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Village Economic Transformation through Digital-Based Sacha Inchi Agroindustry: A Participatory Rural Empowerment Case Study from Gorontalo

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ABSTRACT

This study examines rural economic transformation through a participatory digital agroindustrial intervention based on Sacha Inchi (Plukenetia volubilis) in Tabongo Timur Village, Gorontalo. Using an integrated Rapid Rural Appraisal–Participatory Rural Appraisal (RRA–PRA) framework, the program engaged farmers, the village-owned enterprise (BUMDes), women, and youth across cultivation, processing, and digital marketing. Following technical training, processing technology adoption, and e-commerce-based commercialization, seed productivity increased to 200–300 kg/month, while farmer incomes rose by approximately two to three times. The implementation of a hydraulic press and GMP-based SOPs enhanced oil production capacity and product consistency, and BUMDes turnover increased by around 300% with broadened access to modern retail outlets and online marketplaces. Community digital literacy increased from ~15% to ~85%, with youth and women playing key operational roles. This study proposes a replicable framework for integrating participatory governance, digital agroindustry, and village enterprises to achieve inclusive and sustainable rural economic transformation.

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INTRODUCTION

The global shift toward digitalization has created unprecedented opportunities for rural transformation, particularly in developing countries. As digital technologies become more accessible, their application in agriculture and rural enterprises offers pathways to enhance productivity, efficiency, and economic resilience. Village-Owned Enterprises (BUMDes), a distinctive model of local economic governance in Indonesia, are increasingly positioned as key instruments in this transformation. Through the integration of digital tools, these institutions can enhance operational transparency, enhance service delivery, and connect local products to wider markets (Purnomo et al., 2020; Risfandini et al., 2023). Nevertheless, despite these potentials, rural areas continue to face structural challenges, including limited digital infrastructure, low digital literacy, and unequal access to technological resources (Kiviaho & Einolander, 2023; Zhang & Fan, 2023).

Digital empowerment in rural contexts is particularly constrained by a persistent digital divide. This divide not only limits market access for farmers and micro-enterprises but also inhibits innovation and institutional growth. In many cases, the lack of technical knowledge and insufficient infrastructure prevents rural communities from capitalizing on the benefits of digital economies (Ma et al., 2022; Zulgani et al., 2023). To address these gaps, universities and cross-sector partnerships have emerged as critical facilitators. Educational institutions provide essential capacity-strengthening training, resources, and mentorship to enhance digital competencies among farmers and rural entrepreneurs (Ma et al., 2023; Meng et al., 2023). In addition, collaboration among local governments, private sector entities, and academic institutions plays a vital role in developing infrastructure and supporting access to digital tools (Karelis et al., 2025; Panwar & Sahoo, 2025).

Within this context, co-creative rural advancement models have gained traction as an effective strategy to rural digitalization. These models emphasize local community ownership, local knowledge, and inclusive decision-making processes. BUMDes, as an institutional form, exemplifies the benefits of such co-creative mechanisms. Their structure allows for collective governance and the integration of stakeholder input, which enhances both operational relevance and accountability (Kania et al., 2021; Pribadi et al., 2023; Salimi et al., 2024). Through co-creative strategies, BUMDes are better equipped to tailor digital strategies to the specific needs of their communities, while also fostering trust and long-term engagement (Gunawan & Yuliyanto, 2022; Revida et al., 2023).

In Tabongo Timur, Gorontalo, the potential for digital agroindustrial advancement is exemplified by the cultivation and processing of Sacha Inchi (Plukenetia volubilis) (Salimi et al., 2024). This perennial oilseed crop is notable for its economic and nutritional value, particularly its high content of omega-3 fatty acids (46.8%–50.8%), protein (25%–30%), and essential lipids (35%–60%) (Kong et al., 2023; Rodríguez et al., 2021; Salimi et al., 2025). These attributes not only contribute to health and food security but also create high-value market opportunities both locally and internationally (Mendoza-Almeida et al., 2025; Sierra et al., 2021). Moreover, Sacha Inchi adapts well to agroforestry systems and promotes soil health, supporting environmentally sustainable farming practices.

Despite its advantages, the commercialization of Sacha Inchi in rural Indonesia remains constrained by conventional processing methods, limited market access, and poor institutional integration. Marketing strategies are often manual and local-scale, while business systems lack digitization, undermining transparency, scalability, and competitiveness. These challenges necessitate the adoption of a digital agroindustrial model tailored to the rural context, particularly one that integrates co-creative governance with digital marketing, technology adoption, and agroindustrial innovation.

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Recent evidence suggests that e-commerce adoption among smallholder farmers enhances market transparency, reduces dependence on intermediaries, and increases bargaining power and price competitiveness (Glaros et al., 2023; Gupta, 2025; Jabbouri et al., 2022). Digital platforms enable real-time pricing, direct consumer interaction, and lower transaction costs (Bahn et al., 2021; Morepje et al., 2024). Nevertheless, infrastructure gaps, limited capital, and fragmented agricultural systems often hinder the full realization of these benefits in rural settings (Hassim et al., 2024; Qin et al., 2022).

