

WOMEN, EDUCATION, AND SOCIAL WELFARE
VOL. 3 NO. 4 (2026)

ISSN: 3064-2469

From Local Ethnobotanical Knowledge to a Women-Led Herbal Enterprise Pathway: A Retrospective Implementation Study in Flood-Affected Pidie, Indonesia

Lasri*, Siti Rahmatina, Kartika Selytias Utami, and Nova Fahradina

To cite this article: Lasri, S. Rahmatina, K. S. Utami, and N. Fahradina, "From Local Ethnobotanical Knowledge to a Women-Led Herbal Enterprise Pathway: A Retrospective Implementation Study in Flood-Affected Pidie, Indonesia," *Women, Educ. Soc. Welf.*, vol. 3, no. 4, pp. 1375–1389, 2026. https://doi.org/10.70211/wesw.v3i4.798

Published online: November 12, 2026

Submit your article to this journal

View crossmark data

Full Terms & Conditions of access and use can be found at
https://journal.wiseedu.co.id/index.php/jiswel/about

OPEN ACCESS

https://doi.org/10.70211/wesw.v3i4.798

Women, Education, and Social Welfare Vol 3 No 4 (2026)

Research Article

From Local Ethnobotanical Knowledge to a Women-Led Herbal Enterprise Pathway: A Retrospective Implementation Study in Flood-Affected Pidie, Indonesia

Lasri*, Siti Rahmatina, Kartika Selytias Utami, and Nova Fahradina

Received: July 24, 2026	Revised: August 13, 2026	Accepted: October 31, 2026	Online: November 12, 2026

Abstract

This retrospective qualitative single-case study examines how local herbal knowledge, processing support, and market-facing activities were represented in a women's community-enterprise initiative in flood-affected Pidie, Aceh, Indonesia. One author-supplied programme narrative and a four-panel visual composite were reviewed using a seven-domain evidence matrix that distinguished reported activities, illustrated materials, and outcomes requiring independent verification. The record identifies ginger, turmeric, and lemongrass as familiar inputs, describes processing instruction, and depicts a multi-tray dryer, three product-presentation formats, digital promotional materials, and pharmacy displays. These outputs document elements of an early enterprise pathway, but do not verify individual skills, device performance, product safety, asset control, completed sales, or livelihood recovery. The flood chronology and participant-level losses are also unavailable. By separating participation and market visibility from economic agency, the study provides a focused implementation framework and practical priorities for independent follow-up. Its conclusions concern documentary evidence, not demonstrated causal or economic effects.

Keywords: Appropriate Technology; Digital Market Access; Ethnobotany; Post-Disaster Livelihood Recovery; Women Economic Empowerment.

Publisher's Note:
WISE Pendidikan Indonesia stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Copyright:
©
2026 by the author(s).
License WISE Pendidikan Indonesia, Bandar Lampung, Indonesia. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY 4.0) license (https://creativecommons.org/licenses/by/4.0/).



INTRODUCTION

Recovering livelihoods after a disaster requires more than replacing damaged assets. Households and small enterprises must re-establish productive routines, rebuild networks, and negotiate access to resources and markets. Recovery can be particularly demanding for women whose economic activities intersect with household and care responsibilities [1], [2], [3], [4]. Community-based enterprise initiatives have consequently attracted attention as possible routes to collective production and social reconnection, although their sustainability depends on organization, market relationships, and continued access to resources [5], [6], [7]. These international findings provide a rationale for investigating women-led initiatives in disaster-affected communities without assuming that every participating household experienced comparable losses.

In the village of Krueng Dhou (locally termed a gampong), Kembang Tanjong District, Pidie Regency, Aceh, Indonesia, program documentation describes a women's Family Welfare Empowerment group (Pemberdayaan Kesejahteraan Keluarga, PKK) engaged in a herbal-enterprise initiative in a flood-affected setting. Ginger, turmeric, and lemongrass were identified as familiar materials, while the initial account described largely household-oriented preparation and informal marketing. The account reports processing training, a drying device, product presentations, digital promotion, and local pharmacy displays. It does not establish when the flood occurred, what income participants lost, or whether the enterprise was initiated directly in response to individual losses. The intervention is therefore examined as an initiative situated in a flood-affected locality, not as verified restoration of pre-disaster earnings.

A useful distinction in such programmes concerns participation, access, capability, agency, and empowerment. Attendance establishes involvement; equipment or platform availability indicates access; practical capability entails independently demonstrated performance; and agency involves control over decisions, time, assets, and economic returns. Empowerment additionally requires evidence of sustained choices and benefits. This distinction reflects the understanding of resources, agency, and achievements in women's empowerment research [8], [9]. Studies of crisis entrepreneurship, rural livelihoods, financial access, and enterprise resilience likewise indicate that social participation and business visibility do not necessarily translate into equitable economic outcomes [10], [11], [12], [13], [14], [15].

The enterprise can also be understood through a value-chain lens. Herbal knowledge becomes economically relevant only if the group can connect ingredient selection and preparation to reliable processing, suitable product formats, credible presentation, and viable sales channels. Value-chain governance research emphasizes who coordinates activities and controls value at successive stages [16], whereas gender-sensitive syntheses caution that women's presence in production alone does not establish control over its benefits [17], [18], [19]. For a PKK-managed initiative, the pertinent questions therefore extend beyond the existence of a dryer or an online listing to responsibility for production, product quality, pricing, asset ownership, and revenue allocation.

