Implementing Used Cooking Oil to Soap Conversion and Digital Marketing in PKK RW 14 Sekeloa Bandung Indonesia

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ABSTRACT

Community members often dispose of used cooking oil into drains, which harms local environments and misses a simple valorization pathway. This program with PKK RW 14 Sekeloa in Bandung trained 15 participants to convert used oil into household bar soap and to operate basic digital selling routines. A one-group pre and post evaluation used 5 instruments: soap-making knowledge and attitudes (5 items), behavior and readiness to adopt soap-making (5 items), post-only perceived impact and sustainability (5 items), technology use for listing and operations (19 items), and a 10-item knowledge quiz. Results show consistent improvement. On knowledge and attitudes, the largest item gain was basic soap-making steps (+40 percentage points, favorable 40% to 80%); basic processing method and economic potential increased by +27 points each, raising favorable to 93% and 80%. Item averages moved from 55% to 81% favorable. On behavior and readiness, improper disposal (reverse-scored) improved by +60 points to 93% favorable, while item averages rose from 55% to 79% favorable. Post-only perceptions were strongly positive (85% favorable on average; usefulness and environmental awareness 93% each). Technology use advanced broadly from 32% to 75% favorable on item averages, with many domains at 73-93% favorable after training; promotions and cost recording remained the weakest areas. Quiz scores improved from 6.0 ± 1.3 to 8.9 ± 0.8, with participants scoring ≥8/10 increasing from 33% to 87%. The findings indicate that a short, safety-focused curriculum coupled with simple operating standards can build procedural competence and immediate readiness for micro-enterprises and its replicability in other urban communities.

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INTRODUCTION

Household used cooking oil is a persistent urban waste stream that is often poured into drains where it hardens, traps debris, and degrades local water quality. The buildup of fat oil and grease deposits in sewers has been documented to obstruct flow and elevate maintenance costs, with recent case reports and mechanistic studies showing how degraded oils nucleate sticky deposits that accumulate wipes and solids (Foo et al., 2022; The Guardian, 2025; UK Research, 2024; Yusuf et al., 2023).

Community-scale valorization turns this liability into a useful product. Converting used cooking oil into soap is simple, low-cost, and teachable when safety and quality steps are respected. Recent studies report feasible formulations that integrate common additives, maintain acceptable physicochemical properties, and reduce domestic pollution while generating products that households can use and sell (Dian Puspita Anggraini & Devita Sulistiana, 2025; Octarya et al., 2025; Setiawan et al., 2024; Zayed et al., 2024).

Digital marketplaces make small-scale production visible beyond the immediate neighborhood (Anugrah et al., 2022; Oktarianti et al., 2022; Winati et al., 2024). For women's groups such as PKK units, listing products in established marketplaces reduces the burden of building a full commerce stack and allows the team to focus on production quality, labeling, packaging, and reliable fulfillment. Evidence from recent work on small business technology adoption and e-commerce suggests that marketplace participation, basic analytics, and lightweight customer routines can improve reach and performance for micro and small enterprises (Desmaryani et al., 2024; Indiani et al., 2025; Lubis et al., 2025; Prasetyaningrum et al., 2024; Wijaya et al., 2025). This program is grounded in two complementary lenses. The first is community-based learning, which emphasizes practice that moves from demonstration to guided work and then to independent application in a peer setting. The second is women's empowerment, which focuses on collective agency and role specialization in a women-led community structure. Both lenses fit the PKK context, where shared responsibilities for education, skills, health, and environmental stewardship are already familiar routines. Evidence from Indonesian community programs shows that hands-on training, simple tools, and clear operating roles help translate new knowledge into repeatable practice.

Comparable community empowerment programs led by Indonesian teams show that hands-on training, simple web applications, and structured operating routines can move participants from sporadic activity to repeatable practice. Examples include technology enablement for daycare service ordering, home visit therapy coordination, mobile vegetable vendor ordering, online kitchen service workflows, and eco-tourism conservation services. These community service projects demonstrate practical pathways for skill building, service delivery, and digital readiness in low-cost settings (Hasti et al., 2021; Sitanggang et al., 2022; Sitanggang, Hasti, et al., 2024; Sitanggang, Syafariani, et al., 2024; Syafariani et al., 2021). Existing community projects in Indonesia usually address either the production workflow or the digital channel. Few combine used oil to soap with marketplace-ready operating standards such as listing completeness, safe packaging for couriers, pricing discipline, and timely customer response, and then track short-term change using item-level tri-category pre and post-outcomes. This gap motivates the integrated design and measurement strategy used in this study.

