

Evaluation of Community Empowerment in Utilizing Coffee Husk Waste as Cascara in Peron Village

Umi Rahmawati^{1, a)}, Risa Dwita Hardianti^{1, b)}, Amnan Haris²

¹Natural Sciences Education Study Program, Universitas Negeri Semarang, Semarang, Indonesia

²Environmental Science Study Program, Universitas Negeri Semarang, Semarang, Indonesia

^{a)}Corresponding author: umirahmawati25fmipaunnes@students.unnes.ac.id

^{b)}risadwita@mail.unnes.ac.id

ABSTRACT

This study aims to evaluate a community empowerment program focused on utilizing coffee husk waste into cascara products in Peron Village. The program was implemented through training, mentoring, and hands-on practice involving local community members. Data were collected through observations, interviews, and pre- and post-program evaluations. The results indicate a significant improvement in participants' knowledge and skills in processing coffee waste into value-added products. In addition, the program contributed to increased environmental awareness and economic potential. These findings highlight the importance of community-based approaches in promoting sustainable waste management and rural economic development.

ARTICLE INFO

Article History:

Submitted/Received: 25 February 2026

First Revised: 05 March 2026

Accepted: 20 March 2026

First Available online: 30 April 2026

Publication Date: 30 April 2026

Keyword :

Community Empowerment

Coffee Husk Waste

Cascara

Sustainable Development

Rural Economy

INTRODUCTION

Coffee production still faces environmental challenges, particularly related to solid waste in the form of coffee husks, which are produced in large quantities (Rosdiana et al., 2024). Peron Village, Limbangan District, Kendal Regency, is one of the largest coffee-producing villages in the region (Supriyadi et al., 2014). However, high coffee production is directly proportional to the increasing amount of coffee husk waste produced. This waste can cause environmental problems if not handled properly. One way to utilize coffee husk waste is to process it into cascara, a herbal drink made from dried coffee husks (Base & Noena, 2021). Cascara is known to contain phenolic compounds with high antioxidant activity, making it beneficial for health (Machado et al., 2024; Santos et al., 2021). In addition, cascara production opens up new economic opportunities for the community while contributing to waste reduction and supporting the principles of a circular economy (Karningsih et al., 2025).



FIGURE 1. (a) Coffee commodities in Peron Village (b) Cascara production by the people of Peron Village

In Peron Village, Kendal Regency, a community empowerment program was carried out through training in cascara production and marketing assistance by a team of students and lecturers from Universitas Negeri Semarang. This program was initiated based on the abundant coffee commodity potential in Peron Village, as shown in Figure 1a, as well as the problem of coffee husk waste that had not been optimally utilized. Through community empowerment activities, the community is encouraged to process this waste into value-added products in the form of cascara. The cascara production process is carried out directly by the Peron Village community, as shown in Figure 1b. The results of the activities show an increase in the community's knowledge and skills in processing coffee husk waste into cascara (Naufal et al., 2025). This improvement is an indicator of the initial stage of success, but it is not enough to look only at the aspects of knowledge and skills. Evaluation activities need to be carried out after the training program. Evaluation serves to identify weaknesses faced by the community, such as limited market access, technical skills, and institutional support. Thus, program evaluation not only provides an overview of the effectiveness of activities but also serves as a basis for the development of a sustainable circular economy-based community empowerment model (Analianasari et al., 2025).

Various studies have been conducted to support the use of coffee husk waste into cascara, but each study has a different focus. Arpi et al., (2021) examined the chemical characteristics of cascara from various coffee husk treatments and emphasized sensory quality and bioactive content. Karima et al., (2024) highlighted the effect of drying time on the organoleptic characteristics of coffee husks, which affects the shelf life of cascara raw materials. Safmi et al. (2025) developed a method for predicting the moisture content of cascara using NIR spectroscopy, with a focus on product quality control. Bagaskara

et al., (2022) discuss cascara business development strategies at the small industry level, with an emphasis on business management and marketing aspects. Maxiselly et al., (2023) emphasize the management of coffee skin waste into high-value cascara tea products on coffee plantations, with a focus on production and added value enhancement. Previous studies have focused more on the production potential of cascara, but few have evaluated community empowerment programs that integrate technical training and economic development. Therefore, this study aims to evaluate the effectiveness of community empowerment programs in increasing the capacity to process coffee husk waste into cascara products.