The case of Tabongo Timur presents a relevant opportunity to examine a structured intervention that bridges these gaps. By implementing a Participatory Rural Appraisal (PRA)-based empowerment model, the local BUMDes Sinar Usaha, in collaboration with Universitas Negeri Gorontalo, seeks to integrate agroindustrial technology, digital marketing, and institutional strengthening. This model not only addresses the upstream cultivation and downstream processing of Sacha Inchi but also enhances business formalization through GMP-based SOPs, BPOM certification, and digital administration.

This study seeks to evaluate the effectiveness of this integrated empowerment model by analyzing its effect on productivity, economic outcomes, digital literacy, and institutional capacity. The central hypothesis is that a co-creative digitalization strategy, when aligned with agroindustrial upgrading and supported by structured governance, yields superior outcomes compared to singular interventions. In addition, this research contributes to the growing discourse on digital agroindustry models by offering an empirical framework for replication in similar rural contexts.

In summary, the integration of PRA-based digital empowerment, website-enabled market systems, and Sacha Inchi agroindustrial innovation presents a comprehensive strategy to strengthen village-level economic resilience and food security. By positioning Tabongo Timur as a replicable model of digital agroindustrial transformation, this article provides insights into how local community-driven innovation can address structural rural challenges and support inclusive advancement pathways.

While previous studies have examined digital agriculture and BUMDes separately, limited empirical research has integrated co-creative rural appraisal, digital agroindustry upgrading, and institutional strengthening within a single village-scale intervention. Accordingly, this article contributes an empirical model that links upstream cultivation enhancements, downstream processing modernization, and digital market integration under co-creative governance to support inclusive rural transformation.

METHODOLOGY

Research Design and Approach

This study adopted a combined methodological framework using Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA), as the foundation of its local community-based agroindustrial empowerment model. The RRA was applied at the initial stages to collect rapid baseline data on field conditions, cultivation performance, labor and input constraints, and the socio-institutional context. PRA then followed, involving the local community as active participants in identifying needs, planning, and implementing digital empowerment interventions. This two-step co-creative methodology ensured inclusive engagement and alignment of project objectives with local community priorities (Cahyo Nugroho, 2025; Chakraborty et al., 2020).

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Study Area and Participants

The research took place in Desa Tabongo Timur, Kabupaten Gorontalo, targeting two primary local community partners: BUMDes Sinar Usaha and Kelompok Tani Hutakiki Jaya. The initiative involved a wide stakeholder base, including local farmers, BUMDes administrators, village authorities, women's groups (PKK), and youth organizations (karang taruna), thereby ensuring inclusive representation and engagement across gender and age groups.

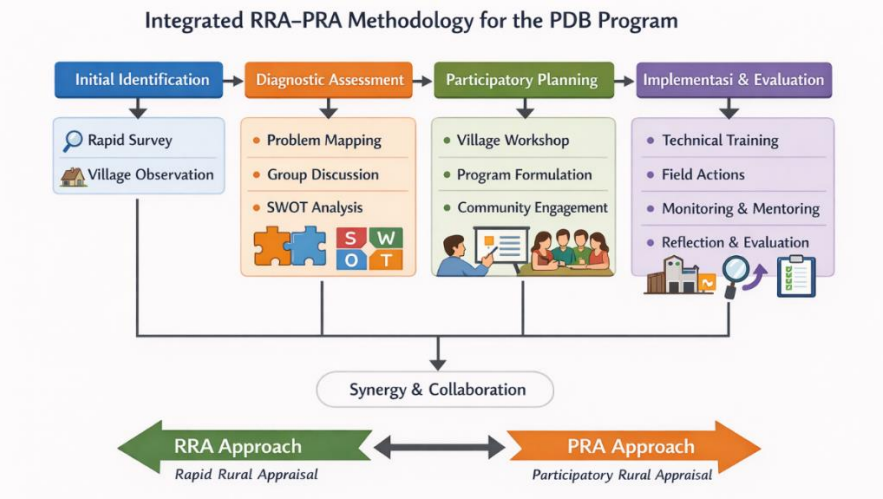

FIGURE 1. Flowchart of integrated RRA–PRA methodology for the PDB program

Stages of Program Implementation

- Coordination and Monitoring of Previous Program

  Initial field assessments reviewed prior outcomes in Sacha Inchi cultivation and processing. These included performance indicators such as pest and fertilizer management, harvest yields, workforce adequacy, and progress in BPOM licensing.

FIGURE 2. Implementation stages of community empowerment activities in Desa Tabongo Timur.

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- Socialization Stage

  A series of local community meetings and farmer forums were conducted to reintroduce Sacha Inchi as a strategic commodity. Emphasis was placed on its health and economic benefits, market potential, and alignment with national and global product standards.

FIGURE 3. Socialization of the Sacha Inchi Village-Assisted Empowerment Program

- Education and Technical Guidance

  Farmers underwent hands-on capacity-strengthening training in semi-organic farming techniques, including pruning, composting, and biological pest control. Post-harvest practices focused on standardized drying, sorting, and raw material handling.