Locally familiar medicinal plants offer culturally recognizable inputs for small-scale processing, but product opportunities must be distinguished from verified production capacity. Ethnobotanical studies in Indonesia document diverse community uses of medicinal plants

[20], [21], [22]. Research on ginger and turmeric processing further illustrates why drying conditions can influence product characteristics [23], [24], [25], [26], [27]. These studies explain the importance of appropriate technology and quality assurance; they do not establish the technical performance or safety of products shown in Pidie. Similarly, research on digital participation among women-led enterprises indicates potential market opportunities, but requires evidence of actual adoption and transactions before economic effects can be inferred [28], [29], [30], [31], [32], [33], [34].

Existing research has examined disaster recovery, women's enterprise resilience, rural digitalization, and the gendered distribution of value-chain benefits, often through independently collected interviews, observations, or business measures. Less clear is what can be established when a community initiative is documented primarily through a programme narrative and visual materials rather than participant-level observations or sales records. The Pidie case permits a focused examination of this evidentiary boundary. Its analytical contribution is to trace how familiar plant knowledge, collective training, processing technology, product presentation, and market-facing activities were assembled in one documented initiative, while distinguishing observable outputs from outcomes requiring further verification.

This retrospective study addresses three connected questions: how local herbal knowledge was represented and linked to programme activities; what production and market-facing outputs were documented; and what organizational and measurement conditions remain necessary for assessing enterprise continuity and women's economic agency. By addressing these questions together, the analysis offers a practical framework for evaluating early implementation without equating programme activity with proven livelihood recovery.

METHODS

Research Design

This study employs a retrospective qualitative single-case document analysis. The object of analysis is the written account and associated visual material relating to one PKK-linked herbal-enterprise programme in Krueng Dhou, not a sample of women interviewed for this study and not a review of published intervention trials. A single-case approach allows the relationships among recorded activities, displayed outputs, and unverified claims to be examined within their local programme context. The analysis draws on framework-based categorization of narrative and visual evidence [35], [36]; it does not imply that the programme was prospectively evaluated or that new participant interviews and observations were undertaken.

Study Setting and Programme Chronology

The programme was reported in Gampong Krueng Dhou, Kembang Tanjong District, Pidie Regency, Aceh, Indonesia, during 2026, with narrative progress described through August 2026. The reported sequence covers local coordination, identification of processing needs, training, introduction of drying equipment, product presentation, promotion, and pharmacy displays. These are ordered programme functions rather than verified event dates. The analysed account does not provide dated records for the flood, baseline assessment, training sessions,

device use, product preparation, or commercial contacts. The sequence summarized in Table 2 must therefore not be read as a chronological log or as proof of individual exposure durations. The specific flood date, duration of disruption, and participants' pre-disaster livelihood conditions were not recorded in the available materials. These contextual uncertainties are retained when interpreting the programme as an enterprise-building activity within a flood-affected locality.

Participants and Unit of Analysis

The named implementation partner was the village Family Welfare Empowerment group (PKK), with village representatives described as coordination partners. The number of unique participants, recruitment criteria, ages, roles, and attendance were not provided in the documentary record. Consequently, the programme and its described outputs form the analytic unit; no participant-level sampling frame or individual performance dataset is inferred. References to women's involvement indicate group-level programme participation, not uniformly demonstrated skill acquisition or decision authority among members.

Documentary Corpus and Source Selection

The accessible analytic corpus comprises one author-supplied programme account provided for this retrospective analysis, together with one composite figure containing four labelled panels: (A) a dryer image, (B) three product-presentation images, (C) digital-listing and social-post screenshots, and (D) a pharmacy-display collage. The existing programme tables and prose provide descriptions of these same materials and were treated as within-source representations, not additional independent documents. Original source files, image metadata, an independently titled programme report, author or custodian identification, acquisition dates, participant logs, retailer records, and a complete archive inventory were not provided. Material was included where it explicitly described the Krueng Dhou initiative or appeared in the four-panel composite; external literature informed interpretation but was never counted as direct evidence of local outcomes. The corpus thus contains one documentary account and one reproduced composite, not a verifiable count of underlying field photographs.

The material was organized into seven domains reflecting the programme's described pathway: familiar herbal knowledge, production procedures, drying equipment, product formats, packaging and labelling, digital promotion, and retail linkage. These domains arose from the activities and artifacts named in the account, rather than from measured latent constructs. Each statement was assessed against three evidence levels: narrative report, visible representation in a panel, and independent outcome verification. The first two levels can support a description of reported activities or shown materials; the third would require corroborating records or direct assessments that were not available. The consolidated evidence matrix in Table 1 records the source statement, visible artifact, and remaining inference boundary for each domain. This documentary procedure follows framework analysis and qualitative implementation-evaluation principles [35], [36].

Analytic decisions were recorded at the claim-to-evidence level in Table 1, separating what the account reports from what the image depicts and from what neither establishes. Agreement between prose and a panel was treated as within-source consistency rather than independent triangulation. The author-supplied materials do not identify the person(s) who

originally selected or coded the records, nor do they provide a dated coding log, second-coder review, or participant verification. Accordingly, intercoder agreement and independent audit checks are not claimed. For transparent replication, subsequent analyses should retain a source inventory, analyst identifiers, dated decision log, and an explicit record of conflicting or negative instances.

