask questions, share progress, and receive feedback from the program team via a dedicated WhatsApp group.

4) Evaluation Method To measure the program's effectiveness, a mixed-methods evaluation was used:

a. Pre-test and Post-test: A short quiz administered before Workshop 1 and after Workshop 2 to measure the quantitative increase in knowledge regarding cost control, SOPs, and waste valorization.
b. Implementation Audit: A follow-up visit and checklist one month after the mentoring period to observe and record the adoption rate of SOPs and waste management practices.
c. Qualitative Interviews: Semi-structured interviews with 10 participants to gather qualitative feedback on the program's

relevance, challenges, and perceived impact.

## RESULT AND DISCUSSION

The program yielded quantifiable improvements in knowledge and practical adoption of new operational strategies. The 30 participating SMEs were representative of the local industry, typically employing 3-10 workers and processing between 1-5 tons of coffee cherries per harvest season.

Initial pre-test results confirmed the baseline assumptions of the project. Only 10% of participants (3 SMEs) reported using any form of written SOPs, and even these were described as "informal." Furthermore, 90% (27 SMEs) stated they viewed coffee pulp exclusively as a waste product, with 75% (22 SMEs) reporting that they either paid for its removal or incurred labor costs to dump it far from their facilities. Knowledge of operational cost tracking was limited, with most owners conflating "profit" with "cash in hand."

The post-test, conducted after the two workshops, demonstrated a significant knowledge gain. The average participant score on the knowledge quiz increased from 32% (pre-test) to 81% (post-test). The most significant gains were in awareness of waste valorization; 100% of participants could correctly identify cascara and its potential as a product, and 95% could describe the basic steps for composting. Understanding of SOPs also improved, with 88% of participants able to articulate how SOPs could reduce processing errors and costs.

The one-month follow-up audit provided tangible evidence of implementation. Of the 30 SMEs, 24 (80%) had successfully implemented at least one of the SOPs they drafted during the clinic. The most commonly adopted SOP was for "cherry sorting before pulping," as participants quickly saw its link to improving the final quality and reducing time spent on sorting defective beans later.

Adoption of waste management practices was also highly positive. A total of 18 SMEs (60%) had initiated new waste management practices. Of these, 12 SMEs (40% of total) began large-scale composting, citing the immediate benefit of creating their own fertilizer for the next season. A smaller, more "market-adventurous" group of 6 SMEs (20% of total) had produced and dried their first small batches of cascara, with two already securing sales to a local cafe.

Qualitative feedback from interviews highlighted a fundamental shift in mindset. One participant stated, "For ten years, the pulp was a headache that cost me money. After the workshop, I realized it is a resource. The compost I am making will save me millions (Rupiah) in fertilizer costs." This sentiment was echoed by others, who felt empowered by the practical, low-cost solutions presented.

Challenges were also noted. Several SMEs (20%) that did not implement SOPs cited "resistance from experienced workers" who preferred "the old way" of doing things. For those attempting cascara, the primary barrier was not production but "finding a buyer" and "understanding quality standards for export." This feedback indicated that while the production knowledge was successfully transferred, a future intervention should include market linkage.

### Discussion

The results of this engagement program strongly suggest that an integrated approach to operational management is highly effective for coffee SMEs. The 49-percentage-point increase in knowledge scores (from 32% to 81%) is a clear indicator that the participatory workshop model was successful. This aligns with adult learning principles, showing that SMEs are highly receptive to new knowledge when it is presented practically and solves an immediate, tangible problem (e.g., "my costs are too high" or "this waste is a problem").

The 80% adoption rate for at least one SOP is a significant finding. In many SMEs, operational practices are deeply ingrained and resistant to change. The success here can be attributed to the "SOP Clinic" method. Instead of providing a thick, generic manual,

participants were guided to write their *own* simple, one-page SOP for their *own* most critical problem. This "bottom-up" co-creation fosters a sense of ownership, making implementation far more likely than a traditional, top-down training approach (Heizer et al., 2020).

