



## STRENGTHENING MURIA COFFEE MSME THROUGH THE IMPLEMENTATION OF DIGITAL ROASTER MACHINES ON THE SLOPES OF MOUNT MURIA, RAHTAWU VILLAGE, KUDUS REGENCY

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### Abstract

The slopes of Mount Muria in Kudus Regency are known as one of the regions producing high-quality coffee. Coffee is a leading commodity used by the local community through various MSME activities. Several MSMEs, such as Kopi Kunci and Kopi Joesoen, have developed processed robusta coffee beans into ground coffee and marketed them under local brands. However, some production processes are still carried out manually, resulting in suboptimal efficiency and productivity. To address this problem, the community service team at Muria Kudus University implemented a program to strengthen Muria Coffee MSMEs by installing digital roaster machines. The implementation of these two machines is designed to increase efficiency, production capacity, and the quality of processed coffee. The results of the activity showed a significant increase in MSME productivity and turnover, 10-fold compared to pre-implementation conditions. This activity is expected to strengthen the competitiveness of Muria coffee MSMEs, improve the welfare of business actors, and have a positive economic impact on the surrounding community.

**Keywords:** Muria Coffee, Kudus, Roaster Machine, Appropriate Technology, MSMEs

### INTRODUCTION

Kudus Regency has excellent potential to develop local coffee commodities, especially Muria Coffee, which grows on the slopes of Mount Muria and is known for its unique taste and character (Dwijayanti et al., 2020). Supporting the geographical potential should be the primary capital for developing coffee as a superior regional commodity (Prakoso et al., 2024). However, to date, this potential has not been fully utilized due to various challenges faced by local MSMEs, including quality standardization and efforts to market coffee products (Niravita et al., 2024).



Figure 1. Rahtawu Village Coffee Plantation

The high productivity of coffee plantations represents a significant opportunity for local communities. (Winarno, 2025). In Rahtawu Village, several coffee-producing MSMEs, such as Kopi

Kunci and Kopi Joesoen, have successfully utilized this potential. Both MSMEs process robusta coffee beans into ground coffee under the brand name "Kunci Joss," as seen in Figure 2. However, observations and interviews revealed that the ground coffee production process used by these two MSMEs remains suboptimal.



Figure 2. "Kopi Kunci" Ground Coffee Product

Some problems faced by both MSMEs include inconsistent product quality due to substandard post-harvest and roasting processes; roaster machines that produce roasted coffee beans with uneven colors; unstable temperature settings during roasting; and production capacity that can produce large quantities but is hampered by equipment limitations. (Purkuncoro et al., 2024).



Figure 3. Coffee MSME Production Site



Figure 4. Coffee MSME Roasting Results with Old Machines (Uneven Results)

In response to the challenges faced by Kopi Muria's two MSME partners, Kopi Kunci and Kopi Joesoen, the Community Service team at Muria Kudus University implemented technology-enhancement activities, including the design and construction of a digital roaster. This activity is expected to increase the production capacity and quality of ground coffee produced by Kopi Kunci and Kopi Joesoen.

## **METHOD AND PROCEDURES**

The Community Service activities carried out by the team from Muria Kudus University at the

Kopi Muria UMKM partner were carried out through the following five stages:

1. User Needs Identification Phase

During this phase, the community service team conducted surveys and interviews at the Kopi Kunci and Kopi Joesoen production sites. The goal was to gather information about partners' needs and expectations, while also identifying the limitations of existing facilities and infrastructure. The results of this process served as the basis for developing the technology's design.

2. Technology Design Phase

Once the partner's needs are identified, the team begins developing a technology design to be implemented, adapting it to the partner's specific needs and limitations. Activities at this stage include determining general and technical specifications, creating a 3D model, and drafting a blueprint as a reference for the manufacturing process.

3. Manufacture Phase

This stage is the process of creating technology based on the established design. The team performs component manufacturing, assembly, finishing, and initial testing to ensure all parts function as designed and intended for the device.

4. Testing Phase at Partner Locations

At this stage, the designed tool is taken to the partner's location for on-site testing. The trial is conducted to monitor the tool's performance during use by the partner. If any issues or failures are identified, the test results will be used to evaluate and improve the tool before it is officially handed over.

5. Evaluation Phase and Equipment Handover

This final stage focused on evaluating the partners' increased production capacity after using the equipment. Additionally, an official handover ceremony was held, attended by the Muria Kudus University team and the owners of Kopi Kunci and Kopi Joesoen.