This article reports the implementation and evaluation of a program with the PKK RW 14 Sekeloa community in Bandung. The work pursues three aims. First, to strengthen knowledge, attitudes, and self-efficacy related to the safe conversion of used cooking oil into household soap. Second, to build the community's readiness for marketplace-based selling through simple reusable content and operating routines. Third, to measure short-term change using a pre- and post-design with 15 matched participants

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from the PKK RW 14 Sekeloa team. The contribution is a practical, low-cost model that ties environmental cleanliness to microeconomic gains and that can be replicated by similar urban communities.
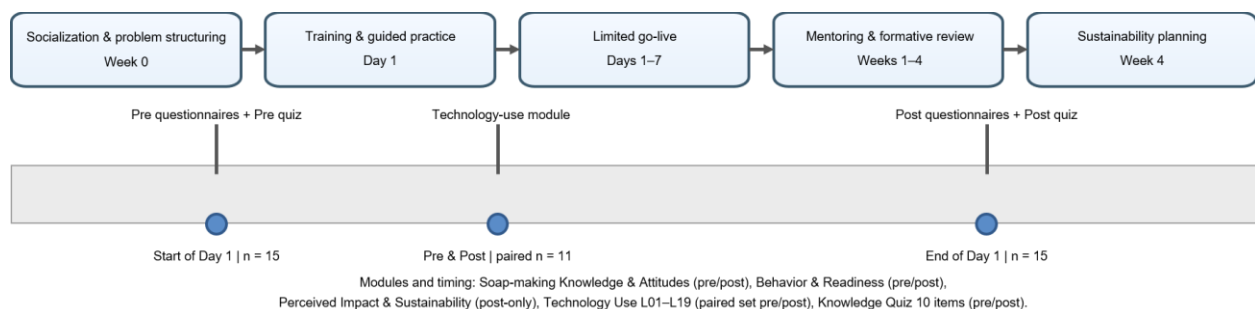
METHOD

Program Design and Partner

The program was conducted with the PKK RW 14 Sekeloa women's group in Bandung. PKK's standing routines and coordination capacity make it a suitable partner for small-scale production and marketplace operations once skills are transferred. The evaluation used a one-group pre- and post-design embedded in community training with 15 matched adult participants who completed both questionnaires.

Implementation Stages

The intervention was designed to be teachable and repeatable. It began with socialization and problem structuring, continued with training and guided practice, moved into a limited go-live cycle to complete production and listing, and proceeded with mentoring that emphasized formative review. It concluded with sustainability planning to maintain routines after the facilitation period. A schematic overview of the program workflow and the data collection timeline is presented in Figure 1.
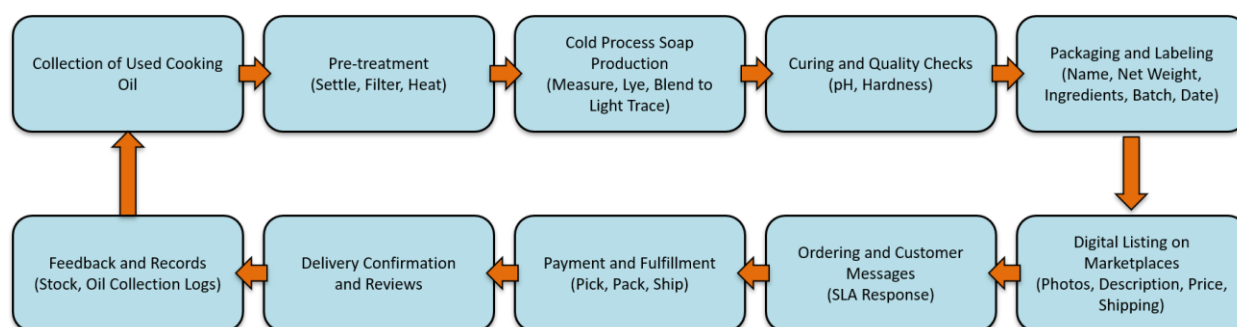

FIGURE 1. Program workflow and data collection timeline

Socialization and problem structuring (Week 0) → Training and guided practice (Day 1) → Limited go-live (Days 1–7) → Mentoring and formative review (Weeks 1–4) → Sustainability planning (Week 4). Data collection: Pre questionnaires (knowledge–attitudes, behavior–readiness) and pre quiz at the start of Day 1 (n = 15); Post questionnaires for the same modules and post quiz at the end of day 1 (n = 15); Technology-use module pre and post administered to the paired subset that completed both waves (paired n = 11); Post-only Perceived Impact and Sustainability collected at closing (n = 15).