Ethical Considerations and Visual Provenance

No identifiable participant-level dataset was analyzed. The available record refers to local programme coordination but does not document an ethics determination, consent for secondary publication of photographs, rights to promotional designs, or authorship and editing histories for the visual panels. Panel A appears to depict a dryer, B product-presentation artwork, C screen captures, and D retail-display scenes; their original files, capture dates, and status as photographs, composites, digital mock-ups, or AI-assisted images have not been authenticated. The figure is therefore used to describe supplied visual representations, not independently verified field events. The authors and rights holders must confirm provenance, permissions, and applicable ethical requirements before publication. No safety, clinical-effectiveness, or therapeutic claim is evaluated.

RESULTS AND DISCUSSION

Results

Documented Programme Baseline and Local Herbal Knowledge

The first research question concerns whether local knowledge entered the reported enterprise activities. The baseline account identifies ginger, turmeric, and lemongrass as familiar materials and describes household-oriented processing, reliance on weather-dependent drying, limited packaging, and informal distribution. It subsequently reports instruction in ingredient preparation and handling. This establishes a documentary link between locally named herbs and a proposed processing sequence, but neither the depth of participants' ethnobotanical knowledge nor plant identity was independently assessed. Table 1 synthesizes all seven domains across the original programme descriptions, visual materials, and unverified outcomes.

Table 1. Integrated documentary evidence matrix for the seven programme domains

Analytical domain	Programme baseline / claim	Source-level evidence	Unverified outcome or provenance
Ethnobotanical knowledge	Household use of familiar herbs; ginger, turmeric, lemongrass named	Narrative: named ingredients and training inputs	No plant authentication, member knowledge scores or provenance
Production steps	Household preparation; reported selection,	Narrative: instructions and activities described	No dated observation, member-specific task assessment or repeatability

Analytical domain	Programme baseline / claim	Source-level evidence	Unverified outcome or provenance
	washing, slicing and handling		
Drying technology	Reliance on sun/weather-dependent drying	Figure 1(A): dryer and sliced material represented	No equipment model, operator, usage logs, cost, ownership or performance
Product formats	Limited local product variation described	Figure 1(B): drink, tea and capsule presentations	No authenticated production batches, recipes, quantities or quality tests
Packaging and labels	Limited branding/product identity described	Figure 1(B–C): branded packages and promotional labels	No verified label compliance, creator details, consumer testing
Digital promotion	Informal/limited marketing channels described	Figure 1(C): online listing and social post screenshots	No authenticated account control, reach analytics or completed orders
Retail linkage	Limited local distribution reported	Figure 1(D): images labelled as pharmacy displays	No dated shop confirmation, contracts, stock movements or sales

Reported Processing Activities and Collective Participation

The programme account describes selection, washing, slicing, drying, handling, and packaging as training topics. The presence of these procedural descriptions supports the conclusion that herbal-processing methods were introduced within programme activities. It does not demonstrate which participants performed the tasks, whether they could reproduce them independently, or whether botanical knowledge was formalized into reliable, documented procedures. The relevant evidence concerns the content and sequence of the initiative, not a measured change in individual skills.

PKK membership provided the organizational setting for these shared activities, but the record does not identify who chose the ingredients, assigned tasks, determined quality standards, or approved expenditure. Table 2 preserves the five stages reported in the original programme account while distinguishing stated actions from dates, participation records, and operational results that were not documented.

Table 2. Reported programme stages and available supporting records

Reported stage	Description in manuscript	Evidence level	Missing temporal/participatory detail
1. Coordination	Engagement of village and PKK	Narrative only	Dates, participants and decision minutes unavailable
2. Needs mapping	Overview of herbs, tools and market constraints	Undated baseline narrative	Original forms, criteria and respondent counts unavailable

Reported stage	Description in manuscript	Evidence level	Missing temporal/participatory detail
3. Demonstration	Instruction in processing and drying	Narrative plus dryer image	Session frequency, attendance, settings and skill tests unavailable
4. Product and market work	Packaging, online promotion, retail display	Panels B–D	Creation dates, authorship and verified transactions unavailable
5. Continuity planning	Plans for routines, roles and market linkage	Narrative only	No independent post-support monitoring or governance records
Cross-cutting	PKK group participation asserted	Group-level report	Member-level agency and distribution of benefits unknown

Drying Equipment and Processing Readiness

Panel A of Figure 1 presents a multi-tray dryer containing sliced material, consistent with the account of introducing equipment for herbal preparation. As a visible illustration, it identifies a technology associated with the programme; the image's source and capture context remain unverified. Neither equipment specifications nor operating temperature, batch volume, running cost, maintenance, user training, or before-and-after drying results were supplied. The potential contribution of this technology therefore remains a technically plausible but untested programme mechanism.

Experimental work on ginger and turmeric drying identifies processing parameters relevant to product quality [23], [24], [25], [26], [27], [37], [38]. Applied to this case, those findings indicate which performance and safety measures would be valuable in a future assessment; they do not establish the performance of the depicted dryer. Recording batch conditions, moisture levels, cleaning and maintenance routines, energy use, and participants' independent operation would permit a more substantive evaluation.