METHOD

This study uses a descriptive evaluative approach that aims to assess the effectiveness of community empowerment programs in utilizing coffee husks into cascara in Peron Village. The research subjects consisted of 25 local community members who were involved in coffee processing activities and participated in training and mentoring activities. Data were collected through observations, interviews, and structured questionnaires containing 20 questions with a Likert scale of 1–5. The research instruments covered five aspects of evaluation, namely product quality, production sustainability, sales effectiveness, marketing strategies, and program benefits. The data obtained was then analyzed descriptively using simple statistics and qualitative interpretation, so that the research results were able to provide a comprehensive picture of the program's strengths and weaknesses.

RESULTS AND DISCUSSION

The community empowerment program evaluation was conducted after the entire series of training and mentoring sessions had been completed. The research questionnaire was completed by 25 respondents from the Peron Village community, which was the target group. The questionnaire was administered on January 18–20, 2026, and all respondents provided complete answers. In addition to the questionnaire, supporting data were also collected through direct observations of production and marketing activities and interviews with participants, which enriched the analysis and ensured that the evaluation captured both quantitative and qualitative perspectives. The data obtained from these instruments was then analyzed descriptively to obtain a comprehensive picture of the program's strengths and weaknesses.

Figure 2 shows the results of the community empowerment program evaluation based on five main aspects, namely product quality, production, sales, marketing, and program benefits. The analysis was conducted by analyzing each question in the questionnaire, thereby obtaining a detailed picture of the strengths that the community already possesses and the weaknesses that still need to be improved. Respondents gave excellent ratings (range 4.20–5.00) for product quality, marketing strategy, and program benefits, indicating the success of activities in improving coffee husk processing skills and the economic value of cascara products. Meanwhile, the aspects of production sustainability and sales effectiveness were rated as fairly good (range 2.60–3.39), indicating weaknesses in production consistency and market stability. These findings form the basis for formulating recommendations for improvement so that the program is not only successful in the initial stages but also sustainable in the long term.

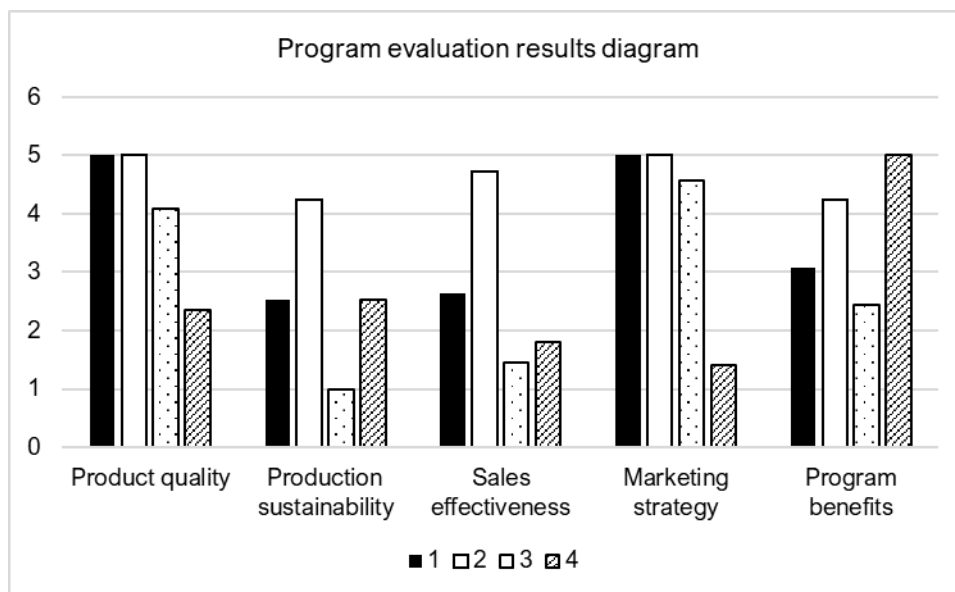


FIGURE 2. Results of the evaluation of the community empowerment program in Peron Village