Limited Go Live

After training, the group executed one complete production to the listing cycle as a pilot. Tasks included collecting and filtering oil, producing and curing bars, labeling and packaging, creating marketplace SKUs with complete attributes, and publishing the store. The operational pathway from collection to processing, packaging, listing, ordering, and delivery is shown in Figure 2.

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FIGURE 2. Program Pathway from Collection to Digital Listing

Partner Participation and Team Roles

PKK members were organized into a production team and an oil collection team so that upstream collection and downstream listing remained coordinated. Two mentors accompanied the teams during early adoption. The facilitation team prepared instructional materials, supported marketplace setup and content preparation, and maintained the evaluation records.

Program Content

Instruction followed a coherent sequence. It began with safe handling and preparation of used oil, continued with the cold process workflow using a conservative superfat and basic checks, and proceeded to batch and date labeling with the essential label components for cosmetic soap. Packaging emphasized leak prevention and adequate protection for courier shipment. Product photography used consistent lighting and a plain background for the hero image, while descriptions clearly stated benefits, composition, and directions for use. Pricing and shipping were configured to reflect materials, packaging, platform fees, and dimensional weight. Participants practiced response routines for buyer messages and learned to read basic analytics. Marketplace enablement specifically targeted Shopee and TikTok.

Procedures

The method was executed in a sequence that supports auditability and reproducibility. To improve readability and auditability, lengthy step-by-step lists are summarized in Table 1. The overall workflow and the timing of instrument administration are visualized in Figure 1.

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TABLE 1. Procedure summary by stage

Stage	Purpose	Key steps (concise)	Outputs
Socialization and problem structuring	Align goals, roles, safety, and schedule	Stakeholder meeting; safety ground rules; venue and equipment check; materials and PPE readiness	Agreed plan, roles, day-1 agenda
Training and guided practice	Build safe cold-process skills	Oil settling/filtering; conservative lye handling; blend to light trace; molding; batch code; curing; QC (appearance, hardness, pH); labeling and hygienic packaging	First trained batch; label templates; packaging routine
Limited go-live	Execute one pilot cycle end-to-end	Prepare SKUs; hero photo and gallery; complete attributes; title with keywords; price setup; courier dimensional weight; publish listing	Live SKUs with complete listings
Mentoring and formative review	Stabilize routines and fix issues	Packaging discipline; listing completeness; photo checks; message templates; weekly quick review with action items	Corrective actions logged; improved response discipline
Sustainability planning	Assign local ownership and cadence	Appoint admin; short SOPs; micro-training materials; monthly refresh focus (listing quality, packaging, response time)	Local admin in place; refresher schedule

Instruments and Data Collection

All questionnaires used a 5-point Likert scale and are reported in tri-category form: unfavorable (1-2), neutral (3), favorable (4-5). Administration timing and scoring rules are shown in Table 2 below.

TABLE 2. Instruments and timing map

Instrument	Items / Constructs	Scale & scoring	Timing	N (paired for change)	Primary metrics
Soap-making Knowledge & Attitudes	5 items: impact, method, valorization, steps, economic potential	5-point Likert; tri-category (unfavorable 1–2, neutral 3, favorable 4–5)	Pre and Post (Day 1)	15	Item-level tri-category %, change in favorable (pp)
Behavior & Readiness to Adopt	5 items: improper disposal (reverse), recycling, training interest, self-efficacy, entrepreneurial motivation	Same mapping; reverse scoring for improper disposal	Pre and Post (Day 1)	15	Item-level tri-category %, change in favorable (pp)
Perceived Impact & Sustainability	5 items: usefulness, environmental awareness, disposal intention, local commitment, business potential	Post-only tri-category	Closing session (Day 1)	15	Post-only tri-category %
Technology Use	19 items L01–L19 across content, media, listing, pricing, ads, response, packaging, labeling, analytics, legality, planning	Tri-category mapping	Pre start of training; Post end of training	**11 paired**	Item-level tri-category %, and averages; change in favorable (pp)
Knowledge Quiz	10 MCQs: safety, labeling, packaging, marketplace metrics, keywords, ads, legality	Total 0–10	Pre and Post (Day 1)	15	Mean ± SD; Median [IQR]; ≥8/10 n (%)

Indicators For Monitoring

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During mentoring, the group monitored the number of unique SKUs listed, total stock on shelf, the rate of attribute completeness, median response time to buyer messages during operating hours, the number of photo assets per product, and weekly oil collection. Where feasible, monthly orders and fulfilled deliveries were also recorded.