- Product Processing Training

  Selected equipment such as milk makers, solar dryers, and digital fillers were deployed to optimize oil yield, reduce moisture content, and maintain quality. Implementation followed Good Manufacturing Practice (GMP) standards to institutionalize production protocols.

- Technology Implementation

  Selected equipment such as milk makers, solar dryers, and digital fillers were deployed to optimize oil yield, reduce moisture content, and maintain quality. Implementation followed Good Manufacturing Practice (GMP) standards to institutionalize production protocols.

- Monitoring and Evaluation

  Impact assessment was conducted through structured semi-structured interviews, direct field observation, and local community-based monitoring systems. Key indicators included increases in productivity, institutional capacity, and market penetration.

- Program Sustainability

  To ensure sustainability, a Village Digital Team was formed, and SOPs were institutionalized. Long-term mentoring by Universitas Negeri Gorontalo was established through research collaboration and thematic KKN interventions.

Data Collection Techniques

Data were collected using both primary and secondary sources:

- Primary Data: Field observations, Focus Group Discussions (FGDs), in-depth interviews, and structured questionnaires.
- Secondary Data: Production records, training reports, and internal documentation from BUMDes and village institutions.

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Data analysis employed a mixed-methods approach:

- Qualitative data were analyzed using descriptive and thematic content analysis to interpret social, managerial, and institutional outcomes.
- Quantitative data were analyzed to assess productivity levels, participation metrics, efficiency improvements, income growth, and return on investment (ROI) trends. Statistical summaries supported outcome evaluation.

Ethical Considerations

All participants provided informed consent, and data confidentiality was maintained throughout the intervention.

RESULTS AND DISCUSSION

This section synthesizes the outcomes of the RRA–PRA-based intervention, emphasizing changes in productivity, income, processing efficiency, institutional capability, and community digital competence.

Upstream Outcomes: Cultivation, Harvest Forms, And Post-Harvest Stabilization

The integrated PRA–digital agroindustry intervention in Tabongo Timur Village produced consistent improvements across the upstream farmer group (Kelompok Tani Hutakiki Jaya) and the downstream village-owned enterprise (BUMDes Sinar Usaha), indicating that participatory governance combined with technology adoption and digital market integration can accelerate rural value-chain upgrading. In line with participatory development theory, the findings underscore the transformative impact of integrating Participatory Rural Appraisal (PRA) with digital agroindustrial innovation, elevating rural stakeholders from raw-material producers to value-adding agroindustrial actors and reaffirming the importance of community participation for sustainable, inclusive rural development (Acero et al., 2024; Suhayati & Maesuri, 2023).

At the farmer group level, the intervention strengthened production and cultivation performance. Farmers managed approximately 3,000–5,000 Sacha Inchi plants, serving as the upstream feedstock base for downstream processing. Following technical assistance and adoption of improved cultivation practices, productivity increased by approximately 60%, while daily dry seed output rose from 1–2 kg/day to 10–15 kg/day. These results are consistent with evidence that technical training improves agronomic decision-making, yield realization, and farmer income through better crop management and reduced avoidable losses (Loignon et al., 2021; Pribadi et al., 2023).

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FIGURE 4. Forms of Harvest and Post-Harvest Sacha Inchi (Plukenetia volubilis L.) Following a Farmer Group Empowerment Intervention. (a) Fresh fruit clusters on the vine before harvest. (b) Mature star-shaped capsules showing pod variants containing 4, 5, and 6 seeds. (c) Shelled seeds with intact brown seed coats after pod opening and sorting. (d) Dehulled kernels ready for downstream processing (e.g., drying and oil extraction)

This sequence contextualizes how field-level improvements translate into more orderly post-harvest flows. Conceptually, it reflects an intervention logic combining improved cultivation practices (e.g., pruning, semi-organic nutrient management, biological pest control) with participatory learning processes that sustain adoption—an essential mechanism in PRA-driven empowerment (Acero et al., 2024; Suhayati & Maesuri, 2023).

Post-harvest handling strengthened markedly through standardized drying and handling procedures. The introduction of a solar dryer dome strengthened moisture control and reduced quality degradation risks, while SOP-aligned storage and sorting reduced post-harvest losses and rose raw material consistency. Consequently, monthly dry seed output rose from 10–20 kg/month to 400–500 kg/month, indicating strengthened supply-chain reliability and readiness for agroindustrial processing. These outcomes align with literature emphasizing that SOP-based post-harvest management stabilizes yield realization and improves oilseed quality by controlling moisture and contamination risks (Loisel et al., 2025; Purwawangsa et al., 2025).

FIGURE 5. Sacha Inchi Processing Center and Solar Dome Drying Facility in Tabongo Timur Village.

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The facility (figure 5) illustrates a key operational shift: drying and handling are treated as controlled processes rather than informal routines. This strengthens consistency, supports quality assurance, and improves downstream processing performance by reducing input variability (Loisel et al., 2025; Purwawangsa et al., 2025).

