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Beyond Production Capacity: Integrating Technology, Packaging Innovation, and Market Access at UD Karomah

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Abstract
UD Karomah is a cattle-skin cracker producer in Seganteng, Cakranegara, Mataram City, with approximately 30 years of operation. Its main constraints included limited processing equipment, weather-dependent sun drying, inconsistent net weight, and packaging unsuitable for broader retail distribution. This community engagement program integrated production technology, weighing standardization, and packaging innovation through participatory needs assessment, training, equipment implementation, mentoring, and evaluation. The intervention introduced high-pressure semawar burners, a drying oven with an 80-100 kg load capacity, a 30 kg digital scale, and a continuous band sealer. The team and partner also developed branded standing pouches in 150 g and 250 g sizes. According to program records, production output was approximately 80 kg per day, while weighing accuracy was reported at 99%. The products were recorded as being marketed in at least two modern shopping centers in Mataram. The partner also obtained a Business Identification Number and intellectual property certificates for its packaging design and logo. The documented outputs connect improvements in processing, packaging, and market access. A numerical productivity gain cannot yet be established because a comparable pre-program output figure was not available.

Keywords: appropriate technology, packaging innovation, cattle-skin crackers, MSME empowerment, market access

Introduction

Cattle-skin cracker production is an established food-processing activity in Mataram City, where small enterprises transform cattle skin into a marketable local snack. The process relies on several successive operations, including cooking, drying, weighing, and packaging. Interruptions at any stage can restrict the quantity and consistency of the finished product. For small producers serving traditional markets and souvenir buyers, production continuity must therefore be considered alongside packaging quality and distribution requirements.

Previous community engagement with a cattle-skin cracker business in Cakranegara identified constraints related to processing practices and business management (Bulkaini et al., 2023). Work with another cracker producer associated appropriate processing technology with better production capacity and consistency (Lestari et al., 2023). In a separate snack-processing program, equipment upgrading was combined with packaging improvements to address product quality and handling (Kusumaningtyas et al., 2025). Studies of small food enterprises have also addressed packaging and marketing assistance (Rahayu et al., 2020). These initiatives establish the value of individual improvements, but they offer a less specific

account of how production bottlenecks, standardized pack sizes, and retail access can be addressed together within one established cattle-skin cracker business.

UD Karomah, located in Seganteng, Cakranegara, Mataram City, has operated for approximately 30 years. Its distribution developed from one traditional market location to four, alongside regular customers, resellers, and buyers from outside Mataram seeking local souvenirs (oleh-oleh). Despite this customer base, the production line depended on four semawar burners and open-air sun drying. Weather changes disrupted drying schedules, and limited equipment restricted the ability to meet incoming orders. The absence of an adequate digital scale also made consistent net-weight control difficult. These conditions pointed to a need for a more dependable workflow and uniform retail packs; the available program narrative does not establish a numerical pre-intervention daily output.

Packaging presented a related barrier. The crackers were previously sold in transparent plastic bags with limited branding and product information. For food businesses, packaging supports protection, product recognition, and the communication of information to buyers (Mulyani et al., 2023; Nurnilasari, 2025). Packaging and label assistance has been used to develop value-added food products among small producers (Ismawati et al., 2021), while packaging rebranding has been associated with greater product acceptance in a community enterprise (Pinandoyo et al., 2022). Research on snack packaging also highlights consumers' responses to functionality, information, and visual design (Setiawati et al., 2024). Such evidence supports a packaging intervention that complements the production changes at UD Karomah (Hidayah et al., 2025).

The intervention was organized as a connected set of actions: easing production constraints, improving weighing and sealing practices, redesigning the product pack, and supporting access to broader sales channels. This integration is important because additional production volume has limited commercial value without adequate product presentation and outlets capable of receiving it. The program adopted participatory empowerment to develop the partner's ability to operate and maintain the equipment through practical training and mentoring (Pujiyanto et al., 2025). Its contribution to Sustainable Development Goal 8 concerns small-enterprise economic opportunities and market participation, while its relevance to Goal 9 lies in the adoption of appropriate processing and packaging technology. These links are reflected in the reported production output, equipment use, packaging outputs, and retail presence; they do not constitute direct measurements of employment growth or income. The program aimed to improve UD Karomah's production readiness and access to modern retail through these linked interventions.

Method

The community engagement program was implemented with UD Karomah in Seganteng, South Cakranegara, Mataram City, using a participatory empowerment approach. The implementation plan covered eight months and envisaged at least eight field visits. Activities were arranged in six connected stages: needs assessment, training, technology deployment, mentoring and evaluation, sustainability support, and partner participation. Each stage addressed constraints identified in the business's existing production and marketing workflow.