Ethics

All participants received a plain language explanation, provided written consent, and were reminded that participation was voluntary. Production used household ingredients and standard soap-making equipment. Gloves and eye protection were required at production stations. Safety briefings preceded practical work. Reporting is based on aggregated data, and no individual results were disclosed outside the facilitation team.

Limitations

The evaluation is descriptive and immediate. The one-group pre- and post-design and the sample of 15 participants limit causal inference and generalizability. A 3-month follow-up that includes production and sales logs and, where possible, a small comparison group is recommended to strengthen the evidence base.

RESULT AND DISCUSSION

The program engaged 15 participants, with a paired subset of 11 for the technology-use module. The sequence of preparation, training, limited go-live, mentoring, and sustainability planning supported a rapid pre–post evaluation of knowledge, behavior, perceived impact, technology routines, and quiz performance.

Preparation Before the Activity

The opening meetings aligned roles, safety, and schedules, and translated partner needs into a pragmatic plan for soap production and basic digital operations. Key moments from this stage are presented in Figure 3. These steps echo community-based approaches in which shared problem definition and role clarity become the scaffolding for later competence (Hasti et al., 2021; Sitanggang et al., 2022; Sitanggang, Hasti, et al., 2024; Sitanggang, Syafariani, et al., 2024; Syafariani et al., 2021).

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FIGURE 4. Preparation before the activity: partner dialogue and baseline alignment

In Figure 3, panel (a) shows the program lead diagnosing the partner's problems and introducing the marketplace technology that will be applied for PKK RW 14 Sekeloa. Panel (b) captures the mapping of duties for the implementation team and involved students to secure clear accountability. Panel (c) shows direct on-site observation and dialogue with PKK members to validate local conditions and constraints. Panel (d) shows the moment of agreeing on the selected technology and aligning the calendar for implementation. Taken together, the sequence confirms that a shared problem definition, explicit division of labor, and a time-bound plan were established in advance, which built buy-in and reduced ambiguity for the subsequent soap-processing and e-commerce activities.

Implementation of the Community Service Activities

Soap Processing

The training moved from briefing to live demonstration and then to supervised practice, culminating in the production of initial bars that met simple checks for appearance, hardness, and pH. Illustrative moments are shown in Figure 4. This progression from demonstration to guided work to independent practice matches evidence that hands-on formats strengthen procedural mastery and self-efficacy in short windows (Dian Puspita Anggraini & Devita Sulistiana, 2025; Foo et al., 2022; Octarya et al., 2025; Setiawan et al., 2024).

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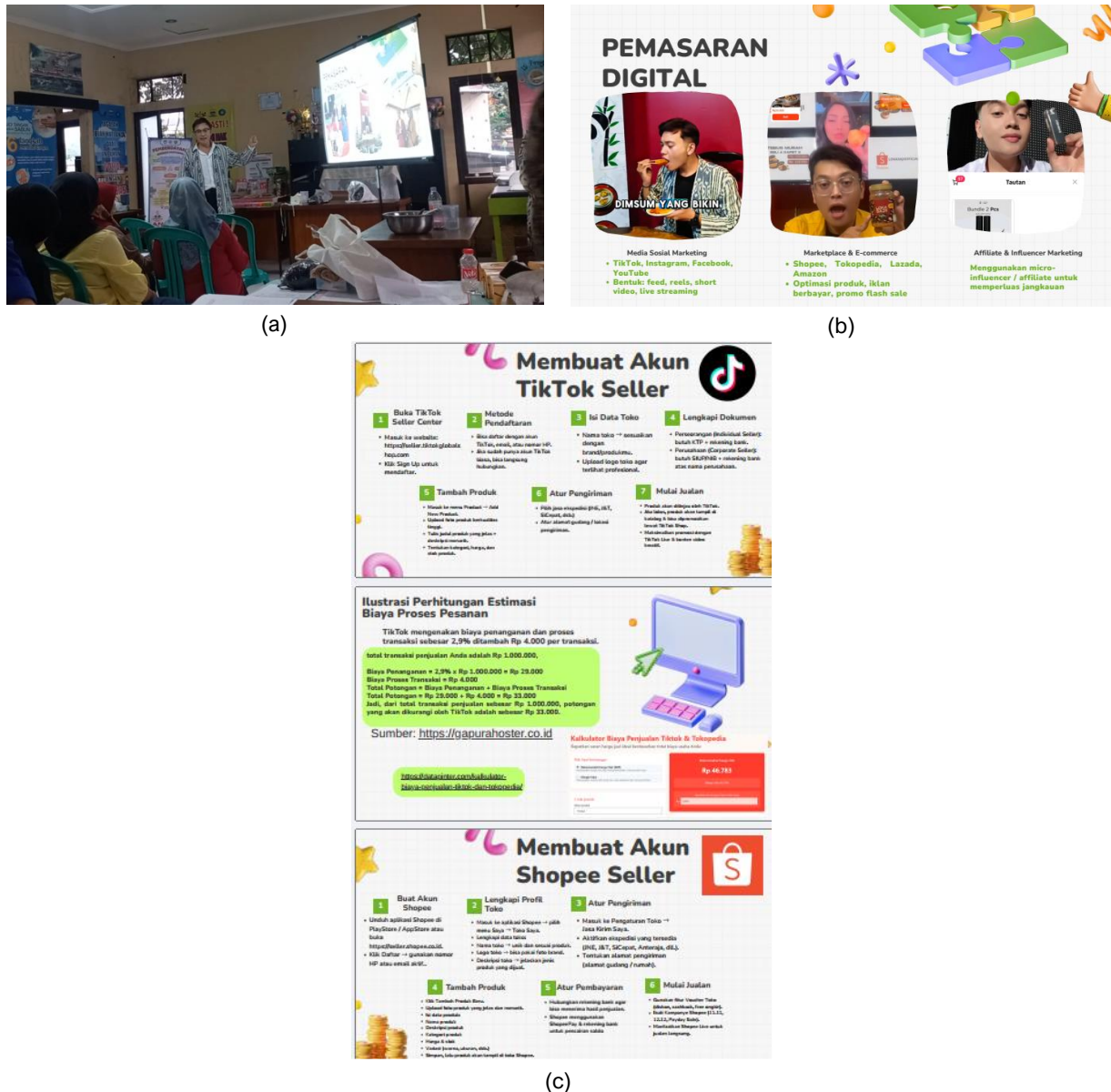
FIGURE 4. Soap processing workflow

