

## Sustainable Economic Empowerment through *Serbuk Sawo Drajat* as a Natural Sugar Substitute: A Participatory Action Research Approach in Lamongan, Indonesia

Siti Shoimah<sup>1\*</sup>, Nawari<sup>2</sup>, Mahfud Sudarsono<sup>3</sup>, Muhammad Tegar Bayu Pamukti<sup>4</sup>,  
Muhammad Hanafi Fahmi<sup>5</sup>

<sup>1\*,2,5</sup>Department of Management, Faculty of Economics and Business, Universitas Islam Darul 'Ulum, Lamongan Regency, East Java Province, Indonesia.

<sup>3,4</sup>Department of Agroecotechnology, Faculty of Agriculture, Universitas Islam Darul 'Ulum, Lamongan Regency, East Java Province, Indonesia.

*Corresponding Email:* sitishoimah@unisda.ac.id<sup>1\*</sup>

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### Abstrak

Desa Drajat di Kabupaten Lamongan merupakan salah satu penghasil utama buah sawo (*Manilkara zapota*). Akan tetapi, tingkat daya tahan buah yang rendah kerap menimbulkan kerugian pascapanen sebesar 20–30%, yang berdampak nyata terhadap kondisi ekonomi petani serta pelaku Usaha Mikro, Kecil, dan Menengah (UMKM) setempat. Penelitian ini bertujuan memberdayakan masyarakat melalui program KKN Tematik yang diselenggarakan oleh Universitas Islam Darul 'Ulum (UNISDA) Lamongan dengan menggunakan pendekatan *Participatory Action Research* (PAR). Program ini dilaksanakan dengan mengonversi buah sawo segar menjadi Serbuk Sawo Drajat, yakni pemanis alami berbasis buah lokal yang selaras dengan prinsip *Green Economy* dan *Circular Entrepreneurship*. Metodologi penelitian mencakup tahapan perencanaan, tindakan (pelatihan pengolahan dan pengemasan), observasi, serta refleksi. Hasil penelitian menunjukkan peningkatan kapasitas mitra yang nyata: pemahaman terhadap konsep nol limbah (*zero waste*) meningkat sebesar 85%, keterampilan teknis pengolahan sebesar 90%, dan kesadaran pemasaran digital sebesar 80%. Produk ini terbukti mampu memperpanjang masa simpan buah sawo hingga 12 bulan serta meningkatkan nilai ekonominya, sehingga memperkuat ketahanan ekonomi masyarakat yang berbasis keberlanjutan.

**Kata Kunci:** Pemberdayaan Masyarakat; Serbuk Sawo; Pemanis Alami; Ekonomi Hijau; Kewirausahaan Sirkular.

### Abstract

Desa Drajat in Lamongan Regency is a major producer of Sapodilla (*Manilkara zapota*), locally known as Sawo. Its high perishability, however, consistently results in 20–30% post-harvest losses, posing substantial economic challenges for farmers and local Micro, Small, and Medium Enterprises (MSMEs). This study aims to empower the community through the KKN Tematik program by Universitas Islam Darul 'Ulum (UNISDA) Lamongan, employing a Participatory Action Research (PAR) approach. The program centers on converting fresh Sapodilla into Serbuk Sawo Drajat, a natural powdered sweetener derived from local fruit that aligns with Green Economy and Circular Entrepreneurship principles. The methodology covered four stages: planning, action (training on processing and packaging), observation, and reflection. Findings indicate a marked increase in partner capacity: zero-waste understanding rose by 85%, processing proficiency by 90%, and digital marketing awareness by 80%. This product successfully extends the shelf life of Sawo to 12 months and raises its economic value, thereby strengthening community-based sustainable economic resilience.