Product Presentations, Packaging, and Market Visibility

Panel B of Figure 1 shows three product representations using the Rimpang Nusantara identity: an instant herbal drink, polyherbal tea, and capsules. The narrative additionally mentions dried ready-to-brew material. These visual formats suggest an intention to move beyond raw-herb use towards differentiated products, but there are no authenticated manufacturing records, recipes, ingredient quantities, packaging specifications, or product-quality tests. In particular, product visuals alone cannot determine whether the items were manufactured or prepared as digital mock-ups.

The visual material documents an emerging brand presentation rather than verified product readiness. This distinction matters for herbal products because botanical identity, formulation, labelling accuracy, storage stability, and applicable product authorizations affect the credibility of market entry. The analysis does not evaluate the safety or therapeutic performance of the displayed items.

Digital Promotion and Retail Representation

Panel C of Figure 1 contains an e-commerce listing and social-media promotional image associated with the same brand. These screenshots illustrate that online-facing marketing materials were included in the programme output. They do not identify who controlled the accounts or establish audience reach, customer inquiries, fulfilled orders, or revenue. Assertions about digital market access are consequently limited to the documented existence of promotional representations.

Panel D shows product packages in settings labelled as local pharmacies. The composite supports a description of retail-display representation, but the individual shop images, their dates, and any delivery or consignment arrangements remain unverified. There are no purchase orders, receipts, inventory records, or retailer confirmations against which to assess completed sales. Together, the promotional and display materials indicate attention to market-facing stages of the value chain, without demonstrating sustained distribution.

Read together, the programme account and the composite provide a coherent depiction of four kinds of output: processing instruction, equipment introduction, product presentations, and market-facing materials. Because they derive from one documentary source, that coherence is not independent validation. The third research question therefore turns to the organizational and measurement conditions needed to determine whether these outputs developed into a women-controlled enterprise.

Enterprise Pathway and Conditions for Continuity

The case suggests a provisional pathway from familiar herbs and collective learning through processing equipment and product presentation to promotion and retail visibility. The pathway identifies what implementation monitoring should follow, but it is not a demonstrated causal sequence. Figure 1 reproduces the programme's four visual panels as illustrative material whose provenance requires author confirmation.

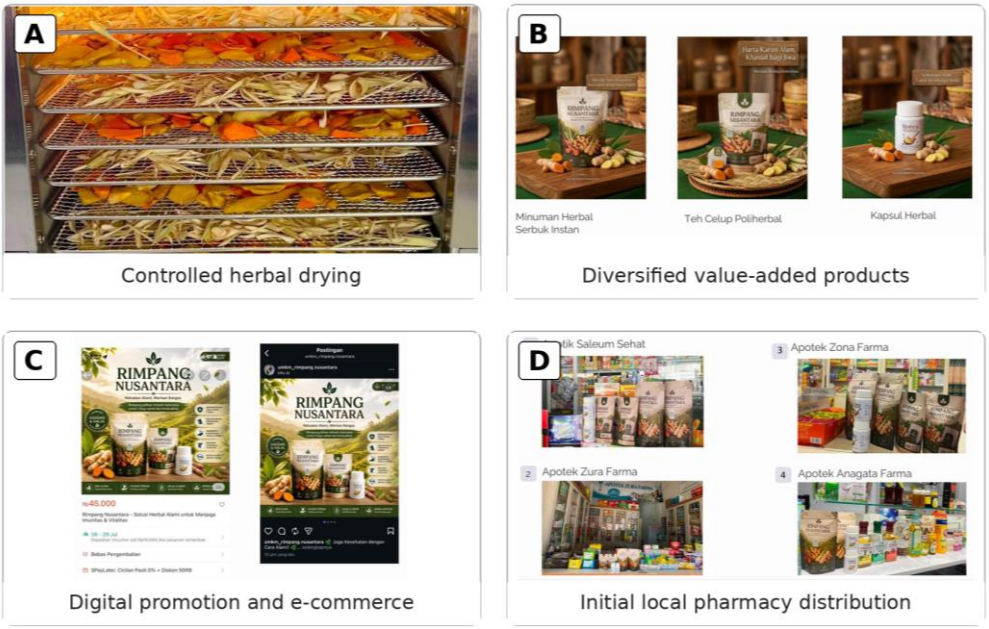


Figure 1. Programme-supplied visual materials: dryer, product designs, digital promotion, and pharmacy displays.

Table 3 sets out prospective follow-up measures for assessing the group's independent operation. These indicators are proposed rather than observed outcomes. A future evaluation would need to establish whether the members retain access to the dryer, determine production schedules, control product identity and online accounts, negotiate retail arrangements, and share revenues through transparent rules. In addition to sales and production records, continuation depends on labour allocation and decision-making authority within the group. Tracking independently performed skills, member time commitments, maintenance costs, stock turnover, and control of business proceeds would allow subsequent research to distinguish social participation from durable economic agency.