Farm-Level Economic and Capability Effects

In addition to production gains, smallholder farmers introduced basic bookkeeping and production logbooks, supporting more transparent tracking of inputs, outputs, and sales. An estimated ROI of ~30% was achieved by month six. Average farmer income rose from IDR 0.5–1.0 million/month to IDR 2–3 million/month, representing a two- to three-fold increase (table 1). Asset expansion was indicated by a 100% increase in plant numbers within five months, suggesting reinvestment capacity and growing confidence in the commodity's profitability. Interpreted within value-chain upgrading frameworks, these income gains are consistent with strengthened price realization and reduced inefficiencies when upstream producers are linked to stronger downstream processing and marketing institutions (Guo & Chen, 2022; Liu et al., 2024).

TABLE 1. Changes in Sacha Inchi production and income at the farmer group level

Indicator	Before Program	After Program
Number of plants managed	~3,000	~5,000
Dry seed production	1–2 kg/day	10–15 kg/day
Monthly dry seed output	10–20 kg	100–300 kg
Average farmer income	IDR 0.5–1.0 million/month	IDR 2–3 million/month
Estimated ROI	Not recorded	~30%

Table 1 consolidates the magnitude of upstream transformation, showing that improvements extended beyond agronomic output to household-level economic outcomes and documented business practices, reinforcing the role of training, SOPs, and appropriate technology in stabilizing perennial oilseed supply chains (Loignon et al., 2021; Pribadi et al., 2023; Purwawangsa et al., 2025).

Social and capacity outcomes further strengthened sustainability. Knowledge scores increased to approximately 80% by month four, while practical skills reached approximately 90% by month five through repeated application of standardized procedures. Participation broadened to include women's groups and youth organizations, indicating inclusive diffusion of skills and shared ownership of production routines, which is critical for continuity beyond external facilitation (Acero et al., 2024; Suhayati & Maesuri, 2023).

Downstream Upgrading: Processing Technology, GMP/SOP Institutionalization, And Certification Readiness

At the institutional level, BUMDes Sinar Usaha demonstrated maturation through the implementation of GMP standards, processing technologies, and strengthened administration. The installation of a

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hydraulic press, food dehydrator, and automatic filler increased processing efficiency. Monthly oil output increased from ~10–20 liters/month to ~100 liters/month, and cost efficiency improved by ~35%, reflecting workflow standardization and reduced inefficiencies. These findings support the literature that processing technology adoption and GMP/SOP implementation enhance efficiency, product quality, and certification readiness in rural agroindustries (Sahruni et al., 2023; Wulandari, 2022).

FIGURE 6. Processing facilities and diversified Sacha Inchi products.

The image illustrates downstream transformation toward a cleaner, standardized processing environment and a broader product portfolio. GMP-oriented workflows strengthen hygiene, consistency, and product stability—conditions required for market expansion and formal compliance (Sahruni et al., 2023; Wulandari, 2022).

Product diversification further strengthened BUMDes competitiveness. The portfolio expanded from a single product (oil only) to 4–5 products (oil, milk, biscuits, snack bars, jam). Importantly, Sacha Inchi oil ("Sachita") obtained BPOM RI MD 013219000100040 certification on 11 September 2025, signaling institutional maturation and increased consumer trust. Diversification and certification jointly indicate agroindustrial scalability and market readiness, consistent with evidence that local-commodity diversification can strengthen rural income generation and SDG-aligned enterprise development (Bait et al., 2024; Salimi et al., 2024).

TABLE 2. BUMDes production, diversification, and economic performance

Indicator	Baseline	After Intervention
Oil production capacity	10-20 liters/month	~100 – 300 liters/month
Number of product variants	1	4-5
Cost efficiency	-	+35%
BUMDes turnover	Baseline	+300%
ROI	-	>50%

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The table links technology adoption and GMP/SOP institutionalization to increased production capacity, product diversification, improved cost efficiency, and stronger economic outcomes (Bait et al., 2024; Salimi et al., 2024).

Digital Market Integration: Turnover Growth And Dual-Channel Commercialization

Digitalization emerged as a strategic driver of market performance. Products were marketed through a dedicated BUMDes website, marketplaces (e.g., Tokopedia), and modern retail chains (e.g., Alfamart, UMGO Mart). BUMDes turnover increased by ~300% compared to the previous year, while average revenue reached ~IDR 30 million/month, accompanied by ROI >50% and break-even by month seven. These results confirm that digital marketing and e-commerce can dramatically expand market access and optimize returns, particularly when combined with strengthened processing standards and product legitimacy (Piranda et al., 2022; Pribadi et al., 2023). The performance also aligns with broader evidence on the financial advantages of rural e-commerce strategies in widening customer reach and improving enterprise outcomes (Fatikhah, 2025; Novantoro et al., 2025).