In terms of cascara product quality, respondents gave excellent ratings for product durability during storage for one to two weeks. The product was assessed to remain in good physical condition, not prone to mold, and the drying process was carried out until it was completely dry with a crisp texture and no stickiness. This assessment shows that cascara quality is sufficiently maintained in the short term. This finding aligns with the research by Tampubolon et al., (2024) , which confirms that drying methods and optimal temperatures significantly influence cascara quality, particularly in terms of the product's physical and sensory characteristics. However, a score of 2.36 on the quality decline assessment item after two weeks of storage indicates that cascara has limited shelf life. This condition is consistent with the research by Safmi et al. (2025), who used NIR spectroscopy to predict the moisture content of cascara, where high moisture content was found to accelerate mold growth and reduce product quality. In addition to drying factors, packaging also plays an important role in maintaining cascara quality. Widyasanti dan Maharani (2025) emphasize that optimizing drying and packaging conditions can maintain the color and quality characteristics of cascara, making the product more competitive in the market. In the context of moisture control, the use of desiccants such as silica gel has been proven effective in extending the shelf life of food products. Research by Pratama & Sonjaya (2023) shows that the application of silica gel in active packaging can slow down microbial growth and maintain organoleptic quality, which is relevant to cascara.

Efforts to improve the quality of cascara need to be directed towards implementing stricter standards in the drying and packaging processes. First, the community needs to be trained in using controlled drying methods with appropriate temperatures and times to keep the moisture content of the product low. Second, airtight packaging with added desiccants such as silica gel can be a practical solution to extend shelf life and prevent mold growth. Third, periodic evaluations of product quality need to be carried out with reference to food quality standards so that cascara has higher competitiveness in the market. With these steps, the quality of cascara will not only be maintained in the short term, but will also be able to meet consumer needs for long-term storage.

Meanwhile, the sustainability aspect of production showed the highest score on the question of the community's ability to produce independently at least once a month. This indicates that most respondents already possess basic production skills. In addition, some respondents were also able to produce at least ten ready-to-sell packages in a single production process. However, the sustainability of

cascara production shows inconsistent results, marked by an average score of 1 on the assessment item for production activities that are not carried out routinely every month. This is due to limited raw materials, as coffee cherry husks are only available during the harvest season, which occurs once a year. This condition makes it impossible to carry out production activities regularly every month, and the number of products produced is still fluctuating. These findings are in line with the research by Arpi et al., (2021), which confirms that the availability of red coffee husks as raw material for cascara is highly dependent on the harvest season, thus requiring a post-harvest strategy to maintain production continuity. These strategies include drying and storage to maintain supply throughout the year. Karima et al., (2024) showed that drying coffee husks for a longer period of time improves organoleptic characteristics and extends the shelf life of the raw material. Controlled drying techniques using a food dehydrator at a temperature of 40–60°C have been proven to maintain the quality of dried coffee husks longer than traditional drying methods. In addition, Wibowo et al., (2024) emphasize that the sustainability of cascara production is highly dependent on storing raw materials in a low-humidity room at a temperature of 25–27°C, because at this range, the stability of cascara's bioactive metabolites is maintained, so that quality is maintained throughout the year.

Sustainable cascara production requires the application of standardized drying techniques for red coffee husks at appropriate temperatures and times. By applying these techniques, the moisture content can be kept low so that the quality of the cascara product is maintained. The community needs to be trained in the use of modern drying equipment or special drying rooms to ensure more consistent results. In addition, the construction of storage facilities with controlled humidity is an important step so that dried coffee husks can be used throughout the year. With this strategy, cascara production in Peron Village is expected to be more sustainable, not only increasing the harvest season, but also capable of supporting the sustainability of coffee.