Table 3. Proposed measures for post-programme enterprise monitoring

Future Assessment Area	Proposed Verification	Participant-Level Issue	Status In Present Case
Skill retention	Direct task demonstrations after support	Who can repeat each task autonomously?	Not measured
Equipment governance	Ownership, training and maintenance logs	Who controls and safely operates the dryer?	Unknown
Product assurance	Species, recipes, lot records, labelling review	Who authorizes products and claims?	Not documented
Retail activity	Dated stock, sales, margins, repeat orders	Who receives payment and profit?	Not measured
Digital management	Account permissions, dated activity and orders	Which members control access and responses?	Unverified
Workload/equity	Time use, role and remuneration logs	Are tasks and benefits shared fairly?	Not measured
Post-support continuity	Independent 6–12 month follow-up	Does production persist without facilitators?	No follow-up available

Discussion

The findings outline a multi-stage enterprise configuration rather than an observed empowerment effect. The first question is addressed by the linkage between familiar herbs and a described processing curriculum; the second by visual materials concerning drying technology, product formats, promotion, and pharmacy displays. What makes the configuration analytically useful is the distinction between joining an activity, gaining access to an asset, demonstrating capability, and controlling its benefits. Drawing on empowerment theory [8], [9], a credible evaluation must move beyond counting outputs to examining women's choices over production and revenue.

The Pidie initiative resembles women-led, community-based recovery enterprises described elsewhere in its reliance on local material knowledge and collective organization [1], [5], [6], [7]. However, published recovery cases are often supported by interviews, extended follow-up, or observed organizational change; this case currently supplies only a programme narrative and illustrative materials. The comparison is therefore conceptual, not evidence that

the same outcomes occurred. Research on crisis entrepreneurship and resilience also suggests that financing, household time demands, and decision authority can constrain continuing activity after external support ends [10], [11], [12], [13], [39], [40], [41], [42].

The seven-domain framework makes visible the organizational transitions that a small herbal enterprise would need to manage. Familiarity with ginger or turmeric may lower the barrier to initial engagement, but product development requires documented ingredient identities, reproducible processes, and reliable quality control. A dryer may reduce dependence on sunshine under suitable conditions, yet equipment access is only one element in a viable production system. Food-processing and drying research [23], [24], [25], [26], [27], [37], [38] identifies technical questions worth measuring; the present materials do not establish product performance or conformity with applicable requirements [43].

At the next stage, product images and promotional screenshots suggest attention to branding and customer visibility. Evidence from rural e-commerce and women's digital entrepreneurship [28], [29], [30], [31], [32], [33], [34], [44] points to opportunities through digital channels, while also highlighting the role of skills and infrastructure. Unlike studies that measure adoption or business performance, the Pidie record contains no independent account controls, engagement data, order histories, or revenue. Its contribution lies in identifying the specific transition from designed market presence to verifiable commercial activity as a priority for further evaluation [45].

The proposed pathway also raises a distributional question: whose enterprise is it in practice? Research on value-chain governance [16] and gender-responsive interventions [17], [18], [19] cautions that women may undertake processing and promotion without controlling supplier decisions, assets, prices, or profit. The available records do not identify who owns the dryer or brand, controls online passwords, negotiates retailer terms, or determines the division of proceeds. Consequently, the presence of a women's community group cannot be treated as sufficient evidence of equal participation in economic decisions. This distinction is central to interpreting enterprise activity as a possible route to empowerment rather than as an accomplished outcome.

Alternative explanations deserve consideration. Some product representations may have been produced by designers or facilitators rather than by PKK members, and retail-display images may reflect short-term programme support rather than repeated procurement. The case documentation does not identify failed batches, unsuccessful listings, or members who withdrew, but their absence from the record cannot be interpreted as evidence that no difficulties occurred. A credible follow-up would compare member-produced outputs with programme materials and obtain independent buyer, retailer, and transaction documentation.

For programme design, a staged evaluation would be more informative than a single post-training satisfaction measure. An initial audit should authenticate the visual record and map the equipment and account owners; a skills assessment should observe members preparing products without prompts; and periodic monitoring should verify stock, costs, repeat orders, and distribution of net proceeds. The four stages of the proposed pathway can then be evaluated for continuity after mentoring, alongside household workload and practical safeguards for herbal products. These measures would permit assessment of both entrepreneurial feasibility and women's agency, while keeping commercial and health claims separate.

The central contribution is therefore methodological as well as practical: a seven-domain evidence framework links ethnobotanical resources, processing technology, and market access without assuming that the links are already effective. It also distinguishes programme implementation, market visibility, organizational control, and livelihood outcomes as different objects of measurement. These boundaries make it possible to design a more rigorous prospective evaluation in Pidie and to compare subsequent cases transparently, while recognizing that the single documentary source presently supports a limited descriptive account.

CONCLUSION

The retrospective case documents an initiative connecting locally familiar herbal ingredients with reported processing instruction, a drying device, three product-presentation formats, digital promotion, and pharmacy-display materials. These sources address the first two research questions at the level of reported activities and visible representations. For the third, they identify the need to verify member-level skills, asset and account control, product safety, transactions, and continuity after mentoring. The study contributes a seven-domain implementation framework that separates early enterprise visibility from independently demonstrated women's economic agency. Its application to wider recovery programmes will require authenticated records and longitudinal evaluation.