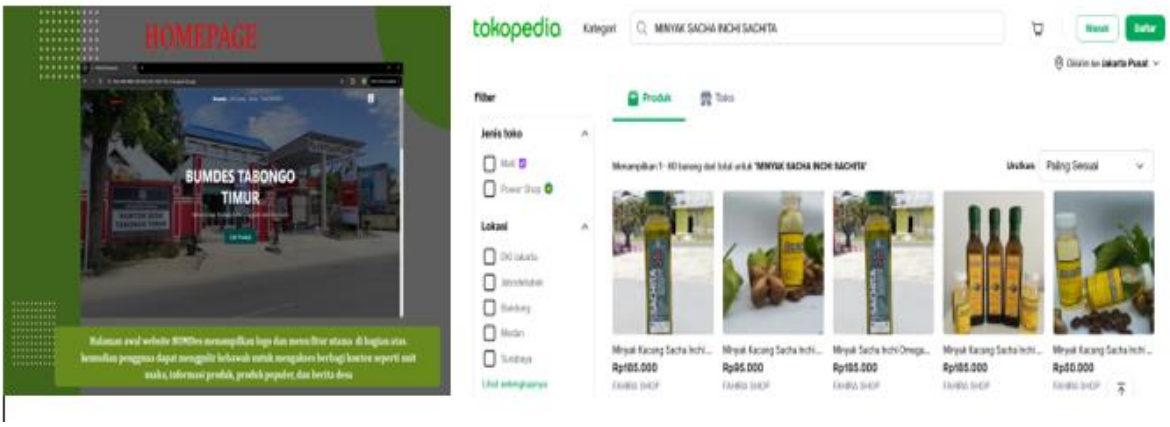

FIGURE 7. Marketing of Sacha Inchi oil in modern retail and e-commerce platforms.

This visualization depicts a hybrid commercialization pathway where offline retail credibility complements online visibility and accessibility. Such dual-channel strategies help rural enterprises expand market reach while maintaining consumer confidence through standardization and certification.

Social Inclusion, Digital Capability Expansion, And Sustainability Implications

Beyond economic performance, the intervention generated measurable empowerment outcomes. Community digital literacy increased from approximately 15% to 85% following training and mentoring. Youth groups became key actors in digital marketing and e-commerce operations, while women dominated processing and packaging tasks, reinforcing gender- and youth-inclusive participation. This inclusive role distribution strengthens social sustainability by embedding digital capability and production routines in the community's institutional fabric, consistent with arguments on empowerment in rural digital economies (Naik et al., 2025). Social cohesion also improved through collective production and profit-sharing mechanisms, reflecting mutual learning and local ownership fostered through PRA—outcomes aligned with social innovation perspectives emphasizing collaboration, cross-sector engagement, and social capital as determinants of sustained enterprise performance (Bait et al., 2024; Kusumaningrum et al., 2022; Salimi et al., 2024).

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TABLE 3. Social and digital impact indicators

Indicator	Before Program	After Program
Digital literacy level	~15%	~85%
Knowledge score	-	~80%
Skills score	-	~90%
Active participants	Limited	>20 people

The table summarizes social transformation indicators—digital literacy gains, knowledge and skills achievement, and broadened participation—supporting the interpretation that the intervention generated capability expansion alongside economic upgrading (Naik et al., 2025).

From an environmental sustainability perspective, the program reported a ~40% reduction in chemical fertilizer usage and a shift toward semi-organic inputs. These practices align with sustainable agriculture and green economy principles, while biomass reuse for compost supports soil health and yield stability (Purwawangsa et al., 2025). Finally, compared to single-intervention empowerment models, the integrated approach—combining participatory governance, agroindustrial technology, and digital marketing—appears to generate stronger and more durable outcomes through adaptability, local ownership, and inclusive benefits (Prajapati et al., 2025; Tang & Chen, 2022). Overall, the results position Tabongo Timur as a plausible and replicable model of a digital agroindustrial village, integrating economic upgrading, institutional strengthening, social inclusion, and environmental stewardship within a unified empowerment framework (Bait et al., 2024; Salimi et al., 2025; Salimi et al., 2024).

The analysis is confined to a single village setting and a short-to-medium intervention period, which may affect generalizability and long-term impact assessment. Future evaluations should monitor sustained performance, institutional resilience, and scalability across diverse agroecological and socio-economic settings.

CONCLUSION

The case study in Tabongo Timur Village demonstrates that digital-based Sacha Inchi processing is an effective strategy for transforming rural economies. Through the integration of RRA-PRA, technical capacity-building sessions, processing technology, and digital marketing, the program notably strengthened productivity, income, institutional capability, and market reach. Active participation by smallholder farmers, youth groups, and women's groups indicates that the model fosters inclusive empowerment and social cohesion. Achievements such as PIRT and BPOM certification, rose digital competence, and adoption of semi-organic practices highlight the readiness of the BUMDes to compete in modern markets sustainably. These findings provide empirical support that digital processing of local commodities can serve as a replicable model for village economic transformation across other regions in Indonesia, aligned with food sovereignty and the Sustainable Development Goals (SDGs).