1. Needs assessment and socialization

The initial assessment combined observations of production practices, discussions with the partner, and a mapping of processing activities from raw skin to packaged crackers. Attention was given to equipment capacity, dependence on outdoor drying, consistency of weighing, sealing practices, and the presentation of products for sale. The identified constraints guided the selection of equipment and packaging assistance. Socialization established the intervention priorities and the responsibilities of the partner and facilitation team.

2. Training

Training combined explanations, equipment demonstrations, hands-on practice, simulation, and discussion. Production activities covered the operation of the semawar burners, drying oven, and digital scale; packaging activities addressed material selection, brand presentation, product information, and use of the continuous band sealer. Practical exercises allowed the partner to rehearse the operating steps subsequently addressed during mentoring. The available documentation describes the training activities but does not provide standardized competency-test scores.

3. Technology implementation

The equipment package comprised high-pressure LPG semawar burners, a stainless-steel drying oven with an 80-100 kg load capacity, a 30 kg load-cell digital scale, and a continuous band sealer. The LPG-powered dryer was equipped with tiered racks, a thermostat, and hot-air circulation. A moisture content of approximately 8-10% was specified as an operating target, not as a verified test result. For product presentation, the team used Canva to develop standing-pouch packaging comprising kraft paper laminated with aluminum foil and polyethylene. Both the equipment configuration and packaging choices addressed problems identified in the partner's existing workflow.

4. Mentoring and evaluation

Mentoring focused on routine equipment use, weighing and sealing practices, packaging consistency, and access to sales channels. Evaluation drew on observations of the original operating constraints and the outputs documented in the program records: reported daily production, weighing accuracy, packaging formats, legal documentation, and retail placement. Because the baseline was described primarily through operating conditions, the records support an assessment of implementation outputs but do not establish a fully matched numerical before-and-after comparison. The evaluation also considered the partner's ability to continue equipment use within its daily activities.

5. Sustainability

Continuation of the program depends on equipment maintenance, consistent operating procedures, periodic checks of product weight and seals, and adjustments to the packaging design in response to buyers. The partner was encouraged to maintain these practices and expand marketing contacts, including digital channels. Post-program consultation was retained as a means of addressing technical or distribution difficulties without making the partner dependent on continued equipment provision.

6. Partner participation

The partner provided the venue and time, prepared raw materials and supporting equipment, took part in equipment trials, supplied administrative documents, and applied what was learned in training. The team was responsible for facilitation, training, technology installation, mentoring, evaluation, and documentation. Under this arrangement, the partner is the main agent of change, while the team acts as facilitator and mentor.

Results

The program records document changes in equipment availability, production practices, packaging formats, and reported retail presence. Table 1 juxtaposes initial operating constraints with recorded outputs. As the initial production capacity was not reported in comparable numerical units, the 80 kg-per-day figure describes the documented program condition and cannot be used alone to calculate a percentage increase.

Table 1. Initial Production Constraints and Recorded Outputs at UD Karomah

Indicator	Initial constraint	Recorded program condition
Production capacity	Limited by four *semawar* burners and sun drying	Approximately 80 kg/day (program record)
Drying	Conventional and weather-dependent	LPG oven; rated load of 80-100 kg per drying cycle
Weighing	Net weight not yet standardized	99% accuracy (reported in program records)
Packaging	Manual sealing	Continuous band sealer introduced

Source: UD Karomah program records

The introduction of semawar burners and an enclosed dryer addressed the two operations most exposed to capacity and weather constraints. The oven's rated load is 80-100 kg; this specification concerns a single drying load and is not equivalent to finished-product output per day. Program records separately place daily production at approximately 80 kg. The enclosed chamber, tiered racks, thermostat, and hot-air circulation offer a more controlled drying arrangement than sun drying. Comparable community programs have used targeted processing equipment to reduce bottlenecks in cracker and snack production (Lestari et al., 2023; Kusumaningtyas et al., 2025). The information available for UD Karomah supports the implementation of these technologies, although it does not quantify a production gain against the original baseline.

The 30 kg digital scale was introduced to support consistent quantities in the two retail pack sizes. Program records report 99% weighing accuracy, but the calculation basis, reference weight, and number of checks are not specified in the documentation. This percentage should therefore be read as a reported program figure, not an independently validated precision estimate. The continuous band sealer was also used to improve the uniformity of package closure. More consistent weighing and sealing are relevant to pack presentation and handling, as noted in packaging support for other small food enterprises (Nurendah et al., 2021; Ismawati et al., 2021).

Table 2. Changes in Packaging Format and Product Presentation

Aspect	Initial condition	Recorded program output
Packaging type	Plain transparent plastic	Standing pouch
Size	No consistent packaging format	150 g and 250 g
Product identity	Limited brand identity and product information	Brand identity and product information included in the design
Marketing function	Limited readiness for modern retail	Standing-pouch format suitable for retail display

Source: UD Karomah program records

The packaging intervention produced standing-pouch formats for 150 g and 250 g portions, replacing the previous plain plastic packaging. The designs incorporated the product's brand identity and product information. Program documentation does not itemize the label contents or document formal food-label compliance checks, so the verified output is the packaging redesign itself. This approach is consistent with packaging development for small enterprises that combines information, appearance, and product identification (Hidayah et al., 2025; Aini et al., 2026). Consumer-oriented packaging design also emphasizes the value of assessing user perceptions before concluding that a redesign has increased sales (Setiawati et al., 2024).