LIMITATIONS

The study is based on one author-supplied account and a four-panel visual composite from a single village programme. It lacks an independently inventoried archive, dated programme and flood records, individual participation or performance data, external corroboration, and verified sales or income information. The visual panels' provenance—including potential digital mock-ups or AI assistance—has not been authenticated, limiting their evidentiary weight. These conditions restrict reproducibility, causal interpretation, and transferability beyond the case. Future work should prioritize verified source records, participant and retailer perspectives, and follow-up measures of independent production, governance, and economic outcomes.

AUTHOR INFORMATION

Corresponding Author
Lasri - Universitas Al Washliyah Darussalam Banda Aceh (Indonesia);
orcid.org/0009-0009-4916-3680
Email: lasrilasri2610@gmail.com

Authors
Lasri - Universitas Al Washliyah Darussalam Banda Aceh (Indonesia);
orcid.org/0009-0009-4916-3680
Siti Rahmatina - Universitas Iskandar Muda (Indonesia);
orcid.org/0009-0008-5127-9204

Kartika Selytias Utami - Universitas Al Washliyah Darussalam Banda Aceh (Indonesia);
orcid.org/0009-0007-6339-1853
Nova Fahradina - Universitas Iskandar Muda (Indonesia);
orcid.org/0009-0007-9567-257X

AUTHOR CONTRIBUTION

L.: Conceptualization, investigation, project administration, data curation, visualization, and writing—original draft. S.R.: Methodology, validation, supervision, formal analysis, and writing—review and editing. K.S.U. and N.F.: Resources, investigation, project administration, and writing—review and editing. All four authors reviewed and approved the final manuscript and accept responsibility for its content.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] A. Matsumoto and M. Ishiwatari, "Navigating Sustainability and Inclusivity: Women-Led Community-Based Businesses in Post-Disaster Recovery," *Sustainability*, vol. 16, no. 14, Art. no. 5865, 2024. https://doi.org/10.3390/su16145865

[2] W. Kreutzer et al., "Disasters and the diminishing of women's economic empowerment," *Disasters*, vol. 47, no. 4, pp. 891-912, 2023. https://doi.org/10.1111/disa.12582

[3] E. T. Paripurno, G. Mahojwala, G. Prabaswara, and S. U. Khabibah, "Agency-driven and community-driven impact in livelihood recovery: Beneficiaries stories," *Jàmbá: Journal of Disaster Risk Studies*, vol. 14, no. 1, Art. no. 1200, 2022. https://doi.org/10.4102/jamba.v14i1.1200

[4] I. D. Utami, I. Santosa, and M. R. Vidya Leila, "Priority resilience strategy for micro, small, and medium enterprises for dealing with natural disasters," *International Journal of Disaster Risk Reduction*, vol. 55, Art. no. 102074, 2021. https://doi.org/10.1016/j.ijdrr.2021.102074

[5] D. Sanderson, T. Heffernan, M. DeSisto, and C. Shearing, "Community-centred disaster recovery: A call to change the narrative," *Disasters*, vol. 49, no. 1, Art. no. e12655, 2025. https://doi.org/10.1111/disa.12655

[6] R. A. Prayoga, E. Wahyono, N. Solekhah, F. N. Hakim, S. Fatimah, L. Purbandini, D. P. Wibowo, and R. Saparita, "Resilience rising: Redefining livelihood systems in disaster-prone rural communities," *Progress in Disaster Science*, vol. 24, Art. no. 100391, 2024. https://doi.org/10.1016/j.pdisas.2024.100391

[7] M. K. Kanyagui, K. J. Sajithkumar, Y. Velankar, R. Mohan, P. K. Viswanathan, and N. Magnani, "Livelihood challenges faced by women in rural India: exploration of solutions using participatory action research," *Development in Practice*, vol. 34, no. 4, pp. 512-526, 2024. https://doi.org/10.1080/09614524.2023.2285251

[8] N. Kabeer, "Resources, agency, achievements: Reflections on the measurement of women's empowerment," *Development and Change*, vol. 30, no. 3, pp. 435–464, 1999. https://doi.org/10.1111/1467-7660.00125

[9] E. Duflo, "Women empowerment and economic development," *Journal of Economic Literature*, vol. 50, no. 4, pp. 1051–1079, 2012. https://doi.org/10.1257/jel.50.4.1051