**Keyword:** Community Empowerment; Serbuk Sawo; Natural Sweetener; Green Economy; Circular Entrepreneurship.

## 1. Introduction

Sawo Drajat (*Mamilkara zapota*), locally known as Sapodilla, is one of the principal horticultural commodities of Desa Drajat, located in Lamongan Regency, East Java, Indonesia. The fruit is widely recognized for its naturally sweet taste, high nutritional content, and cultural significance as a local identity marker. Despite its potential as a distinctive agro-product, Sawo Drajat faces a persistent challenge: its high perishability. Under ambient storage conditions, the fruit retains acceptable texture, flavor, and aroma for only two to three days before undergoing rapid physiological deterioration. This limited shelf life results in 20–30% post-harvest losses, as documented by local farmer groups, particularly during peak harvest seasons when supply exceeds local demand. Such losses reduce profit margins, destabilize income streams, and increase economic vulnerability among farmers and Micro, Small, and Medium Enterprises (MSMEs) that depend on Sapodilla-based products as their primary source of livelihood. Desa Drajat produces an estimated 1.5 tons of fresh Sapodilla per harvest season; yet a considerable portion remains unsold due to insufficient post-harvest handling, inadequate storage facilities, and the absence of value-added processing strategies. As a result, large quantities of fresh produce are either discarded or sold at low prices to prevent spoilage. This recurring situation underscores the urgency of adopting product diversification and post-harvest processing strategies to raise the fruit's marketability and long-term viability. According to Fellows (2017), converting fresh fruit into shelf-stable derivative products is a fundamental approach to reducing post-harvest losses, raising economic value, and ensuring long-term viability in agri-based economies. Value-added processing also stabilizes market fluctuations and provides farmers with consistent income even outside harvest periods.

One concrete solution proposed and implemented in this study is the conversion of fresh Sawo Drajat into Serbuk Sawo Drajat—a natural powdered sweetener that is durable, hygienic, versatile, and environmentally responsible. This product not only extends the fruit's shelf life to 12 months but also creates a new market segment catering to the growing demand for natural sweetener alternatives among health-conscious consumers. This shift aligns with the Green Economy paradigm as defined by the United Nations Environment Programme (UNEP, 2011)—a model of economic growth that advances human well-being and social equity while substantially reducing environmental risks and ecological scarcities. By utilizing fruits that would otherwise be discarded, the production of Serbuk Sawo Drajat embodies the "Waste to Wealth" principle, promoting responsible consumption and sustainable production patterns consistent with Sustainable Development Goal (SDG) 12. This initiative is also grounded in the concept of sustainable MSME management, where the capacity to develop new products, adopt environmentally conscious practices, and respond to technological change are key determinants of long-term viability. Hasan, Shoimah, *et al.* (2023) assert that in the current economic setting, MSME sustainability depends on product development, environmental awareness, and technological adaptation. Accordingly, equipping local MSMEs to produce Serbuk Sawo Drajat not only addresses environmental and economic challenges but also strengthens community-based entrepreneurship and rural development.

In response to these challenges, this study applies the Participatory Action Research (PAR) approach within the KKN Tematik program initiated by Universitas Islam Darul 'Ulum (UNISDA) Lamongan. PAR was selected for its collaborative nature, which emphasizes co-learning between researchers and the community, ensuring that resulting solutions are contextually appropriate and socially empowering. Through collective planning, action, observation, and reflection, this program aims to: (1) reduce post-harvest losses through the adoption of zero-waste processing practices; (2) strengthen community capacity in product development, hygiene, and digital marketing; and (3) promote sustainable and circular entrepreneurship within rural economic systems. This initiative seeks to establish Serbuk Sawo Drajat as a model of rural eco-innovation, demonstrating how community-driven research and participatory education can produce sustainable economic empowerment in line with the Green Economy and circular entrepreneurship principles.

## 2. Methods

This program employed the Participatory Action Research (PAR) methodology, which places active community participation at the center of problem identification, action planning, solution implementation, and outcome assessment. PAR was selected because it enables collaboration between researchers and local stakeholders, ensuring that solutions are contextually relevant, sustainable, and community-driven. The primary participants were farmers, housewives, and local MSME entrepreneurs in Desa Drajat, Lamongan—groups selected due to their direct involvement in the Sapodilla (Sawo) value chain, spanning cultivation and harvesting through to small-scale processing and local marketing.

The PAR process consisted of four interrelated stages: Planning (To Know), Action (To Act), Evaluation (To Judge), and Reflection (To Reflect).

### 1) To Know – Planning Phase

The initial phase centered on identifying the community's primary challenge: the high perishability of Sawo fruit and the resulting post-harvest losses. Participatory discussions and focus group interviews were conducted with farmers and MSME actors to assess the potential of developing Sawo powder (Serbuk Sawo Drajat) as a durable, value-added derivative product. This phase also included resource mapping to evaluate local assets such as raw material availability, existing processing tools, skill levels, and local market potential. The mapping helped identify opportunities for sustainable agriculture practices and capacity development (Shoimah *et al.*, 2025a). Findings revealed that despite high production volumes, the community lacked knowledge in preservation techniques and had limited access to broader markets.