Figure 1. Participatory Training Session with UD Karomah
Source: Program documentation

Figure 1 documents a partner training activity, providing evidence of the engagement process. Related programs have used packaging demonstrations and direct practice to strengthen product presentation and operator familiarity with packaging methods (Hastutiningtyas et al., 2025; Mufti et al., 2026). At UD Karomah, the reported training and mentoring activities accompanied the production and packaging outputs; the available figure does not independently document installation or performance of every device.

Table 3. Marketing and Business Strengthening Outputs

Output	Recorded achievement
Market access	Products recorded as marketed in at least two modern shopping centers in Mataram City
Packaging design	Standing pouch available in 150 g and 250 g sizes
Business legality	Business Identification Number (Nomor Induk Berusaha) obtained
Design protection	Intellectual property certificates for the packaging design and logo issued
Program publicity	News coverage in mass media and an activity video uploaded by the institution

Source: UD Karomah program records

Program records indicate that UD Karomah products reached at least two modern shopping centers in Mataram. This is a recorded distribution outcome, although outlet names, initial sales dates, and transaction figures are not included in the manuscript's source documentation. Accordingly, retail presence can be reported without attributing a measured sales increase to packaging alone. The Business Identification Number and intellectual property certificates for the packaging design and logo represent additional administrative and brand-protection outputs. Packaging development paired with business formalization has also been documented in community engagement with other small producers (Aini et al., 2026). Together, these outputs indicate improved market readiness, while revenue and repeat orders remain outside the measured outcomes.

Discussion

The intervention illustrates how production constraints and retail presentation can be treated as connected operating problems. UD Karomah already served traditional markets and returning buyers, yet weather-sensitive drying and limited processing equipment restricted its ability to respond consistently to demand. The LPG dryer provided a way to reduce reliance on sunshine, while standard weighing and packaging facilitated the preparation of uniform portions. Similar applications of production technology in small snack businesses support the relevance of targeting specific processing bottlenecks (Lestari et al., 2023; Kusumaningtyas et al., 2025). Nevertheless, the available records do not compare drying time, fuel consumption, costs, or gross margins before and after implementation. The reported production level should therefore not be taken as direct evidence of higher profitability.

Technology transfer also depends on the partner's ability to use and maintain the equipment. Training, practical exercises, and mentoring were incorporated to make equipment operation part of daily processing, consistent with the practical approach described by Pujiyanto et al. (2025). Digital weighing and mechanized sealing can support standard pack sizes, but a reliable quality-control assessment requires repeat measurements and records of rejected or reworked packs. The reported weighing-accuracy percentage remains descriptive because its testing procedure was not documented. Future routine records could provide a stronger basis for evaluating product consistency.

The standing pouch addresses a different part of the same value chain: product recognition and communication at the point of sale. Studies of small-enterprise packaging

identify the importance of visual identity, product information, and consumer acceptance (Pinandoyo et al., 2022; Setiawati et al., 2024; Mulyani et al., 2023). Packaging assistance is also associated with improved product presentation and market orientation in community programs (Mufti et al., 2026). At UD Karomah, modern-retail placement occurred alongside the packaging and production interventions. This sequence is consistent with improved market readiness, but the contribution of each action to sales cannot be separated without transaction or consumer-response data. The integrated approach extends earlier work on processing, packaging, and distribution among small food businesses (Rahayu et al., 2020).

The longer-term value of the intervention will depend on maintenance requirements, LPG expenditure, equipment downtime, packaging costs, and the stability of retail orders. None of these cost or demand variables is quantified in the current program records. A practical continuation of monitoring would record daily finished-product output, drying cycles, fuel use, rejected packs, and monthly sales by channel. The partner could use these records to assess operating efficiency and adjust pack design or distribution arrangements. In this sense, the intervention establishes operational and marketing capabilities whose economic effects should be examined over a longer period.

Conclusion

The program introduced high-pressure semawar burners, an 80-100 kg drying oven, a digital scale, and a continuous band sealer at UD Karomah, alongside branded 150 g and 250 g standing-pouch packaging. Program documentation records finished-product output of approximately 80 kg per day, reports weighing accuracy of 99%, and identifies sales presence in at least two modern shopping centers in Mataram. The partner also obtained a Business Identification Number and intellectual property certificates for its packaging design and logo. Continued monitoring should prioritize daily output, weighing checks, operating and maintenance costs, and retail orders. Such records would allow the partner to assess the durability of the new practices and their economic contribution.

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