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REFERENCES

Acero, A., Ramírez-Cajiao, M. C., & Baillie, C. (2024). Understanding Community Engagement From Practice: A Phenomenographic Approach to Engineering Projects. Frontiers in Education. https://doi.org/10.3389/feduc.2024.1386729

Bahn, R. A., Kareem Yehya, A. A., & Zurayk, R. (2021). Digitalization for Sustainable Agri-Food Systems: Potential, Status, and Risks for the MENA Region. Sustainability. https://doi.org/10.3390/su13063223

Bait, Y., Salimi, Y. K., Zubair, M., Rahmatia, S., & Suleman, D. (2024). Pemberdayaan Masyarakat Desa Tabongo Timur Melalui Pengolahan Produk Berbasis Kelapa dan Sacha Inchi untuk Mendukung Pencapaian SDGs. Lumbung Inovasi: Jurnal Pengabdian kepada Masyarakat, 9(4), 1143–1156. https://doi.org/10.36312/linov.v9i4.2393

Cahyo Nugroho, M. K. (2025). Ecovillage-Based Empowerment: A Collaborative Approach to Waste Management and Food Security in Air Anyir Village. Prospect Jurnal Pemberdayaan Masyarakat. https://doi.org/10.55381/jpm.v4i2.489

Chakraborty, P., Daruwalla, N., Gupta, A., Machchhar, U., Kakad, B., Adelkar, S., & Osrin, D. (2020). Using Participatory Learning and Action in a Community-Based Intervention to Prevent Violence Against Women and Girls in Mumbai's Informal Settlements. International Journal of Qualitative Methods. https://doi.org/10.1177/1609406920972234

Fatikhah, S. A. (2025). Pendampingan Digital Marketing Untuk Meningkatkan Penjualan BUMDes Makmur Anugerah Lestari Di Ciomas. Jurnal Pengabdian Kepada Masyarakat. https://doi.org/10.37567/pkm.v5i3.4306

Glaros, A., Thomas, D., Nost, E., Nelson, E., & Schumilas, T. (2023). Digital Technologies in Local Agri-Food Systems: Opportunities for a More Interoperable Digital Farmgate Sector. Frontiers in Sustainability. https://doi.org/10.3389/frsus.2023.1073873

Gunawan, Y., & Yuliyanto, M. R. (2022). Dissemination of Appropriate Technology Importance and Legal Basis of BUMDES in the Pandemic Era. International Journal of Research in Community Service. https://doi.org/10.46336/ijrcs.v3i3.322

Guo, N., & Chen, H. (2022). Comprehensive Evaluation and Obstacle Factor Analysis of High-Quality Development of Rural E-Commerce in China. Sustainability. https://doi.org/10.3390/su142214987

Gupta, A. (2025). The Role of Farmer Producer Organizations (FPOs) in Bargaining for Better Credit Terms and Market Access: A Comprehensive Review. International Journal of Scientific Research in Engineering and Management. https://doi.org/10.55041/ijsrem53216

Hassim, O. A., Osman, I., Awal, A., & Amin, F. M. (2024). Navigating the Path to Equitable and Sustainable Digital Agriculture Among Small Farmers in Malaysia: A Comprehensive Review. Information Management and Business Review. https://doi.org/10.22610/imbr.v16i2(i)s.3795

Jabbouri, I., Jabbouri, R., Bahoum, K., & Hajjaji, Y. E. (2022). E-commerce Adoption Among Moroccan Agricultural Cooperatives: Between Structural Challenges and Immense Business Performance Potential. Annals of Public and Cooperative Economics. https://doi.org/10.1111/apce.12406

https://doi.org/10.35568/abdimas.v9i1.7590

Kania, I., Anggadwita, G., & Alamanda, D. T. (2021). A New Approach to Stimulate Rural Entrepreneurship Through Village-Owned Enterprises in Indonesia. Journal of Enterprising Communities People and Places in the Global Economy. https://doi.org/10.1108/jec-07-2020-0137

Karelis, C., Lachana, Z., Gorelova, I., Alexopoulos, C., Lavdaria, N., Bellini, F., & Charalabidis, Y. (2025). Digital Inclusion and Social Cohesion in Smart Cities. Dgo. https://doi.org/10.59490/dgo.2025.987

Kiviaho, A., & Einolander, J. (2023). Digital Transformation, Well-Being and Shrinking Communities: Narrowing the Divides Between Urban and Rural. Heliyon. https://doi.org/10.1016/j.heliyon.2023.e18801

Kong, S., Keang, T., Bunthan, M., Say, M., Nat, Y., Tan, C. P., & Tan, R. (2023). Hydraulic Cold-Pressed Extraction of Sacha Inchi Seeds: Oil Yield and Its Physicochemical Properties. Chemengineering. https://doi.org/10.3390/chemengineering7040069

Kusumaningrum, A., Amri, A. F., Nurhikmat, A., Susanto, A., & Prayogi, S. (2022). Thermal Processing and Chemical Characteristics of Canned Traditional Foods Based on Beef: Rawon, Kuah Gandul and Empal Gentong. https://doi.org/10.2991/absr.k.220101.001

Liu, M., Tian-jun, L., Ren, Y., & Wu, L. (2024). How Does the Adoption of E-Commerce Impact the Selling Prices of Agricultural Products? Empirical Evidence From Apple Farmers in China. Review of Development Economics. https://doi.org/10.1111/rode.13168