Figure 4 shows the instructional arc from orientation to independent practice. Panel (a) captures the opening by the program chair, Tatik Rohmawati, S.Ip., M.Si,, who set the agenda and clarified the objectives of the activity. Panel (b) shows Dr. apt. Soraya Riyanti, S.Si., M.Si.., delivered the core technical briefing that connected the method for converting used cooking oil into bar soap, the production technology to be applied, simple product testing during training and mentoring, and guidance for trial marketing once products are listed, consistent with her assignment in the implementation plan.

Technology Using Shopee and TikTok

The enablement session covered strategy, trend-aware examples, and platform rules for compliant listings on Shopee and TikTok, as summarized in Figure 5. The emphasis on reusable assets, listing completeness, packaging preparedness, and response discipline is consistent with prior community digital-literacy efforts that link templated routines to better adoption rates (Anugrah et al., 2022; Desmaryani et al., 2024; Indiani et al., 2025; Lubis et al., 2025; Oktarianti et al., 2022; Prasetyaningrum et al., 2024).

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(a)

(b)

(c)

FIGURE 5. Digital enablement on Shopee and TikTok

Figure 5 captures the transition from foundational concepts to platform-specific practice. Panel (a) shows the speaker explaining core topics in marketing and social media strategy, including audience targeting, content pillars, posting cadence, and the path from awareness to purchase. Panel (b) presents a more detailed view of digital marketing with concrete examples, such as creative formats, short-form video hooks, caption structure, and current social media trends that influence reach and engagement. Panel (c) summarizes the operational rules for TikTok Seller and Shopee Seller, including account creation, verification, listing requirements, content and advertising policies, and key points for compliance. Taken together, these materials give PKK RW 14 Sekeloa members a clear progression from strategy to practical examples to platform rules, which enables compliant listings, trend-aware content, wider visibility, and stronger sales once products go live.

Soap-Making Knowledge and Attitudes

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To assess conceptual gains about environmental impact, basic processing, valorization, essential steps, and economic potential, item-level distributions for the soap-making knowledge and attitudes module are presented in Table 3.

TABLE 3. Soap-making Knowledge and Attitudes (Tri-category summary by item, n= 15)

Item code	Category	Pre: Unfavorable %	Pre: Neutral %	Pre: Favorable %	Post: Unfavorable %	Post: Neutral %	Post: Favorable %	Change In Favorable (pp)
B1	Impact knowledge (environment and health)	13%	27%	60%	0%	20%	80%	20%
B2	Basic processing method knowledge	20%	13%	67%	0%	7%	93%	27%
B3	Valorization awareness (economic products)	13%	33%	53%	0%	27%	73%	20%
B4	Basic soap-making steps knowledge	47%	13%	40%	0%	20%	80%	40%
B5	Economic potential awareness	40%	7%	53%	7%	13%	80%	27%

