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Redefining Accounting Education: Balancing Technological Innovation with Ethics and Sustainability

Implementation of Agroforestry Technology and Postharvest Innovation in Strengthening the Sustainable Economy of Durian and Coffee Farmers in Brongkol Village

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ABSTRACT
This community service project aimed to enhance the economic sustainability of Brongkol Village through the development of value-added durian and coffee products. Brongkol's durian and Robusta coffee, key agroforestry commodities, faced challenges including low productivity, inconsistent quality, and a lack of postharvest management. The project utilized participatory methods, involving local farmers in training, mentoring, and technology application, such as solar dryers and Android-based coffee roasters. As a result, farmers improved their product quality, diversified their income through value-added products, and gained a deeper understanding of sustainable agroforestry practices. Additionally, the project contributed to the village's development as a potential agrotourism destination. The success of this program underscores the importance of collaboration between academia, government, and local communities, and provides a model for sustainable development in agroforestry regions across Central Java. Future efforts should focus on expanding market access and obtaining product certifications for long-term success.

Keywords: agroforestry, value-added products, sustainable development

INTRODUCTION

Brongkol Village, located in Jambu District, Semarang Regency, holds significant potential in durian and coffee commodities, two key agroforestry products that support the local economy. Brongkol's durian is known for its sweet and slightly bitter taste, with fruit quality recognized at the provincial level [1]. Meanwhile, the Robusta coffee cultivated in Brongkol is also renowned for its unique flavor and has a good reputation in the domestic market [2]. These two commodities are the primary sources of income for local farmers, most of whom are engaged in agriculture [3]. Despite this potential, the agricultural sector in Brongkol faces several challenges [4–6]. The productivity of both commodities remains low, product quality is unstable, and there is a lack of value-added products. Postharvest management, which includes processing and storage techniques, is also suboptimal, impacting the quality and sustainability of farmers' incomes.

In addition, the village's natural resources are significantly declining [7,8]. This is evident from the increasing difficulty in accessing clean water and the decreasing water flow, which impacts irrigation and water supply. The threat of natural disasters, such as landslides and floods, is rising due to the reduction in land cover, leading to soil instability. This worsens the economic and social conditions of the Brongkol community, which heavily depends on the sustainability of natural resources and agriculture.

Despite its potential, Brongkol Village faces several critical issues that need to be addressed urgently. One of the main problems is the low productivity and inconsistent quality of the durian and coffee products. Durian production in Brongkol often fluctuates, with many durian trees failing to produce high-quality fruit, and most farmers still rely on natural growth without intensive care. Meanwhile, the coffee produced by the Karya Bakti I Farmer Group (KTKB I) has unstable quality, with most of the coffee classified as low quality (grade 2). Furthermore, the lack of value-added products from durian and coffee hinders the increase in farmers' incomes. Value-added products, which could enhance the value of these commodities, are not being managed optimally, preventing the development of these products' markets. This negatively affects the economic sustainability of the community, which is reliant on the seasonal yields of these primary products.

Postharvest management, including drying and processing, is also a major issue in the village [9,10]. Without proper technology, the abundant durian during the harvest season is often poorly managed, leading to a decline in its market value. Similarly, coffee is often processed manually and relies on weather conditions, making it difficult to consistently maintain the quality of the coffee products.

On the other hand, the decline in the quality of natural resources and the environment poses an increasingly real threat. Climate change and deforestation are increasingly affecting soil quality and water availability, potentially increasing the risk of natural disasters such as landslides and floods. Better environmental management and the application of eco-friendly technologies have become urgent needs so that this agro-based economy can develop more sustainably.

The primary objective of this community service initiative is to enhance the value-added and economic sustainability of Brongkol Village's economy, focusing on the development of value-added products from durian and coffee. In the long term, this program aims to optimize the use of natural resources in a sustainable manner and improve the competitiveness of local agricultural products through the application of appropriate technologies. The program also seeks to promote Brongkol Village as a pioneer agrotourism village based on environmental conservation. By utilizing key products like durian and coffee as the main attractions, it is expected that the village will attract tourists, increase local income, and support the conservation of natural resources.

Additionally, this community service aims to enhance farmers' capacity through training and mentoring that covers modern and efficient cultivation and postharvest processing techniques. By implementing eco-friendly and efficient technologies, it is hoped that farmers will be able to improve the quality of their products and increase their market value.

This community service holds significant importance, both directly for the Brongkol community and in supporting local government programs. First, it supports UNNES's vision as a university with a conservation-based approach by applying research focused on conserving natural resources and implementing sustainable agroforestry management. Second, the program contributes to strengthening the local economy by introducing value-added products from durian and coffee, which can increase farmers' incomes and create new business opportunities.

The program also includes the commercialization of interdisciplinary research involving economics, applied biology, industrial engineering, and informatics. Technological innovations, such as the use of *solar dryer dome* for drying coffee and durian and the application of digital bookkeeping apps, will help improve agribusiness efficiency and open up broader market opportunities. Therefore, this community service not only benefits the people of Brongkol Village directly but also supports the development of a conservation-based economy that can serve as a model for other villages in Indonesia.