In terms of sales effectiveness, the score obtained was relatively lower than other aspects. The highest score was on the additional income generated from sales indicator, although the amount was still limited. Several respondents stated that they had successfully sold at least ten packages of cascara products in the past month. However, the lowest score, with an average of 1.8, appeared on the sales consistency assessment item of at least ten packages per month. Most respondents stated that sales were not yet stable and consumer demand was still lower than the number of products produced. This condition indicates an imbalance between production capacity and market absorption. Ardian (2023) revealed that cascara product sales can stagnate if consumer demand is low and product distribution is not yet optimal, so that excess production is not absorbed by the market. This shows that producers need to adjust production levels to consumption patterns to avoid excess stock. Additionally, Yudha & Roche (2023) emphasize that the food supply chain in Indonesia must align production with consumer demand to prevent surpluses that depress prices and harm producers. This principle is relevant to cascara because excess production without a ready market to absorb it will reduce the economic value of the product and hinder business sustainability.

The implementation of a demand-based production system is an important step in maintaining a balance between production capacity and market absorption. The Peron Village community needs to conduct regular market surveys to identify consumption trends and adjust production volumes to consumer demand. In addition, developing derivative products such as ready-to-drink beverages or processed foods can open up new markets and reduce the risk of stockpiling. Distribution must also be expanded through cooperation with local stores, cooperatives, and online platforms to stabilize sales. With these measures, cascara production will be more balanced with consumer demand, resulting in consistent sales and sustainable income growth for the community.

In terms of marketing strategy, respondents gave very good ratings to the indicators of social media

utilization and packaging design. Marketing through WhatsApp and social media was considered successful in attracting buyers. Product packaging design was also considered capable of attracting consumer interest, leading to purchases. This advantage indicates that the public already understands the importance of marketing strategies in increasing product appeal. However, weaknesses are still evident in the average score of 1.4 on the assessment item of lack of regular monthly promotional activities, which shows that market reach is not yet optimal. This weakness can be overcome by strengthening digital promotion strategies and holding regular marketing activities. Research by Khaerunnisa et al., (2024) confirms that the application of a marketing mix strategy for cascara-based beverages can increase product competitiveness and expand the market. The study shows that a combination of digital promotion, competitive pricing, and attractive packaging can significantly increase sales. Thus, the people of Peron Village need to strengthen digital promotion so that cascara marketing can be more optimal.

Strengthening the cascara marketing strategy is important in order for the product to be competitive and reach a wider market. First, the community needs to conduct regular digital promotions using social media so that consumers always have the latest information about the product. Second, implementing a more consistent marketing mix strategy, including price adjustments and packaging innovations, can increase the product's appeal in the market. Third, collaborating with local communities and other businesses will help expand the distribution network, so that marketing does not rely solely on direct sales. With these steps, cascara marketing in Peron Village is expected to be more optimal, able to reach a wider market, and support the sustainability of community businesses.

Finally, the benefits of the empowerment program received very good ratings from respondents. The highest rating was given to the indicator of improved community skills in processing cascara after participating in the program. Respondents felt that these skills could be directly applied in production activities. The program was also considered to have opened up additional income opportunities that could be felt every month. However, the average score of 2.44 on the assessment item indicates that further assistance is still needed so that production and sales can be carried out regularly. This finding is in line with the research by Nalurita et al., (2026) that cascara tea production training can improve community skills, but the sustainability of the business is highly dependent on further assistance and institutional support. Additionally, Analiasari et al. (2025) emphasize that applying the circular economy concept to cascara utilization in coffee agroforestry centers can increase product value and strengthen local community empowerment.

Future recommendations can be directed towards strengthening group institutions and support from academic partners and local governments. Alydrus (2025) explains that the success of empowerment programs is not only measured by technical skills, but also by the sustainability of economic and social impacts. The study shows that continuous assistance from universities can increase the capacity of communities to manage small businesses so that the impact of the program is more sustainable. This reinforces the recommendation that the Peron Village community still needs continued support so that the benefits of the program do not stop at the initial stage.

The improvement in participants' skills can be attributed to the hands-on training approach, which enabled direct practice and immediate feedback. Furthermore, participants' understanding increased from 60% to 85% based on evaluation results, showing a substantial gain in knowledge and confidence. This finding is consistent with previous studies showing that community-based training enhances skill adoption and sustainability, thereby reinforcing the importance of continuous mentoring and institutional support.