The divergence in waste management adoption—60% overall, with 40% choosing compost and 20% choosing cascara—is particularly insightful. This reflects a rational risk assessment by the SME owners. Composting is a "low-risk, cost-saving" strategy; the market is internal (their own farm), and the benefit (reduced fertilizer cost) is guaranteed. Cascara, conversely, is a "high-risk, revenue-generating" strategy. It requires more careful processing and market access, which many SMEs lack (Murthy & Naidu, 2012). This program successfully introduced both options, allowing SMEs to self-select the strategy that best fit their individual risk tolerance and capabilities.

The program's key contribution is the demonstrated synergy between SOPs and waste management. These two concepts are not independent. To produce high-quality, food-safe cascara, the coffee pulp must be handled cleanly and processed immediately after pulping. This is only possible if an SOP for "pulp handling" is in place. Therefore, SOP compliance becomes an *enabling factor* for waste valorization. An inefficient, non-standardized process produces contaminated or partially rotted pulp, which can only be composted, limiting its potential value.

The challenges identified—employee resistance and lack of market access—are consistent with barriers to SME innovation cited in the literature (Rahayu, 2017; Rizos et al., 2016). Employee resistance highlights the need for future programs to include "change management" modules, not just for the owners, but for their key employees. The market access barrier for cascara suggests that the next phase of engagement should move beyond *production* training and focus on *market linkage*, perhaps by connecting the SME cooperative with specialty coffee exporters or local hotel/restaurant associations.

Ultimately, the most profound outcome, as noted in the qualitative interviews, was the attitudinal shift. The program helped reframe "waste" as a "resource." This cognitive change is a critical prerequisite for the adoption of circular economy practices. By demonstrating a clear financial incentive—either through cost reduction (SOPs, compost) or revenue generation (cascara)—the program effectively aligned sustainability goals with the SMEs' primary objective of financial survival and profitability.

## CONCLUSION

This community engagement program was set against the critical challenge of operational cost vulnerability within Indonesia's coffee processing SME sector. We can conclusively report that the program successfully achieved its primary objective: to implement tangible operational cost control strategies. The intervention's design, which uniquely integrated the twin pillars of Standard Operating Procedure (SOP) compliance and coffee pulp waste management, provided a holistic and highly effective solution to the participants' most pressing financial and operational inefficiencies.

The findings regarding SOP adoption were particularly strong, with an 80% implementation rate of at least one new procedure post-intervention. This success is attributed to the "SOP clinic" methodology, which favored co-creation over a top-down mandate. By drafting their own simple procedures, SME owners took ownership, leading to immediate application. This compliance directly translated into cost control by reducing process variability, minimizing costly errors in sorting and drying, and establishing a baseline for consistent quality.

In parallel, the program's success in reframing coffee pulp from "waste" to "resource" was evident in the 60% adoption rate of new valorization practices. This outcome was not monolithic; it revealed a rational

decision-making process among entrepreneurs. The majority (40%) adopted composting as a low-risk, high-impact *cost-saving* strategy to reduce fertilizer expenses. A smaller, more market-agile group (20%) pursued cascara production, representing a direct *revenue-generation* strategy, thereby turning a former disposal liability into a new product.

Crucially, the program's most significant contribution lies in its demonstration of the *synergy* between these two pillars. They are not independent solutions but a deeply integrated system. High-quality waste valorization, such as producing food-safe cascara, is fundamentally dependent on SOP compliance for clean and timely pulp handling. This insight confirms that operational efficiency (SOPs) is an enabling-factor for participating in the circular economy (valorization), and this combined approach is what unlocks the most substantial cost benefits.

Beyond the quantifiable metrics of adoption, the program's most critical outcome, as confirmed in qualitative interviews, was the profound attitudinal shift among participants. The participatory, hands-on educational model was instrumental in changing the entrepreneurs' fundamental mindset. This intervention effectively dismantled the perception that sustainability and profitability are competing goals. By demonstrating a clear, immediate financial case for both SOPs and waste valorization, the program successfully aligned sustainable practices with the SMEs' core objective of financial resilience.

In conclusion, this engagement provides a proven and scalable model for bolstering the coffee SME sector in Indonesia. It moves beyond theoretical training by providing low-cost, high-impact solutions that SMEs can implement immediately. The program confirms that by empowering entrepreneurs with the practical knowledge to standardize their processes and create value from by-products, we can foster a new generation of coffee businesses that are not only more profitable and competitive but also inherently more financially resilient and environmentally sustainable.

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