[10] A. Bagheri, G. Javadian, P. Zakeri, and Z. Arasti, "Bearing the Unbearable: Exploring Women Entrepreneurs Resilience Building in Times of Crises," *Journal of Business Ethics*, vol. 193, no. 3, pp. 715-738, 2024. https://doi.org/10.1007/s10551-023-05577-9
[11] F. A. Kitole and E. Lulu, "Empowering her drive: Unveiling the resilience and triumphs of women entrepreneurs in rural landscapes," *Women's Studies International Forum*, vol. 104, Art. no. 102912, 2024. https://doi.org/10.1016/j.wsif.2024.102912
[12] W. Yu, J. Fei, G. Peng, and J. Bort, "When a crisis hits: An examination of the impact of the global financial crisis and the COVID-19 pandemic on financing for women entrepreneurs," *Journal of Business Venturing*, vol. 39, no. 2, Art. no. 106379, 2024. https://doi.org/10.1016/j.jbusvent.2024.106379
[13] H. L. Bruce, T. Rooney, and E. Krolikowska, "Women microbusiness owners' entrepreneurial marketing decision-making during a crisis," *Journal of Marketing Management*, vol. 39, nos. 17-18, pp. 1800-1832, 2023. https://doi.org/10.1080/0267257X.2023.2209584
[14] S. Abdalla, E. Ramadan, and W. Al Mamari, "Enhancing gender-responsive resilience: The critical role of women in disaster risk reduction in Oman," *Progress in Disaster Science*, vol. 24, Art. no. 100376, 2024. https://doi.org/10.1016/j.pdisas.2024.100376
[15] A. Hendratmi, M. C. M. Salleh, P. S. Sukmaningrum, and R. T. Ratnasari, "Toward SDG's 8: How sustainability livelihood affecting survival strategy of woman entrepreneurs in Indonesia," *World Development Sustainability*, vol. 5, Art. no. 100175, 2024. https://doi.org/10.1016/j.wds.2024.100175
[16] G. Gereffi, J. Humphrey, and T. Sturgeon, "The governance of global value chains," *Review of International Political Economy*, vol. 12, no. 1, pp. 78–104, 2005. https://doi.org/10.1080/09692290500049805
[17] S. K. Malhotra et al., "Value chain interventions for improving women's economic empowerment: A mixed-methods systematic review and meta-analysis," *Campbell Systematic Reviews*, vol. 20, no. 3, Art. no. e1428, 2024. https://doi.org/10.1002/cl2.1428
[18] J. I. Nagasha, M. Ocaido, E. Rajala, A. Abu Hatab, and L. Chiwona-Karltun, "Gender-based approaches for improving milk safety, value addition, and marketing among smallholder livestock farmers," *Frontiers in Sustainable Food Systems*, vol. 8, Art. no. 1392020, 2024. https://doi.org/10.3389/fsufs.2024.1392020
[19] C. Prithika, M. Anjugam, and B. Sivasankari, "Deciphering the crux of women's empowerment in agricultural value chains - A scoping review," *Outlook on Agriculture*, vol. 53, no. 4, pp. 302-319, 2024. https://doi.org/10.1177/00307270241267787
[20] R. M. Febriyanti et al., "A systematic review of ethnobotanical study in Indonesia: Diversity and cultural patterns of medicinal plant use," *Journal of Ethnobiology and Ethnomedicine*, vol. 22, Art. no. 42, 2026. https://doi.org/10.1186/s13002-026-00879-4
[21] H. Albar, Juhriah, and S. Santosa, "Ethnobotany of medicinal plants by the community in Langgudu Sub-district, Bima District, West Nusa Tenggara, Indonesia," *Biodiversitas*, vol. 26, pp. 315-325, 2025. https://doi.org/10.13057/biodiv/d260131
[22] N. Jadid et al., "An ethnobotanical study of medicinal plants used by the Tengger tribe in Ngadisari village, Indonesia," *PLOS ONE*, vol. 15, no. 7, Art. no. e0235886, 2020. https://doi.org/10.1371/journal.pone.0235886
[23] K. Chen et al., "Optimum drying conditions for ginger (Zingiber officinale Roscoe) based on time, energy consumption and physicochemical quality," *Food Chemistry: X*, vol. 20, Art. no. 100987, 2023. https://doi.org/10.1016/j.fochx.2023.100987
[24] R. Bai, J. Sun, X. Qiao, Z. Zheng, M. Li, and B. Zhang, "Hot Air Convective Drying of Ginger Slices: Drying Behaviour, Quality Characteristics, Optimisation of Parameters, and Volatile Fingerprints Analysis," *Foods*, vol. 12, no. 6, Art. no. 1283, 2023. https://doi.org/10.3390/foods12061283