CONCLUSION

This study shows that community empowerment programs focused on the utilization of coffee husk waste can improve local skills, environmental awareness, and economic opportunities. The transformation of coffee waste into cascara represents a sustainable approach to waste management and value creation. Similar programs in the future should emphasize sustainable assistance, product standardization, and market access to ensure long-term sustainability. Furthermore, the results of this study emphasize the importance of institutional support and consistent digital marketing strategies so that cascara businesses can compete in local and regional markets. These findings also imply that community empowerment based on the circular economy can be an alternative model for agricultural waste management while improving the sustainable welfare of the community.

ACKNOWLEDGMENTS

The author would like to express his deepest gratitude to the Ministry of Education, Culture, Research, and Technology through the Directorate General of Higher Education, Research, and Technology for their financial support, which enabled this program to be carried out successfully. Thanks are also extended to the community of Peron Village for their active participation in every stage of the activities. Special appreciation is given to the team of students and lecturers from Universitas Negeri Semarang who have shown commitment and solid cooperation in the implementation and evaluation stages of the program.

REFERENCES

- Alydrus, M. (2025). Strategi pengabdian kepada masyarakat dalam pemberdayaan ekonomi lokal. *Tifani: Jurnal Penelitian dan Pengabdian Kepada Masyarakat*, 5(1), 64–69.
- Analianasari, A., Noer, I., Berliana, D., Soeherman, G. P., & Maryana, D. T. (2025). Circular economy: Pemanfaatan limbah cascara di sentra agroforestri kopi Pesawaran. *SEMAR: Jurnal Ilmu Pengetahuan, Teknologi, dan Seni bagi Masyarakat*, 14(2), 221–229.
- Ardian, M., & Kusno, K. (2023). Strategi pemasaran produk teh cascara di PT Agritama Sinergi Inovasi Kota Bandung. *Mimbar Agribisnis*, 9(1), 679–688.
- Arpi, N., Muzaiifa, M., Sulaiman, M. I., Andini, R., & Kesuma, S. I. (2021). Chemical characteristics of cascara, coffee cherry tea, made of various coffee pulp treatments. *IOP Conference Series: Earth and Environmental Science*, 709(1), 012030. <https://doi.org/10.1088/1755-1315/709/1/012030>
- Bagaskara, E. R., Sudyarto, S., & Winarno, S. T. (2022). Strategi pengembangan usaha cascara di CV. Kopi Citarasa Persada. *Jurnal Ilmiah Mahasiswa Agroinfo Galuh*, 9(2), 627–638.
- Base, N. H., & Noena, R. A. N. (2024). Karakteristik kombucha kulit buah kopi arabika (*Coffea arabica* L.) dengan berbagai varian rasa. *Jurnal Kesehatan Yamasi Makassar*, 8(2), 92–100. <https://doi.org/10.59060/jurkes.v8i2.347>
- Karima, U., Hartati, D. A. S., & Chusnah, M. (2024). The effect of long drying on the chemical and organoleptic characteristics of Excelsa coffee skin tea (*Coffee liberica* var. *dewevrei*). *Agaricus: Advances Agriculture Science & Farming*, 4(1).