Loignon, C., Dupére, S., Leblanc, C., Truchon, K., Bouchard, A., Arsenault, J., Carvalho, J. P., Boudreault-Fournier, A., & Marcotte, S. A. (2021). Equity and Inclusivity in Research: Co-Creation of a Digital Platform With Representatives of Marginalized Populations to Enhance the Involvement in Research of People With Limited Literacy Skills. Research Involvement and Engagement. https://doi.org/10.1186/s40900-021-00313-x

Loisel, Q., An, Q., Anand-Kumar, V., Balaskas, G., Papadopoulos, H., Pappa, D., Giné-Garriga, M., Longworth, G. R., & Chastin, S. (2025). Scoping Review of Needs for Digital Technology in Co-Creation: A Health CASCADE Study. Research Involvement and Engagement. https://doi.org/10.1186/s40900-025-00797-x

Ma, W., McKay, A., Rahut, D. B., & Sonobe, T. (2023). An Introduction to Rural and Agricultural Development in the Digital Age. Review of Development Economics. https://doi.org/10.1111/rode.13025

Ma, W., Qiu, H., & Rahut, D. B. (2022). Rural Development in the Digital Age: Does Information and Communication Technology Adoption Contribute to Credit Access and Income Growth in Rural China? Review of Development Economics. https://doi.org/10.1111/rode.12943

Mendoza-Almeida, T., Roca, E., & Suárez-Cunza, S. (2025). Fatty Acid Profile and Effect of Plukenetia Volubilis L. (Sacha Inchi) Oil on Lipid Metabolism in Rats Fed a High-Fat Diet. Brazilian Journal of Medical and Biological Research. https://doi.org/10.1590/1414-431x2025e14684

Meng, X., Wang, X., Nisar, U., Sun, S., & Ding, X. (2023). Mechanisms and Heterogeneity in the Construction of Network Infrastructure to Help Rural Households Bridge the “Digital Divide.” Scientific Reports. https://doi.org/10.1038/s41598-023-46650-7

Morepje, M. T., Sithole, M. Z., Msweli, N. S., & Agholor, I. A. (2024). The Influence of E-Commerce Platforms on Sustainable Agriculture Practices Among Smallholder Farmers in Sub-Saharan Africa. Sustainability. https://doi.org/10.3390/su16156496

https://doi.org/10.35568/abdimas.v9i1.7590

Naik, A., Dash, S. R., Das, K. S., Sahoo, S. K., & Baral, P. (2025). Empowering Farmers Through Climate Resilience: A Socio-Economic Study of the Farmers Under the National Innovations in Climate Resilient Agriculture (NICRA) Project in Jharsuguda District of Odisha, India. International Journal of Environment and Climate Change. https://doi.org/10.9734/ijecc/2025/v15i34786

Novantoro, B. D., Juman, N., Rahman, A. N., Nekli, & Adji, W. H. (2025). Pelatihan Pembuatan Web Guna Mendukung Sarana Promosi Menggunakan Google Sites Pada BUMDes Mitra Mandiri Sajau. Padma. https://doi.org/10.56689/padma.v5i1.1865

Panwar, A., & Sahoo, S. (2025). Digital Divide in Agriculture: A Study on Farmers' Awareness of Digital Marketing Platforms in Haryana. International Journal of Social Sciences and Management Review. https://doi.org/10.37602/ijssmr.2025.8327

Piranda, D. R., Sinaga, D. Z., & Putri, E. E. (2022). Online Marketing Strategy in Facebook Marketplace as a Digital Marketing Tool. Journal of Humanities Social Sciences and Business (Jhssb). https://doi.org/10.55047/jhssb.v1i2.123

Prajapati, C. S., Priya, N. K., Bishnoi, S. K., Vishwakarma, S., Buvaneswari, K., Shastri, S., Tripathi, S., & Jadhav, A. (2025). The Role of Participatory Approaches in Modern Agricultural Extension: Bridging Knowledge Gaps for Sustainable Farming Practices. Journal of Experimental Agriculture International. https://doi.org/10.9734/jeai/2025/v47i23281

Pribadi, U., Sakir, S., Juhari, J., Naufal, R. M., & Ani, S. (2023). Unlocking the Potential of Village-Owned Enterprises (BUMDes) in the Digital Era: A Case Study on Optimizing E-Commerce Application Development in Sumberarum Village, Moyudan, Sleman. Iccs. https://doi.org/10.18196/iccs.v1i1.80

Purnomo, S., Rahayu, E. S., Riani, A. L., Suminah, S., & Udin, U. (2020). Empowerment Model for Sustainable Tourism Village in an Emerging Country. Journal of Asian Finance Economics and Business. https://doi.org/10.13106/jafeb.2020.vol7.no2.261

Purwawangsa, H., Slamet, A. S., Irfany, M. I., Prawiro, B. P., Haq, D. A., & Ramadhini, F. (2025). Transforming Rural Communities: The Innovative Approach of the One Village One CEO Program to Sustainable Business Development in Central Kalimantan. Bio Web of Conferences. https://doi.org/10.1051/bioconf/202518602010