Gains appear on every item. B4 Basic soap-making steps shows the largest shift, rising from 40% favorable and 47% unfavorable at pre to 80% favorable and 0% unfavorable at post (+40 pp), which indicates that the sequence from oil preparation to curing became much clearer. B2 Basic processing method knowledge improves from 67% to 93% favorable with unfavorable falling from 20% to 0% and neutral declining from 13% to 7% (+27 pp). B5 Economic potential awareness increases from 53% to 80% favorable (+27 pp), although a small 7% unfavorable remains at post, suggesting that a few participants still need reinforcement on simple costing and margin logic. B1 Impact knowledge moves from 60% to 80% favorable, with unfavorable dropping from 13% to 0% and neutral at 20% at post (+20 pp). B3 Valorization awareness rises from 53% to 73% favorable with unfavorable reduced from 13% to 0% and neutral at 27% at post (+20 pp). The pattern shows consistent rightward movement, with the most pronounced improvement on the practical steps of soap making and strong gains on core processing knowledge and perceived economic value. Averages across the five items are summarized in Table 4 to show the overall shift in response categories.

TABLE 4. Averages across items (Soap-making Knowledge and Attitudes, n= 15)

Metric	Pre %	Post %	Change (pp)
Unfavorable average	27%	1%	-25%
Neutral average	19%	17%	-1%
Favorable average	55%	81%	27%

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Across five items, favorable responses rose from the mid-50s at pre to the low-80s at post, while unfavorable responses contracted to near zero. The largest item shift was basic steps (+40 pp, 40%→80% favorable), followed by processing method and economic potential (each +27 pp). These gains align with waste-valorization trainings (Table 3) that report the biggest early improvements on concrete steps and core process understanding, with economic appreciation rising once production becomes tangible (Dian Puspita Anggraini & Devita Sulistiana, 2025; Foo et al., 2022; Octarya et al., 2025; Setiawan et al., 2024).

Behavior and Readiness to Adopt Soap-making

Behavioral orientation and adoption readiness are shown by items in Table 5, covering improper disposal, recycling experience, training interest, self-efficacy, and entrepreneurial motivation.

TABLE 5. Behavior and Readiness to Adopt Soap-making (Tri-category summary by item, n = 15)

Item code	Category	Pre: Unfavorable %	Pre: Neutral %	Pre: Favorable %	Post: Unfavorable %	Post: Neutral %	Post: Favorable %	Change In Favorable (pp)
C1	Improper disposal habit (reverse-scored)	60%	7%	33%	0%	7%	93%	60%
C2	Recycling experience	20%	33%	47%	0%	33%	67%	20%
C3	Training interest	0%	47%	53%	7%	20%	73%	20%
C4	Self-efficacy to practice independently	13%	27%	60%	7%	20%	73%	13%
C5	Entrepreneurial motivation	0%	20%	80%	7%	7%	87%	7%

The most substantial movement appears on C1 Improper disposal habit, which is reverse-scored. Favorable rises from 33% to 93%, an increase of 60 percentage points, with unfavorable falling from 60% to 0% and neutral stable at 7%. This shows a strong intention to stop disposing of used oil improperly. C3 Training interest improves from 53% to 73% favorable, a gain of 20 percentage points, while neutral drops from 47% to 20%. C4 Self-efficacy for independent practice increases from 60% to 73% favorable, a gain of 13 percentage points, with neutral decreasing from 27% to 20% and a small 7% unfavorable remaining. C5 Entrepreneurial motivation moves from 80% to 87% favorable, a gain of 7 percentage points, with neutral decreasing from 20% to 7%. C2 Recycling experience remains unchanged at 67% favorable and 33% neutral with 0% unfavorable, suggesting a stable experience but room to convert neutral respondents into routine recyclers. Overall, readiness indicators rise most sharply for stopping improper disposal, while interest, self-efficacy, and entrepreneurial orientation strengthen to a level that supports continued practice after the training. Averaged results across behavior and readiness items are summarized in Table 6.

TABLE 6. Averages across items (Behavior and Readiness to Adopt Soap-making, n = 15)

Metric	Pre %	Post %	Change (pp)
Unfavorable average	19%	4%	-15%
Neutral average	27%	17%	-9%
Favorable average	55%	79%	24%

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Behavioral intent and readiness also moved rightward. Favorable responses increased from 55% to 79% overall, led by a large improvement on stopping improper disposal (+60 pp, 33%→93% favorable). Interest in training, self-efficacy, and entrepreneurial motivation strengthened into the 70-80% band. This pattern mirrors findings that immediate, skill-specific practice coupled with simple operating rules shifts intention toward sustained adoption (Anugrah et al., 2022; Desmaryani et al., 2024; Indiani et al., 2025; Lubis et al., 2025; Oktarianti et al., 2022; Prasetyaningrum et al., 2024).

