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Organic Farmer Field School (FFS) and the Implementation of Quality Control Systems in Sustainable Farming Practices

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Abstract

The market prospects and price stability of Javanese long pepper (Piper retrofractum Vahl) indicate that this commodity has the potential to generate profit and bolster the economy as a leading commodity in Wonogiri Regency, particularly in Paranggupito District. To capitalize on these opportunities, the produced yields must adhere to specific standards, notably organic certification. This community service initiative aimed to enhance farmers' technical proficiency in the production and implementation of organic fertilizers, as well as to improve their capacity in implementing quality control systems. The program was conducted in Gudangharjo Village, Paranggupito District, Wonogiri Regency, utilizing the Farmer Field School (FFS) methodology. The outcomes of this activity include: (1) An increase in farmers' knowledge regarding Javanese long pepper cultivation through the application of both solid and liquid organic fertilizer technologies. (2) The establishment of demonstration plots (demplots) to facilitate direct participation in organic cultivation practices aligned with organic Good Agricultural Practices (GAP). (3) The successful formulation of organic GAP Standard Operating Procedures (SOPs) by farmers, serving as a formal guideline for cultivation to ensure uniform and high-quality organic Javanese long pepper production.

Keywords*: Internal Control System, javanese long pepper, marginal land*

1. INTRODUCTION

Javanese long pepper (*Piper retrofractum* Vahl), also known as cabe jawa, is a spice closely related to black pepper (Piper nigrum) and cubeb (Piper cubeba). As an indigenous Indonesian plant, its cultivation is concentrated in East Java (Sumenep, Pamekasan, Banyuwangi, and Jember), Central Java (Wonogiri), Lampung, and Banjarmasin, due to favorable agroclimatic conditions (Evizal, 2013). This species thrives at altitudes of 0–600 meters above sea level (masl), with an average annual rainfall of 1,259–2,500 mm and temperatures ranging from 20–34°C. Consequently, it exhibits high adaptability, growing from coastal areas to hilly terrains. While it prefers friable, well-drained sandy loam soils, it can also flourish in dry, rocky land, making it an ideal commodity for unproductive or marginal lands where other crops struggle to survive (Hasan & Ihsannudin, 2023).

The development prospects for Javanese long pepper are promising, driven by the growth of the modern herbal medicine industry and the global "back to nature" trend. The demand for natural-based pharmaceuticals continues to rise (Arifiyanti et al., 2017). Therefore, cultivation is essential not only to meet domestic demand for traditional medicine (jamu) but also for the export market. Currently, global demand reaches approximately 6 million tons, yet Indonesia only fulfills one-third of this requirement (Bahruddin et al., 2021). With importing countries spanning Singapore, Malaysia, China, the Middle East, Europe, and the United States, the opportunities for cultivation remain extensive.

Wonogiri Regency is one of the largest producers of long pepper in Central Java. Gudangharjo Village, located in the Paranggupito District, possesses significant potential for developing this commodity. As a high-value export product, long pepper must meet global market qualifications, primarily through organic certification (Esteves et al., 2021). Certification ensures integrity across the entire supply chain and allows organic producers to identify products that comply with organic standards (Sacchi et al., 2024). However, current

community conditions reveal low farmer knowledge; cultivation remains conventional, often integrated into agroforestry systems as a secondary crop due to its climbing nature.

The challenges in developing organic Javanese long pepper in Gudangharjo Village, Paranggupito District, Wonogiri Regency, include: (1) technical land aspects, agricultural land consists of dry, hilly, and rocky topography. (2) Water availability, limited water access necessitates prioritizing household use, leaving agricultural practices dependent on seasonal rainfall. (3) Seed quality, seedlings used in cultivation are non-standardized and of low quality. (4) Fertilizer availability, while farmers use manure, the production process does not yet align with Good Agricultural Practices (GAP). (5) Cultivation practices, methods from land preparation to harvesting remain conventional and unsystematic. (6) Quality documentation and certification, there is a lack of quality documents, Internal Control Systems (ICS), and Standard Operating Procedures (SOP) for organic cultivation, resulting in inconsistent product quality due to limited knowledge of organic certification standards. Based on preliminary observation, 75% of participants did not have adequate knowledge regarding adoption of organic farming.