Qin, T., Wang, L., Zhou, Y., Guo, L., Jiang, G., & Zhang, L. (2022). Digital Technology-and-Services-Driven Sustainable Transformation of Agriculture: Cases of China and the EU. Agriculture. https://doi.org/10.3390/agriculture12020297

Revida, E., Ismail, R., Lumbanraja, P., Trimurni, F., Br. Sembiring, S. A., & Purba, S. (2023). Village Owned Enterprises Governance (BUMDes) Based on the Tourism Village Development. International Journal of Sustainable Development and Planning. https://doi.org/10.18280/ijsdp.181034

Risfandini, A., Yulianto, I., & Wan-Zainal-Shukri, W.-H. B. (2023). Local Community Empowerment for Sustainable Tourism Development: A Case Study of Edelweiss Park Wonokitri Village. International Journal of Sustainable Development and Planning. https://doi.org/10.18280/ijsdp.181127

Rodríguez, G., Squeo, G., Estivi, L., Quezada Berru, S. M., Buleje, D., Caponio, F., Brandolini, A., & Hidalgo, A. (2021). Changes in Stability, Tocopherols, Fatty Acids and Antioxidant Capacity of

https://doi.org/10.35568/abdimas.v9i1.7590

Sacha Inchi (Plukenetia Volubilis) Oil During French Fries Deep-Frying. Food Chemistry. https://doi.org/10.1016/j.foodchem.2020.127942

Sahruni, Latief, R., & Achmad, H. (2023). Rural Agroindustry Development Based on Prime Commodities in Soppeng Regency. Iop Conference Series Earth and Environmental Science. https://doi.org/10.1088/1755-1315/1230/1/012008

Salimi, Y. K., Amali, L. N., Baderan, U. S., Liputo, S. A., & Mohamad, E. (2024). Developing Sacha Inchi Cultivation in Tabongo Timur Village: An Empowerment Strategy for Food Security and Economic Improvement. Abdimas Jurnal Pengabdian Masyarakat, 7(4), 1782–1791. https://doi.org/10.35568/abdimas.v7i4.5474

Salimi, Y. K., Bait, Y., Huruji, A., Isra, M., Amali, N., & Baderan, U. S. (2025). Pengembangan Susu Sacha Inchi sebagai Minuman Fungsional Antioksidan melalui Pemberdayaan Masyarakat di Tabongo Timur. Paluwala:Jurnal Ilmu Kesehatan Vol. 1 No. 3 (2025): Special Issue: Proceeding Gorontalo International Conference on Health and Sport. https://ejournal.airlangga.org/index.php/ghj/issue/view/3

Salimi, Y. K., Tungadi, R., Liputo, S. A., Kilo, A. K., Rauf, A. N. P., & Dali, I. B. (2025). Physicochemical Properties, Fatty Acid and Amino Acid Profiles, and Antioxidant Activity of Sacha Inchi (Plukenetia Volubilis L.) Seed Oil and Press Cake Extracted Using Hydraulic Press and Soxhlet Methods. Trends in Sciences, 22(6), 9690. https://doi.org/10.48048/tis.2025.9690

Sierra, D. M. C., Rave, L. J. G., & Soto, J. (2021). Biological Activity of Sacha Inchi (Plukenetia Volubilis Linneo) and Potential Uses in Human Health: A Review. Food Technology and Biotechnology, 59(3), 253–266. https://doi.org/10.17113/ftb.59.03.21.6683

Suhayati, M., & Maesuri, Y. (2023). Pemberdayaan Masyarakat Melalui Program Babari Sebagai Metode Literasi. Jurnal Pengabdian Masyarakat (Abdira). https://doi.org/10.31004/abdira.v3i1.255

Tang, Y., & Chen, M. (2022). The Impact Mechanism and Spillover Effect of Digital Rural Construction on the Efficiency of Green Transformation for Cultivated Land Use in China. International Journal of Environmental Research and Public Health. https://doi.org/10.3390/ijerph192316159

Wulandari, S. (2022). Scenario Development of Implementing Cleaner Production on Pepper Agroindustry. Iop Conference Series Earth and Environmental Science. https://doi.org/10.1088/1755-1315/950/1/012048

Zhang, X., & Fan, D. (2023). Can Agricultural Digital Transformation Help Farmers Increase Income? An Empirical Study Based on Thousands of Farmers in Hubei Province. Environment Development and Sustainability. https://doi.org/10.1007/s10668-023-03200-5

Zhao, Q., Gao, Y., Jin, F., & Zhu, L.-Y. (2022). Preparation Process Optimization and Performance Characterization of Feed Plant Essential Oil Microcapsules. Molecules. https://doi.org/10.3390/molecules27207096

Zulgani, Z., Junaidi, J., Hastuti, D., Rustiadi, E., Pravitasari, A. E., & Asfahani, F. R. (2023). Understanding the Emergence of Rural Agrotourism: A Study of Influential Factors in Jambi Province, Indonesia. Economies. https://doi.org/10.3390/economies11070180.

https://doi.org/10.35568/abdimas.v9i1.7590