### 2) To Act – Implementation Phase

Based on the identified needs, a series of technical training sessions and workshops were organized to transfer practical knowledge and build local capacity. The activities were designed using experiential learning methods that encouraged hands-on practice and peer-to-peer knowledge sharing, covering three core modules. First, *Raw Material Selection and Hygienic Processing*: participants learned to identify mature yet firm fruits suitable for powder processing, apply sanitation standards during washing and slicing, and carry out food-grade handling procedures. Second, *Low-Temperature Drying and Grinding Technology*: training introduced the community to solar dryers and temperature-controlled dehydrators that prevent nutrient degradation while extending shelf life, with demonstrations covering grinding consistency, moisture testing, and fine-particle sieving to ensure powder uniformity. Third, *Packaging and Digital Marketing*: participants were trained on eco-friendly packaging using biodegradable materials, labeling in accordance with food safety regulations, and online marketing strategies through e-commerce platforms such as Shopee and Tokopedia. Throughout this stage, broad participation was emphasized, ensuring that women and youth groups were actively involved to support equitable knowledge dissemination and community ownership of outcomes.

### 3) To Judge – Evaluation Phase

An evaluation system was designed using pre-test and post-test questionnaires to measure participants' improvements in knowledge, technical skills, and entrepreneurial motivation across four areas: (1) understanding of zero-waste and green economy principles; (2) proficiency in processing techniques and food safety standards; (3) digital marketing literacy; and (4) entrepreneurial attitude and self-efficacy. Qualitative observations and focus group discussions supplemented the quantitative data, allowing the research team to document behavioral changes, participant satisfaction, and collective reflections on learning outcomes.

### 4) To Reflect – Reflection Phase

The reflection stage provided an opportunity for participants and facilitators to jointly analyze the project's outcomes and sustainability potential. Discussions addressed three main points: the feasibility of scaling Serbuk Sawo Drajat production within the village; the community's readiness for independent operation without external facilitation; and future market

opportunities alongside challenges in maintaining product consistency. This collaborative reflection encouraged continuous improvement and established the basis for institutionalizing the initiative within local governance structures such as Village-Owned Enterprises (BUMDes).

### 3. Results and Discussion

#### 3.1 Results

Figure 1 illustrates the sequence of activities carried out throughout the program, beginning with stakeholder engagement through a Focus Group Discussion (FGD), followed by hands-on training for product processing, and culminating in the development of the Serbuk Sawo product. These visual records support the narrative of the project's implementation and outcomes.



Figure 1. Documentation of Program Activities

#### 3.1.1 Product Development: Serbuk Sawo Drajat through Diversification

The primary tangible outcome of this project was the successful development and production of Serbuk Sawo Drajat. Converting Sawo fruit into powder represents a strategic advancement in rural agro-industry. By reducing the fruit's moisture content through controlled drying, microbial activity is inhibited, resulting in greater product stability and an extended shelf life of up to 12 months (Fellows, 2017). This technological shift reduces post-harvest losses and stabilizes prices during surplus seasons. The powder form also broadens market reach, enabling MSMEs to sell both locally and online year-round. The product's versatility as a natural sweetener for beverages, bakery goods, and health-conscious consumers opens potential for branding under the "Healthy Local Sweetener" category, consistent with global trends toward sustainable food production.

#### 3.1.2 Community Empowerment Evaluation

The evaluation results demonstrated substantial improvements in participants' technical and managerial competencies, as shown in Table 1.

Table 1. Pre-Test and Post-Test Results of Participant Capacity Assessment

Component	Pre-Test (%)	Post-Test (%)	Improvement (%)
Zero Waste & Green Economy Awareness	30	85	+55
Technical Skills (Sawo Powder Production)	10	92	+82
Hygiene & Food Safety Practices	40	90	+50
Packaging & Digital Marketing	25	80	+55
Entrepreneurial Motivation	45	95	+50

The most notable improvement was recorded in technical proficiency (+82%), indicating effective transfer of production knowledge. Participants also demonstrated stronger entrepreneurial motivation and greater environmental awareness, reflecting a shift from conventional selling practices toward value-added processing and eco-conscious entrepreneurship. These findings are consistent with Shoimah *et al.* (2025a), who assert that participatory education combined with continuous mentoring produces lasting behavioral change and supports the adoption of new practices among rural communities.