RESEARCH METHOD

The approach used in this community service project is participatory descriptive, where the community is actively involved in every stage of the activities. This participatory approach ensures that local knowledge and participation are integrated throughout the project, which helps foster ownership and sustainability of the program.

The activities were carried out in several stages, as follows:

- Socialization: This initial stage involved introducing the program to the community, explaining the goals, and assigning roles to different stakeholders. The schedule and job descriptions for each participant were shared. This helped establish a shared understanding and set expectations for the project.

Table 1. Problem-Solving Methods for AT and KTKB I Partners

No	Method	2025 Plan
Target Partner: Ajuning Tani (Durian Commodities)		
1. Socialization	- Socialization of the community service activities for 2025 - Involvement of CDK3, Village Government (Pemdes), and target partners - Activity design for 2025 - Tentative schedule for 2025 - Job desk for 2025	Partner Participation: - Pemdes provides the venue and LCD; - CDK3 gives guidance; - Target partners attend the event.
2. Training	- Durian product processing: Gelato, Ice Lollies, Candy, Ice Cream - Business Management	Partner Participation: - Pemdes provides the venue and LCD; - CDK3 acts as instructor; - Target partners actively participate in training.
3. Technology Application	- Durian product processing: - Frozen - Ice Lollies - Gelato - Candy	Target Partners: - Involved in every technology application activity.
4. Mentoring, Monitoring, and Evaluation	- Ensuring that every technology is correctly applied by the partners	Target Partners: - Actively involved and ready for every mentoring, monitoring, and evaluation activity.
5. Sustainable Program	- Ensuring that partners can independently and correctly apply all technologies - Agrotourism village development	Commitment from Pemkab, CDK3, Pemdes: - Support for realizing the village's vision. Partner Participation: - Together with the implementation team, monitor to ensure program sustainability.
Target Partner: Karya Bakti I Farmer Group (Robusta Coffee Commodities)		
No	**Method**	**2025 Plan**
1. Socialization	- Socialization of community service activities for 2025 - Involvement of CDK3, Pemdes Brongkol, and two target partners - Activity design for 2025 - Tentative schedule for 2025 - Job desk for 2025	Partner Participation: - Pemdes provides the venue and LCD; - CDK3 gives guidance; - Target partners actively participate in training.
2. Training	- Coffee powder packaging - Coffee souvenirs - Business management - Agrotourism village development	Partner Participation: - Pemdes provides the venue and LCD; - CDK3 acts as instructor; - Target partners actively participate in training.
3. Technology Application	- Coffee souvenirs (resin keychains), Coffee powder	Target Partners: - Involved in every technology

No	Method	2025 Plan
	packaging, and Coffee perfume	application activity.
4. Mentoring, Monitoring, and Evaluation	- Ensuring that every technology is correctly applied by the partners	Target Partners: - Actively involved and ready for every mentoring, monitoring, and evaluation activity.
5. Sustainable Program	- Ensuring that partners can independently and correctly apply all technologies - Agrotourism village development	Commitment from Pemkab, CDK3, Pemdes: - Supporting economic and environmental development. Partner Participation: - Together with the implementation team, monitor to ensure program sustainability.

- Training: The training sessions covered the production of value-added products. For durian, this included making gelato, ice lollies, candy, and frozen durian, while for coffee, training focused on creating souvenirs, perfume, and keychains from coffee waste.

Figure 1. Training sessions for durian and coffee processing

- Technology Application: This stage involved introducing key technological innovations such as the solar dryer dome for drying durian and coffee, the Android-based coffee roaster, and the barcode system for durian and coffee trees for digital record-keeping. These technologies were introduced to improve processing efficiency and product quality.
- Mentoring and Monitoring: To ensure the effective implementation of technology, continuous mentoring and monitoring were conducted. This ensured that all technologies were being used correctly and that the farmers were adapting to the new methods.
- Evaluation and Sustainability: In this phase, the project evaluated the improvements in the farmers' capacity, the effectiveness of the activities, and the overall sustainability of the program. Data on farmers' progress and technology adoption were reviewed to guide further development.

The main target groups for these activities were:

- Ajuning Tani Farmer Group (focused on durian)
- Karya Bakti I Farmer Group (focused on coffee)

Data were collected through observations, interviews, and field documentation to assess the effectiveness of the activities.

RESULTS AND DISCUSSION

The project has shown positive results across several areas, impacting both the social and economic aspects of the Brongkol community.

Farmers' Capacity Enhancement: One of the primary achievements is the increased capacity of the farmers in sustainable agroforestry management and basic bookkeeping. About 80% of the members of the farmer groups now understand these essential practices, which is a significant step towards improving the sustainability of their businesses.