[25] J. Chen, J. Wang, and Y. Ge, "Difference in Quality and Volatile Flavor Compounds of Zingiber officinale Roscoe with Different Drying Methods," *Journal of Food Quality*, Art. no. 5560410, 2023. https://doi.org/10.1155/2023/5560410
[26] S. Latinović et al., "Impact of Drying Methods on Phenolic Composition and Bioactivity of Celery, Parsley, and Turmeric—Chemometric Approach," *Foods*, vol. 13, no. 21, Art. no. 3355, 2024. https://doi.org/10.3390/foods13213355
[27] T. Venkateshwari, V. Thirupathi, M. Balakrishnan, R. Ravikumar, D. Uma, and S. Karthikeyan, "Thin-layer mathematical modeling for drying of turmeric slices in infrared dryer," *Journal of Food Process Engineering*, vol. 47, no. 4, Art. no. e14601, 2024. https://doi.org/10.1111/jfpe.14601
[28] S. Dong, N. Wang, C. Fan, S. Chen, and L. Zhang, "E-commerce and rural women entrepreneurship - Based on the quasi-natural experiment of comprehensive demonstration policy for E-commerce in rural areas," *Economic Analysis and Policy*, vol. 83, pp. 749-765, 2024. https://doi.org/10.1016/j.eap.2024.07.018
[29] J. Aracil-Jordá, J.-A. Clemente-Almendros, A.-I. Jiménez-Zarco, and I. González-González, "Improving the social performance of women-led microenterprises: The role of social media marketing actions," *Technological Forecasting and Social Change*, vol. 191, Art. no. 122484, 2023. https://doi.org/10.1016/j.techfore.2023.122484
[30] T. Sarker, R. Roy, S. Yeasmin, M. G. Rabbany, and M. Asaduzzaman, "Technology Adoption Intention and Sustainable Entrepreneurship Ability of Rural Women in Bangladesh," *Business Strategy & Development*, vol. 8, no. 1, Art. no. e70067, 2025. https://doi.org/10.1002/bsd2.70067
[31] Nuraisyiah, M. Azis, and M. Hasan, "Gendered Financial Literacy and Digital Marketing Adoption: Insights from Female Entrepreneurs in an Emerging Economy," *Administrative Sciences*, vol. 16, no. 1, Art. no. 11, 2026. https://doi.org/10.3390/admsci16010011
[32] D. S. Cahyaningsih, R. Safriliana, G. Chandrarin, S. D. A. Tianti, and N. F. Agustina, "Analysing the Impact of Digital Knowledge, Technology Access, and Social Support on Women's Participation in Indonesian MSMEs," *International Review for Spatial Planning and Sustainable Development*, vol. 14, no. 2, pp. 259-281, 2026. https://doi.org/10.14246/irspsd.14.2_259
[33] H. W. Soetikno, H. Maupa, and H. Cahyadi, "Digital entrepreneurship decisions in Indonesian women-led SMEs: an integrated SEM of transformation, skills, innovation, and behavioral intention," *Eastern-European Journal of Enterprise Technologies*, vol. 3, no. 13 (135), pp. 60-67, 2025. https://doi.org/10.15587/1729-4061.2025.330229
[34] T. Šmaguca, V. Škokić, and R. Kudelić, "Digital transformation and resilience in entrepreneurship and small business: A systematic literature review," *Cogent Business & Management*, vol. 13, no. 1, Art. no. 2662665, 2026. https://doi.org/10.1080/23311975.2026.2662665
[35] N. K. Gale, G. Heath, E. Cameron, S. Rashid, and S. Redwood, "Using the framework method for the analysis of qualitative data in multi-disciplinary health research," *BMC Medical Research Methodology*, vol. 13, Art. no. 117, 2013. https://doi.org/10.1186/1471-2288-13-117
[36] A. B. Hamilton and E. P. Finley, "Qualitative methods in implementation research: An introduction," *Psychiatry Research*, vol. 280, Art. no. 112516, 2019. https://doi.org/10.1016/j.psychres.2019.112516
[37] V. Pramananda and R. Hasibuan, "Solid desiccant-based dehumidification drying for herbal plants: a comprehensive review on drying performance, kinetics, and product quality," *Journal of Engineering and Applied Science*, vol. 73, Art. no. 240, 2026. https://doi.org/10.1186/s44147-026-01071-x

[38] S. Borkakoti, B. Das, and A. Gupta, "Environmental and economic assessment of single-slope solar greenhouse dryer for ginger and turmeric drying in north-eastern region of India," *Journal of Stored Products Research*, vol. 106, Art. no. 102299, 2024. https://doi.org/10.1016/j.jspr.2024.102299
[39] N. Liyanagamage, C. Glavas, T. Kodagoda, and L. Schuster, "Psychological capital and emotions on 'surviving' or 'thriving' during uncertainty: Evidence from women entrepreneurs," *Journal of Small Business Management*, vol. 62, no. 5, pp. 2670-2706, 2024. https://doi.org/10.1080/00472778.2023.2250408
[40] Annu, A. K. Kashyap, S. Sharma, and A. K. Dwivedi, "Technology adoption among women entrepreneurs of the Global South: A systematic literature review and research agenda," *Journal of Management Development*, vol. 45, no. 5, pp. 933–945, 2026. https://doi.org/10.1108/JMD-08-2025-0471
[41] L. Purwoto, C. H. T. Rahmawati, T. Rahayu, and E. A. S. Abhedananda, "Digital Financial Literacy and Entrepreneurial Resilience of Women Entrepreneurs: A Moderated Model of Overconfidence," *Journal of Women's Entrepreneurship and Education*, pp. 1-25, 2025. https://doi.org/10.28934/jwee25.12.pp1-25
[42] N. Gurkan, "Bricolage, community support, and resilience: Women SME owners rebuilding after the 2023 Türkiye earthquakes," *Journal of Contingencies and Crisis Management*, vol. 34, no. 1, Art. no. e70141, 2026. https://doi.org/10.1111/1468-5973.70141
[43] C. Steuer and J. Raeber, "A story of falsification and authentication: Authenticity control of phytopharmaceuticals and herbal remedies," *European Journal of Pharmaceutical Sciences*, vol. 211, Art. no. 107136, 2025. https://doi.org/10.1016/j.ejps.2025.107136
[44] M. Savira, K. Salemink, and F. Z. Fahmi, "Rural entrepreneurial motivation and digital adoption: Evidence from two cases in Bali, Indonesia," *International Journal of Entrepreneurship and Innovation*, advance online publication, 2025. https://doi.org/10.1177/14657503251375150
[45] W. Deng, W. Zhou, R. Song, J. Li, and J. Zhang, "Female entrepreneurship: Systematic literature review and research framework," *Chinese Management Studies*, vol. 19, no. 6, pp. 1752–1784, 2025. https://doi.org/10.1108/CMS-04-2024-0279