This community service program aims to provide practical solutions directly applicable to farmers' cultivation practices. The specific objectives are to enhance farmers' capabilities in Good Agricultural Practices (GAP) for long pepper in preparation for organic certification, and to improve farmers' proficiency in implementing Organic Quality Control Systems (OQCS). It is anticipated that farmers will not only acquire new technical skills but also undergo a paradigm shift that increases long-term productivity. Success in this program will facilitate broader market access and more favorable pricing for the farmers.

2. METHOD

This community service initiative was conducted in Gudangharjo Village, Paranggupito District, Wonogiri Regency, commencing on June 4, 2024. This community service activity targeted 50 members of the farmer group. The program was implemented in collaboration with the technical team from Rikolto, an international non-governmental organization (NGO). The assistance provided to Javanese long pepper farmers encompassed several strategic activities, including: seedling production training, the formulation of solid organic fertilizer, the production of liquid organic fertilizer, and training on the implementation of Internal Control Systems (ICS). The primary methodology employed was the Farmer Field School (FFS) approach. FFS is a community-centered learning model that utilizes participatory methods to create a conducive learning environment, allowing participants to exchange knowledge and experiences in a risk-free setting. Practical field exercises—comprising direct observation, group discussion, and collective decision-making—facilitate learning-by-doing. The field serves as a laboratory where local indigenous knowledge and external scientific insights are tested, validated, and integrated within the context of the local ecosystem and socio-economic environment. Furthermore, community-based problem analysis serves as the foundational entry point for FFS groups to develop site-specific curricula (FAO, 2026).

3. RESULT AND DISCUSSION

Based on observations conducted by the UTP Surakarta Community Service Team, Javanese long pepper (*Piper retrofractum* Vahl) holds significant potential for development as a high-value export commodity. This potential is reflected in the global market trends for long pepper, where export data from 2016 to 2021 indicates a consistent annual increase (Susetiyo & Hayati, 2021). Furthermore, the strategic partnership with exporters facilitated by UTP Surakarta—who are prepared to market long pepper in both local and global markets—strengthens the prospects for developing and enhancing the added value of this commodity as

a flagship product in Paranggupito District, Wonogiri Regency. Capitalizing on these substantial opportunities requires products to meet global market qualification standards, specifically through organic certification (Esteves et al., 2021). To achieve organic certification readiness, the UTP community service team conducted a series of assistance activities, including:

1. Focus Group Discussion (FGD) on Organic Javanese Long Pepper Product Development

The Focus Group Discussion (FGD) conducted with Farmer Field School (FFS) participants regarding the development of organic Javanese long pepper was characterized by high enthusiasm and active participation. This FGD aimed to elicit innovative ideas, share practical experiences, and formulate collective strategies to enhance the quality and added value of organic long pepper products. Participants—comprising farmers, farmer group leaders, and FFS facilitators—discussed critical challenges in cultivation, including Integrated Pest Management (IPM) techniques, the utilization of organic fertilizers, and post-harvest management. The discussion emphasized the imperative of implementing sustainable agricultural practices to maintain the integrity of organic products in accordance with prevailing certification standards.

Beyond serving as a platform for knowledge exchange, the FGD functioned as a mechanism for building collective commitment toward improving organic product quality, which yields positive impacts for both the farmers and the environment. Driven by a collaborative spirit, participants expressed optimism that organic Javanese long pepper could emerge as a flagship commodity, contributing to agricultural sustainability and enhanced farmer welfare. Consequently, a key output of this FGD was the collaborative planning and subsequent implementation of the agreed-upon activities.