Innovation in Value-Added Products: Significant progress was made in the development of value-added products. For durian, farmers were trained to produce gelato, candy, ice lollies, and frozen durian, which increased the shelf life and marketability of the product. For coffee, innovations included coffee perfumes, keychains made from coffee waste, and rebranding coffee powder. These products have helped diversify the income sources of farmers.

Improvements in Production Aspects: In terms of production, 100 top-working trees (durian and coffee) were successfully developed, resulting in superior-quality products. Additionally, coffee quality improved, with the beans now reaching Grade I–II (defect rate <25), reflecting better processing methods.

Table 2. Production of several superior durian varieties (AT) in the last 5 years

No	Name of Durian Variety	Variety Type	Fruit Production (pieces/tree)	2019	2020	2021	2022	2023	Tree Age (years)	Number of Parent Trees	Number of Trees
1	J Pink	Local	250	250	150	150	150	80	80	15	15
2	Vera	Local	250	250	75	150	100	80	75	15	15
3	Thilang	Local	300	300	50	200	150	100	100	1	1
4	Najwa	Local	60	60	30	50	40	20	50	1	1
5	Inul	Local	200	200	40	60	80	80	70	1	1

Social and Economic Benefits: The program has led to a diversification of income for farmers, with the introduction of value-added products boosting their overall earnings. Additionally, the development of agrotourism potential in the village has attracted increased interest from tourists, leading to positive economic effects. Brongkol is now on the path to becoming a pioneer agrotourism village. Outcomes and Publications: The program has resulted in the following outcomes:

- An academic article is currently under review which will detail the methods and results of this community service project.
- The project has been featured in several online media outlets, such as Portalsemarang, Timlo.id, and UniversitasIndonesia.com, increasing awareness about the efforts in Brongkol.
- The "Solar Dryer Dome" innovation developed during the project has been registered for copyright protection, securing the intellectual property rights for this new technology.

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Figure 2. Media coverage

These results indicate that the project has successfully contributed to both the economic improvement of the farmers and the environmental sustainability of the village, with a lasting impact on the local economy and agroforestry practices.

The success of this community service program can be attributed to the effective combination of technology-driven empowerment and community participation. The model utilized in the project has proven to be effective in increasing the value-added of agricultural products. By introducing technologies such as the automatic coffee roaster and the solar dryer dome, farmers were able to streamline production processes, reduce drying time, and enhance the overall quality of their products. These innovations not only improved the efficiency of production but also provided farmers with the tools needed to expand their product offerings and increase profitability.

The sustainability of the program is also a key achievement. The agroforestry approach has helped preserve soil and water resources, contributing to the conservation of land while supporting the mitigation of natural disasters like landslides and floods [11,12]. By promoting the use of sustainable farming practices, the project has ensured that agricultural activities are not only economically viable but also environmentally friendly. Additionally, the initiative's focus on transforming coffee waste into souvenirs (such as keychains) highlights the application of circular economy principles, where waste materials are repurposed to create value-added products, reducing waste and contributing to the local economy [13,14].

However, several challenges remain. The most pressing issues include the limited capacity of human resources (HR) and infrastructure. Despite the success of the program, continued support from local government is necessary to strengthen the capacity of the farmers and ensure that the infrastructure required for sustainable agroforestry practices is available. Furthermore, there is a need to expand market access for the value-added products and to legalize these products by obtaining certifications such as the PIRT (Indonesian Food Safety Certification) and registering trademarks for products like D'ren-NNES (durian products) and KOFFINNES (coffee products). These steps are crucial for broadening the market scope and ensuring that the products meet the standards required for both domestic and international markets.

The implications of this program are far-reaching. The successful implementation of these practices and innovations can serve as a model that can be replicated in other agroforestry regions across Central Java. This project exemplifies how collaboration between universities and local communities can foster the development of local economies while promoting sustainable agricultural practices. The partnership between academia and the community has proven to be a powerful approach to addressing local challenges and creating long-term, sustainable solutions.

CONCLUSION

The community service program has successfully enhanced both the productivity and product diversification of durian and coffee in Brongkol Village. Through targeted training, mentoring, and the application of postharvest technology, significant improvements have been observed in both farmers' income and product quality. The introduction of value-added products such as durian gelato, coffee souvenirs, and rebranded coffee powder has not only opened up new revenue streams for the farmers but also elevated the marketability of local agricultural products. The success of the program can be attributed to the strong synergy between academics, government, and the local community, which has been a key factor in driving the village towards becoming a sustainable agrotourism destination. This collaboration has created a model for sustainable development, where each stakeholder plays a crucial role in the success of the program. Looking ahead, there are still areas that need to be strengthened to ensure the long-term sustainability of the initiatives. Specifically, efforts should be focused on expanding marketing strategies, obtaining product certifications such as PIRT and trademarks, and providing advanced training for farmers to further enhance their capacity. By addressing these areas, the program can continue to thrive, supporting the economic and environmental sustainability of Brongkol Village.

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