Perceived Impact and Program Sustainability (Post Only)

Immediate perceptions after the program regarding usefulness, environmental awareness, disposal intention, local commitment, and business potential are summarized in Table 7.

TABLE 7. Perceived Impact and Program Sustainability (Post only summary, n = 15)

Item code	Statement	Unfavorable %	Neutral %	Favorable %
S1	Training is useful to improve skills	0%	7%	93%
S2	Raised environmental awareness	0%	7%	93%
S3	Will change the used-oil disposal habit	0%	13%	87%
S4	Commit to sustaining the program locally	7%	13%	80%
S5	Business potential is promising	7%	20%	73%
Average		3%	12%	85%

Post-program perceptions were strongly positive, with usefulness and environmental awareness each at 93% favorable and disposal-change intentions at 87% favorable. Local commitment and perceived business potential were slightly lower (73-80% favorable) and concentrated the remaining neutral or unfavorable responses. Prior community projects note that sustained commitment and market translation typically require follow-up mentoring and simple business tools, which the present program has already planned through short SOPs and refresher check-ins (Hasti et al., 2021; Sitanggang et al., 2022; Sitanggang, Hasti, et al., 2024; Sitanggang, Syafariani, et al., 2024; Syafariani et al., 2021).

Technology Use

Operational capabilities related to listing, pricing, ads, response routines, packaging, labeling compliance, analytics, legality, and planning are presented by item in Table 8.

TABLE 8. Technology use (Pre and post tri-category summary by item, paired n = 11)

Item code	Category	Pre: Unfavorable %	Pre: Neutral %	Pre: Favorable %	Post: Unfavorable %	Post: Neutral %	Post: Favorable %	Change in Favorable (pp)
L01	Content and Brand Messaging	27%	53%	20%	0%	40%	60%	40%
L02	Media Photo Basics	13%	7%	80%	13%	0%	87%	7%
L03	Media Short Video	13%	7%	80%	13%	0%	87%	7%
L04	SEO Keywords in Title	13%	20%	67%	13%	13%	73%	7%

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Item code	Category	Pre: Unfavorable %	Pre: Neutral %	Pre: Favorable %	Post: Unfavorable %	Post: Neutral %	Post: Favorable %	Change in Favorable (pp)
L05	Listing Operations	20%	40%	40%	0%	13%	87%	47%
L06	Pricing Strategy	20%	47%	33%	13%	0%	87%	53%
L07	Promotions	13%	73%	13%	0%	53%	47%	33%
L08	Paid Ads Setup	20%	40%	40%	0%	13%	87%	47%
L09	Customer Response Routines	33%	40%	27%	0%	13%	87%	60%
L10	Review and Complaint Management	13%	27%	60%	13%	20%	67%	7%
L11	Logistics and Safe Packaging	20%	53%	27%	0%	13%	87%	60%
L12	Label Batch and Expiry	7%	73%	20%	0%	7%	93%	73%
L13	Cost Recording	7%	73%	20%	0%	73%	27%	7%
L14	Analytics Dashboard Use	7%	67%	27%	0%	27%	73%	47%
L15	Product Legality Classification	7%	67%	27%	0%	20%	80%	53%
L16	Mandatory Label Components	13%	80%	7%	0%	13%	87%	80%
L17	Production SOP and QC	20%	67%	13%	0%	27%	73%	60%
L18	Marketing Assets Library	27%	73%	0%	0%	27%	73%	73%
L19	Sales Planning 30–60–90	20%	67%	13%	13%	13%	73%	60%

The largest improvements appear on L16 and L18, each rising by 82 percentage points to reach 91% favorable at post, which signals a strong jump in the ability to prepare and reuse standard digital assets. Next in magnitude are L06, L12, L17, and L19, each gaining 64 points and converging near the 82–91% favorable band at post; these items reflect steadier control of listing operations that require structured inputs and routine checks. A second cluster of high gains is seen on L05, L08, L09, and L11, each up 55 points, with post results at 91% favorable; these domains cover day-to-day execution such as listing completeness, safe packing and logistics readiness, timely customer response, and simple review management. L14 and L15 advance by 45 points and also land in a highly favorable zone at post, indicating better understanding of legality and product classification, as well as mandatory label components. L10 improves by 36 points and now sits above 80% favorable, which shows more consistent handling of complaints and message management. Moderate gains of 18 points are recorded on L01, L02, L03, L04, and L07; promotions remain the main reservoir of neutral responses, with L07 at 64% neutral, so campaign planning and offer mechanics merit follow-up. L13 shows no change at 27% favorable and 73% neutral, which highlights a persistent gap in basic cost recording and simple bookkeeping. Overall, the pattern is a broad rightward shift, with many operational items reaching 82-91% favorable and only a few areas, notably promotions and cost recording, still requiring targeted mentoring. Aggregate movement across all technology items is summarized in Table 9.