### 3.2 Discussion

The adoption of circular-economy business models has been recognized as a strategic pathway to achieve sustainable entrepreneurship and resource efficiency in SMEs (Munir & Fausiah, 2025; Supriadi, Maghfiroh, & Abadi, 2025). Green entrepreneurial orientation has been shown to contribute to sustainable business performance, particularly in food and agro-based SMEs operating within a circular economy framework (Musfar *et al.*, 2025; Aboalhoon, Alzubi, & Iyiola, 2024). Systematic review studies document a clear trend toward circular business models and sustainability, underscoring the growing importance of green business model development (Brenner & Drdla, 2023; Susilo, Darmawan, & Hartono, 2023).

The Serbuk Sawo Drajat initiative directly supports the green economy by converting potential agricultural waste into a marketable product. What was previously discarded now becomes an economic asset, embodying the "Waste to Wealth" principle. Shoimah *et al.* (2025b) argue that circular entrepreneurship—characterized by resource recirculation, eco-efficiency, and zero-waste principles—is central to rural economic change. This model ensures that economic growth does not depend on resource depletion or environmental degradation (UNEP, 2011). In practical terms, the initiative introduced community-accessible technologies such as low-energy dryers and reusable packaging to reduce production footprints. It also encouraged collective resource management, where surplus fruit from multiple farmers was pooled for powder processing, ensuring both efficiency and inclusivity. This practice repositions waste management as an opportunity for economic productivity and environmental stewardship.

The sustainability roadmap developed from this program includes both economic and institutional strategies. MSMEs are encouraged to use e-commerce platforms and social media marketing to promote Serbuk Sawo Drajat as a unique, locally sourced, and environmentally responsible product, with collaborative branding under a village label to strengthen product recognition. Partnership with Village-Owned Enterprises (BUMDes) enables collective production management, ensures fair profit distribution, and supports business continuity through shared facilities and cooperative financing. As recommended by Shoimah *et al.* (2025c), incorporating mobile payment systems and digital bookkeeping tools can improve transparency, financial inclusion, and MSME growth performance. Establishing a community learning center in Desa Drajat further ensures ongoing training in processing, business planning, and environmental management. These measures collectively strengthen the economic resilience and long-term sustainability of the Serbuk Sawo Drajat enterprise, making it a replicable model for other agricultural villages in Indonesia.

## 4. Conclusion and Recommendations

This study demonstrates that the development of Serbuk Sawo Drajat through a Participatory Action Research (PAR) approach has successfully converted the persistent challenge of Sapodilla perishability into an opportunity for sustainable community empowerment. By processing surplus and easily spoiled fruits into a durable natural sweetener with a shelf life of up to 12 months, the program effectively reduces post-harvest waste, raises product value, and stabilizes income for local farmers and MSMEs in Desa Drajat. The program produced measurable improvements in participants' green-economy awareness, processing technology skills, hygiene practices, and digital

marketing knowledge. These outcomes confirm that community-based eco-innovation, when supported by structured training and participatory engagement, can strengthen rural economic resilience while advancing circular entrepreneurship. Serbuk Sawo Drajat stands as a replicable model of sustainable agro-industry development that aligns with SDG 12, the Green Economy paradigm, and sustainable MSME development.

Based on the findings and community reflections, several recommendations are proposed to ensure long-term sustainability and scalability of the Serbuk Sawo Drajat initiative.

- 1) **Strengthen Institutional Collaboration**  
Integrating the production of Serbuk Sawo Drajat into Village-Owned Enterprises (BUMDes) is recommended to ensure consistent production management, shared resources, and equitable profit distribution.
- 2) **Advance Digital Marketing and Branding**  
MSMEs should develop unified branding strategies and use e-commerce platforms, social media campaigns, and digital storytelling to promote the product as a healthy, natural, and eco-responsible sweetener.
- 3) **Broaden Product Diversification**  
Future development should consider derivative products such as sawo-infused drinks, snacks, or instant mixes to widen market reach and raise value creation within the Sawo commodity chain.
- 4) **Invest in Appropriate Technology**  
To maintain product consistency and meet food safety standards, investment in energy-efficient dehydrators, humidity-controlled storage, and standardized packaging equipment is strongly advised.
- 5) **Continue Capacity Building**  
Establishing a community learning center can ensure ongoing training in agro-processing, business management, financial literacy, and environmental stewardship, supporting the long-term sustainability of rural entrepreneurship.
- 6) **Expand Government and Academic Support**  
Collaboration with local government, universities, and agricultural extension agencies should be broadened to provide regulatory guidance, technology assistance, and market linkage support.

These recommendations aim to strengthen economic empowerment, maintain product quality, and position Desa Drajat as a model of rural circular entrepreneurship in Indonesia.

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