- Karningsih, P. D., Ciptomulyono, U., Suef, M., & Nabilah, I. (2025). Circular economy adoption on coffee production: Case study of a coffee cooperatives farmer in Indonesia. *BIO Web of Conferences*, 157, 04007.
- Khaerunnisa, T., Setiawan, I., Trimo, L., & Mukti, G. W. (2024). Strategi pemasaran kombucha cascara menggunakan konsep marketing mix 7P dengan analisis matriks SWOT dan QSPM. *JIA: Jurnal Ilmiah Agribisnis*, 9(2), 171–185.
- Machado, M., Ferreira, H., Oliveira, M. B. P. P., & Alves, R. C. (2024). Coffee by-products: An underexplored source of prebiotic ingredients. *Critical Reviews in Food Science and Nutrition*, 64(20), 7181–7200. <https://doi.org/10.1080/10408398.2023.2181761>
- Maxiselly, Y., Sari, D. N., Bakti, C., & Anjarsari, I. R. D. (2023). Pengelolaan limbah kulit kopi menjadi produk teh (cascara) bernilai tinggi di perkebunan kopi rakyat Kabupaten Bandung. *Jurnal Kajian Budaya dan Humaniora*, 5(2), 194–198. <https://doi.org/10.61296/jkbh.v5i2.130>
- Nalurita, I., Arzani, L. D. P., Zulfikri, M., Pravitri, K. G., Naufali, M. N., & Ulpiana, M. (2026). Pelatihan pembuatan produk teh cascara sebagai upaya penanganan limbah kulit kopi di KWT Kaki Rinjani. *ADMA: Jurnal Pengabdian dan Pemberdayaan Masyarakat*, 6(2), 91–98.
- Naufal, M. A., Revalina, A. D. N., Primagati, A. T., Najwa, R., Hidayat, F. N., Nabila, H., Rahmawati, R., Salwa, L., Erdana, J. R., Anam, S. M., & Haris, A. (2025). Edukasi dan pelatihan pemanfaatan kulit kopi menjadi teh kaskara melalui program PPK Ormawa di Desa Peron Kabupaten Kendal. *Jurnal Dharma Indonesia*, 3(2), 92–99.
- Pratama, M., & Sonjaya, A. M. (2023). Effect of using silica gel as active packaging to the lemag deterioration in Lahat. *Jurnal Pangan dan Agroindustri*, 11(1). <https://doi.org/10.31186/jagroindustri.13.1.56-70>
- Rosdiana, E., Nugroho, S. A., Kusumaningtyas, R. N., & Santika, P. (2024). Peningkatan nilai tambah bahan baku kopi melalui pemanfaatan limbah kulit kopi menjadi teh cascara di teaching factory pengolahan produk kopi. In *National Conference for Community Service* (Vol. 7, pp. 218–222).
- Safmi, N. A., & Fahmy, K. (2025). Non-destructive prediction of moisture content in cascara using NIR spectroscopy with PLS and PCR. *Jurnal Keteknik Pertanian*, 13(2). <https://doi.org/10.19028/jtep.013.2.249-264>
- Santos, E. M., Macedo, L. M., Tundisi, L. L., Ataide, J. A., Camargo, G. A., Alves, R. C., Oliveira, M. B. P. P., & Mazzola, P. G. (2021). Coffee by-products in topical formulations: A review. *Trends in Food Science and Technology*, 111, 280–291. <https://doi.org/10.1016/j.tifs.2021.02.064>
- Supriyadi, A., Wahyuningsih, S., & Awami, S. N. (2014). Analisis pendapatan usaha tani kopi (*Coffea sp.*) rakyat di Kecamatan Limbangan Kabupaten Kendal. *Mediagro: Jurnal Ilmu Pertanian*, 10(1), 1–13. <https://doi.org/10.31942/mediagro.v10i1.1576>
- Tampubolon, S. D. R., Seleleubajak, M. B., & Nurhayati, N. (2024). Effect of drying method and temperature on the quality of cascara tea. *Agro Bali: Agricultural Journal*, 7(2), 435–448.
- Wibowo, N. A., Wanita, Y. P., Novitasari, E., Amri, A. F., Purwanto, E. H., Yulianti, Y., & Aurum, F. S. (2024). Innovative of cascara as potential in beverage, food and their functional impact: A review. *International Journal of Food Science and Technology*, 59(11), 8082–8092. <https://doi.org/10.1111/ijfs.17562>

- Widyasanti, A., & Maharani, S. D. (2025). Optimasi kondisi proses pengeringan kulit kopi (cascara) terhadap karakteristik warna dengan response surface methodology. *Jurnal Teknologi dan Industri Pertanian Indonesia*, 17(1), 80–85. <https://doi.org/10.17969/jtjipi.v17i1.41694>
- Yudha, E. P., & Roche, J. (2023). How was the staple food supply chain in Indonesia affected by COVID-19? *Economies*, 11(12), 292. <https://doi.org/10.3390/economies11120292>.