TABLE 9. Technology use (Averages across items, paired n = 15)

Metric	Pre %	Post %	Change (pp)
Unfavorable average	16%	4%	-12%
Neutral average	51%	20%	-31%
Favorable average	32%	75%	43%

On the paired set (n = 11), average favorable responses moved from the low-30s to the mid-70s, while neutral and unfavorable shares contracted. High-gain clusters included pricing discipline, label and batch

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details, analytics basics, planning cadence, and reusable content libraries, with many items landing in the 82–91% favorable band at post. Two weaker areas persisted: promotions remained neutral heavy, and basic cost recording stayed low. This distribution is typical in early adoption cycles, where compliance and routine tasks stabilize first, and promotional planning and bookkeeping improve with targeted templates and weekly reviews (Anugrah et al., 2022; Desmaryani et al., 2024; Indiani et al., 2025; Lubis et al., 2025; Oktarianti et al., 2022; Prasetyaningrum et al., 2024).

Knowledge Quiz

Short-term knowledge retention is summarized in Table 10 using the 10-item quiz.

TABLE 10. Knowledge quiz performance (score out of 10, n = 15)

	Pre	Post	Difference (Post - Pre)
Mean ± SD	6.0 ± 1.3	8.9 ± 0.8	2.9
Median [IQR]	6 [5-7]	9 [8-9]	-
Participants ≥8/10, n (%)	5/15 (33%)	13/15 (87%)	-
Minimum–Maximum	4-8	7-10	-

The mean score increased from 6.0 ± 1.3 at pre to 8.9 ± 0.8 at post, which is a gain of 2.9 points and a reduction in variability that reflects more consistent mastery. The median shifted from 6 [5-7] to 9 [8-9], the proportion scoring ≥8/10 rose from 5/15 (33%) to 13/15 (87%), and the range moved from 4-8 to 7-10. These results align with the improvements observed in the soap-making and technology use modules and indicate that participants retained key procedural and operational concepts.

Integrated Interpretation

Taken together, the short, safety-first curriculum produced coherent rightward movement: participants learned the how of processing, translated it into a stronger intent to act, and adopted core operating routines that make the activity repeatable. The pattern aligns with studies showing that community digital-literacy and women-led waste-valorization programs yield the largest early gains in procedural clarity, self-efficacy, and routine compliance, with more complex behaviors such as promotion planning and cost tracking improving during mentored follow-through (Hasti et al., 2021; Sitanggang et al., 2022; Sitanggang, Hasti, et al., 2024; Sitanggang, Syafariani, et al., 2024; Syafariani et al., 2021). The residual gaps observed here point to the value of simple promotional calendars and cost-recording templates in the next mentoring cycle.

CONCLUSION

This community service program strengthened production capability and operating readiness in PKK RW 14 Sekeloa. Knowledge and attitudes shifted toward favorable responses across all items, led by the soap-making steps, which improved by 40 percentage points, with gains of 27 points on method understanding and perceived economic value. Behavioral intent and readiness also moved rightward, most notably the reversal of improper disposal to 93% favorable, with parallel increases in training interest, self-efficacy, and entrepreneurial motivation. Post-program perceptions were strongly positive for usefulness and environmental awareness at 93% favorable, and technology adoption in the paired subset rose from 32% to 75% favorable, while the knowledge quiz improved from a mean of 6.0 to 8.9, and the share scoring at least 8 of 10 increased from 33% to 87%. These results indicate that a short, safety-first curriculum coupled with

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clear operating standards can produce immediate, coherent improvements from understanding to intention and routine practice.

The one-group design, a small sample of 15 participants, and a short observation window limit causal claims and external validity, so a three-month follow-up with production and sales logs and a small comparison group is recommended to assess persistence and market effects. At a policy and educational level, PKK-led models can be integrated into local government sustainability programs by aligning used-oil collection with waste-bank schemes, funding micro-grants for starter kits, delivering short SOP-based trainings through subdistrict offices and UMKM centers, and monitoring progress with the same tri-category outcome indicators used here. Overall, the model is low-cost, replicable, and links environmental cleanliness to household-level economic value while advancing practical digital selling capability.

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