Figure 1. *Focus Group Discussion* (FGD) activity

2. Organic Fertilizer Production Training via the Farmer Field School (FFS) Approach

In an effort to train farmers in implementing Organic Good Agricultural Practices (GAP), the Farmer Field School (FFS) methodology was employed. FFS is widely recognized as an effective pedagogical method for the diffusion and dissemination of agricultural innovations and technologies among smallholder farmers. The primary objective of conducting an organic FFS is to facilitate a transition in farming behavior—shifting from conventional practices reliant on synthetic chemical inputs toward the utilization of natural and organic inputs. Within this community service program for organic Javanese long pepper development, the FFS curriculum included the following components:

a. FFS on Organic Fertilizer Production (Composting)

In Gudangharjo Village, farmers typically utilize livestock manure derived from cattle and goat excrement. Based on focus group discussions, it was identified that farmers

showed limited interest in the composting process; they traditionally applied raw manure directly onto the land surface without soil incorporation. Consequently, this intervention program trained farmers in the aerobic fermentation of cattle manure to produce solid compost. Compost is defined as organic matter that has undergone decomposition through the interaction of endogenous microorganisms. Cattle manure is a potent feedstock for composting, containing essential nutrients: 0.33% Nitrogen (N), 0.11% Phosphorus (P), 0.13% Potassium (K), and 0.26% Calcium (Ca). As an organic soil amendment, compost is superior and more sustainable compared to synthetic conditioners. Although organic fertilizers generally possess lower macronutrient (NPK) concentrations, they contain sufficient micronutrients vital for plant physiology. The materials utilized in this production included cattle manure, rice husks, foliage, molasses, water, and a decomposer (Stardec) enriched with 0.5 liters of rumen fluid. The technical procedures for solid compost production are as follows: (1) feedstock preparation, layering cattle manure at the base, followed by rice husks. (2) Inoculation, even application of the Stardec decomposer. (3) Activation, diluting and distributing molasses as a carbon source for microbes. (4) Homogenization, thorough mixing of all organic materials. (5) Moisture regulation, maintaining a moisture content of approximately 60% (indicated by the material retaining its shape when squeezed without dripping water). (6) Hydration, adjusting moisture levels as necessary. (7) Incubation, covering the mixture with a tarpaulin to facilitate thermophilic activity. (8) Aeration, weekly turning of the pile to ensure oxygen supply. (9) Monitoring, verification of microbial activity on the third day via temperature observation (heat production indicates active decomposition). (10) Maturation, the process concludes within a three-week duration.

Upon completion, farmers were guided to identify the physical characteristics of mature compost, specifically a reduction in temperature and the absence of foul odors. Further criteria for high-quality compost discussed with the participants include: (1) color: the compost exhibits a dark brown to blackish hue, indicating successful humification. (2) Odor: High-quality compost lacks a pungent or ammoniacal scent, instead emitting an earthy aroma characteristic of forest humus. (3) Texture and Consistency: When compressed in the palm, the material forms a cohesive clump; however, these organic aggregates should crumble easily under gentle pressure, demonstrating an ideal friable structure.

Figure 2. Solid organic fertilizer production training

b. FFS: Liquid Organic Fertilizer Production from Cattle Urine

Liquid Organic Fertilizer (LOF) is a naturally derived fertilizer produced through the fermentation process, resulting in a nutrient-rich solution from the decomposition of plant residues or animal waste. The training stages for producing LOF from cattle urine are as

follows: (1) preparation, all necessary tools and raw materials are gathered. (2) Mixing base ingredients, cattle urine and soybean wash water (as a protein source) are poured into the fermentation vessel. (3) Carbon supplementation, molasses is added to provide a carbon source for microbial activity. (4) Inoculation, rumen fluid is introduced as a microbial starter to initiate fermentation. (5) Additive incorporation, ground medicinal herbs (empon-empon) are added to enhance the fertilizer's bioactive properties. (6) Homogenization and sealing, the mixture is stirred thoroughly and hermetically sealed. (7) Incubation, the solution is allowed to ferment for 10–15 days. (8) Aeration and gas release, to optimize the process, accumulated gases are released daily by briefly opening the container and stirring the mixture before resealing.

After a 14-day period, farmers were guided to identify the characteristics of a successful fermentation. The maturation of the liquid fertilizer is indicated by a distinctive fermented aroma (resembling tapai). The implementation phase involved a dilution practice where the LOF is mixed with water at a 1:10 ratio (e.g., 1 liter of LOF dissolved into 10 liters of water) prior to field application.