**RESULTS**

The community service activities carried out by the Muria Kudus University team began with gathering information regarding partner needs and the limitations of their available resources. Figure 5 shows the situation during the community service team's discussion with the partner. The survey and interviews yielded the information displayed in Table 1.

Table 1. Partner issues and solutions offered

<b>Constraint</b>	<b>Impact</b>	<b>Solution Plan</b>
The old roaster machine cannot stir optimally.	The roasting results are not evenly cooked	Replace with a digital roaster machine

<b>Constraint</b>	<b>Impact</b>	<b>Solution Plan</b>
The heat generated by the engine is difficult to monitor and control easily.	The roasting results are sometimes burnt	Adding components that function to monitor temperature
The capacity of the roasting container on the machine is small	Limited roasting capacity	Design a roasting container that can accommodate large quantities of coffee beans.
Electric power at the partner's production site is 900 VA	Cannot use machines with high power consumption	The designed machine must use components with the lowest possible electrical power consumption.



Figure 5. Discussion with partners

Based on the results of field surveys and interviews, and to address problems faced by partners, the community service team at Muria Kudus University decided to design a digital roaster machine.

The next step is to design the Digital Roaster Machine. This machine is designed to roast coffee beans at adjustable roasting levels (light, medium, or dark roast) with precisely controlled temperature and roasting time, resulting in a consistent coffee flavor. The following are the specifications of the digital roasting machine, tailored to partners' conditions and needs.

a. Technical Specifications

- Material: Body: Food Grade Stainless Steel (SS 304)
- Production Capacity: 5 kg of coffee beans per batch
- Heating Source: LPG / Electricity (Hybrid option)
- Digital real-time temperature monitoring feature (thermocouple sensor)

b. Dimensions

- Machine Dimensions: ± 100 cm (L) × 60 cm (W) × 120 cm (H)
- Machine Weight: ± 70–120 kg (depending on capacity)

The digital roaster machine, which has been designed and manufactured, then enters the manufacturing phase. Following this process, the roaster's motion mechanism is tested to ensure its proper functioning. Figure 6 shows a digital roaster machine that has been successfully designed and manufactured. After being assessed for optimal performance, the roaster is transported to the partner's location for on-site testing. Figure 7 shows the performance testing process of the digital roaster machine conducted with the partner. The test results indicate that the developed digital roaster machine is capable of roasting coffee beans to the level of doneness required by the partner.



Figure 6. Manufactured Roaster Machine



Figure 7. Machine Testing at Partner Production Sites

Based on machine performance testing results conducted with partners, an analysis of potential improvements can be carried out, as shown in Table 2.

Table 2. Analysis of the potential daily increase of partners

Parameter	Before Machine Implementation	After Machine Implementation	Potential Improvement
Production Capacity	5 kg	50 kg	10 times
Turnover (assuming	Rp 660.000,-	Rp 6.600.000,-	10 times

Parameter	Before Machine Implementation	After Machine Implementation	Potential Improvement
selling price is Rp 20,000/-/150 grams)			

Based on the data in Table 2, digital roasters can increase partners' potential daily income by up to 10 times. This increase is expected to improve partners' welfare. This community service activity concluded with a handover ceremony for the equipment to the partners, as shown in Figure 8.



Figure 8. Handover of Equipment with Partners

## CONCLUSION

The community service program implemented by the Muria Kudus University team in collaboration with Kopi Kunci and Kopi Joesoen can be concluded as highly successful and impactful. The introduction and application of digital roaster technology have brought significant improvements to the partners' production processes, efficiency, and overall business performance. By replacing conventional roasting methods with modern digital systems, partners are now able to achieve more consistent product quality, better temperature control, and reduced production time. These technical improvements have directly contributed to a remarkable increase in production capacity and business turnover, reaching up to ten times higher than the conditions prior to the installation of the machines.

Beyond the quantitative growth, this program has also strengthened the partners' competitiveness in the local and regional coffee market. Increased productivity enables them to meet higher market demand, expand distribution networks, and enhance brand credibility. Furthermore, the growth in turnover is expected to improve the welfare of business owners and workers, while opening opportunities for job creation and local economic stimulation. In the long term, this program demonstrates how appropriate technology transfer, combined with academic–industry collaboration, can empower small and medium enterprises. Therefore, this initiative can serve as a sustainable model for community empowerment and economic development in other regions with similar characteristics.

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