Figure 3. Liquid organic fertilizer production training

3. Quality Control System

To prepare the Gudangharjo Farmers' Association (Gapoktan) for organic certification, a digital-based system was developed to facilitate farmers in implementing organic quality control. A product can only be officially claimed and certified as organic if every stage—encompassing cultivation, harvesting, post-harvest handling, processing, labeling, storage, and logistics—strictly adheres to organic principles. This compliance is verified through regular annual inspections by an accredited certification body, ensuring that organic integrity remains transparent and accountable.

a. Establishment of the Internal Control System (ICS) for the Gudangharjo Farmers' Association

Based on the identified challenges within the Gudangharjo Farmers' Association (Gapoktan), it was noted that a quality control management system—commonly referred to as an Internal Control System (ICS)—to produce organic-standard Javanese long pepper was not yet established. An ICS is a specialized group or management body tasked with conducting internal audits to monitor the implementation of cultivation and management practices, ensuring they align with Organic Standard Operating Procedures (SOPs). Furthermore, the establishment of this body is a mandatory prerequisite for applying for organic certification through an Organic Certification Body (LSO). Consequently, this community service initiative facilitated the formation of an ICS management structure, comprising members of the Gapoktan executive board, representatives from farmer groups, and local farmers in Gudangharjo. The ICS organizational structure consists of Supervisors, an ICS Coordinator, an Approval

Committee, Internal Inspectors, Field Assistants, Documentation Officers, Purchasing Personnel, and Sales Personnel. This structure represents the formal organizational framework of the ICS within the Gudangharjo Farmers' Association.

b. Formulation of the Organic Quality Control System (OQCS) Documents

The training for the Internal Quality Assurance System (IQAS) documents conducted with the farmer groups encompasses a set of formal guidelines, including Policies, Manuals, Standards, and Forms. These are independently designed to guarantee the quality of the "Tridharma" or specific agricultural production standards. The documents were structured following the PPEPP cycle (Planning, Implementation, Evaluation, Control, and Improvement) to ensure continuous quality improvement. The primary components of the organic IQAS documents are as follows:

- Quality Policy: Contains the background, vision, mission, and objectives of the IQAS implementation within the organization, as well as the organizational structure of the quality management body.
- Quality Manual (IQAS): A set of guidelines explaining the procedures for implementation, evaluation, control, and the enhancement of standards.
- Quality Standards: Written documents establishing technical specifications that refer to the National Standards for Higher Education or the SNI 6729:2016 standard for organic products.
- Forms and Instruments: Supporting documents used to record and document the execution of quality activities, which include:
    1. Farmer Profile Data
    2. Farmer Land Maps and Boundary Data
    3. Risk Management Analysis
    4. Cooperation Agreement between Farmers and the ICS Chairperson
    5. Farmer Land Sketches
    6. Farmer and Land Data Collection Forms
    7. Farmer Logbooks (Farm Records)
    8. Internal Inspection Forms
    9. Approved Farmer List (AFL) Form

The development of the Organic Quality Control System (OQCS) has been completed with several adjustments to ensure effective implementation by the farmers within the Gudangharjo Farmers' Association (Gapoktan).

4. CONCLUSION

The community service initiative conducted for the Gudangharjo Farmers' Association (Gapoktan) in Paranggupito District, Wonogiri, offers substantial benefits, provided that farmers remain actively engaged and committed to implementing the disseminated technologies and innovations. The key outcomes of this program include: (1) enhanced Technical Knowledge: An increase in farmers' proficiency regarding Javanese long pepper cultivation through the application of organic fertilizer technologies in both solid and liquid forms. (2) Practical Skill Acquisition via Demonstration Plots: The establishment of demonstration plots (demplot) facilitated hands-on experience for farmers, allowing them to directly apply organic cultivation practices that align with Organic Good Agricultural Practices (GAP). (3) Standardization of Cultivation Practices: Farmers have successfully developed Organic GAP Standard Operating Procedures (SOPs). These documents serve as a primary reference for cultivation practices, ensuring the production of organic Javanese long pepper with consistent and superior quality.

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