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Assistance for coffee processing into kombufee with fermentation method in Benjor Village

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ABSTRACT

Benjor Village, located in Malang Regency, is one of the largest Arabica coffee producing areas in East Java, has great potential in the development of processed coffee products, but still has limitations in terms of innovation. Currently the community only sells coffee in raw form or coffee powder. This service activity aims to increase the added value of Benjor Village Arabica coffee through the innovation of kombufee beverage products. This drink is produced from fermentation of Arabica coffee with kombucha culture, making it rich in probiotics and antioxidants. The target in this activity leads to the productive economic sector of mothers of Family Welfare Empowerment Benjor Village.The method of implementing this service activity is carried out by training and mentoring the processing of Arabica coffee into kombufee using the fermentation method. The results of the training and mentoring were an increase in partner skills, such as mothers of Family Welfare Empowerment in Benjor village, in the contents of kombufee made from coffee beans by 72%. Mentoring activities were carried out for two months, both offline and online (using Whatsapp Group) so that the trainees were able to make kombufee independently and were suitable for sale. Kombufee processing training to the community, especially mothers of Family Welfare Empowerment, is expected to encourage community economic independence and introduce high-value local products.

Keyword: Coffee, Community Service, Fermentation, Kombucha

ABSTRAK

Desa Benjor yang terletak di Kabupaten Malang merupakan salah satu daerah penghasil kopi Arabika terbesar di Jawa Timur, memiliki potensi besar dalam pengembangan produk olahan kopi, namun masih memiliki keterbatasan dalam hal inovasi. Saat ini masyarakat hanya menjual kopi dalam bentuk mentah atau bubuk kopi. Kegiatan pengabdian ini bertujuan untuk meningkatkan nilai tambah kopi arabika Desa Benjor melalui inovasi produk minuman kombufee. Minuman ini dihasilkan dari fermentasi kopi arabika dengan kultur kombucha sehingga kaya akan probiotik dan antioksidan. Sasaran dalam kegiatan ini mengarah pada sektor ekonomi produktif ibu-ibu PKK Desa Benjor Metode pelaksanaan kegiatan pengabdian ini dilakukan dengan pelatihan dan pendampingan pengolahan kopi arabika menjadi kombufee dengan metode fermentasi. Hasil dari pelatihan dan pendampingan tersebut adalah adanya peningkatan keterampilan mitra yaitu ibu-ibu PKK Desa Benjor dalam pembuatan kombufee berbahan dasar biji kopi

sebesar 72%. Kegiatan pendampingan dilakukan selama dua bulan, baik secara offline maupun online (menggunakan Whatsapp Group) agar peserta pelatihan mampu membuat kombufee secara mandiri dan layak jual. Pelatihan pengolahan kombufee kepada masyarakat khususnya ibu-ibu PKK diharapkan dapat mendorong kemandirian ekonomi masyarakat dan mengenalkan produk lokal yang bernilai jual tinggi.
Keyword: Fermentasi, Kombucha, Kopi, Pengabdian Masyarakat,

1. Introduction

Benjor Village is part of the Tumpang District, which is located in Malang Regency, East Java Province. Tumpang sub-district itself has a geographical area of 72.09 km2 with a population of 75,657 people [1] Tumpang District is an agricultural area that has a few potential and superior products in agriculture, plantations, industry, and tourist attraction destinations. One of the plantation crops productions which is a superior commodity in Malang Regency is coffee [2].

Benjor Village has a high potential in the coffee plantation sector; there are two types of coffee namely Arabica coffee and Robusta coffee [3]. Coffee land in Benjor Village is very extensive, which consists of 20 hectares of forest land, 131.13 km2/ha of yard land, and 234 km2/ha of village forest land. Benjor Village coffee is one type of coffee that is in demand by consumers from abroad, such as Japan, Australia, and Morocco. This type of coffee has a distinctive and superior taste with fruit flavours such as durian, avocado and banana. The cause of the distinctive flavour is because the fruit trees act as shade trees for coffee plants [4]. This can be a great opportunity for the coffee business in Benjor Village. Coffee seed waste, which are abundant waste, are also an opportunity to be turned into a business [5].

As a village with a superior agricultural and plantation sector, most of its people work as farmers. Coffee bean farmers in Benjor Village generally have side jobs as ginger farmers, skewer craftsmen, and sugar cane coolies. This is because coffee bean farmers work on land only at certain times so that community income from coffee production is not enough to meet their needs [3]. On the other hand, the lack of community knowledge related to the utilisation and processing of coffee beans, so they only sell coffee in its raw form or coffee powder. In this case, the selling price of coffee beans is cheap and difficult to sell because it competes with the price of processed coffee products that are currently on the market.

Based on the situation analysis, it shows that there is no processing of Arabica coffee into kombufee. Therefore, this service program aims to provide solutions faced by partners, namely solving the problem of abundant coffee beans which are only processed into coffee powder in Benjor village. Training and assistance in making kombufee aimed at mothers of Family Welfare Empowerment in Benjor village can also be a business opportunity, so that the welfare of the village increases and encourages the ability of the community to advance. Training and mentoring can increase the understanding and skills of mothers of Family Welfare Empowerment to produce kombufee products independently.

The potential of coffee in Benjor Village is a great business opportunity to improve the welfare of the village. Coffee is known as an alternative drink to prevent drowsiness so that you can do activities at night [6] Coffee harvests can be made into high-value drinks rather than just being sold in powder form. Therefore, we, the community service team from the State University of Malang, were moved to increase the potential of Benjor Village by processing coffee into kombufee, which is to utilize existing processed coffee products by combining coffee with kombucha as coffee fermentation to produce high-value product innovations so that coffee ingredients can be utilised more optimally and can improve the quality of micro, small and medium enterprises (MSMEs) products as a business opportunity for village communities. This innovative coffee processing product can also be marketed online through a shopping application that is easily accessible via mobile phone, so that sales transactions can be easier and generate high economic turnover in improving the standard of living of the residents of Benjor Village [7]. The counselling, training, and mentoring activities of the FMIPA Biotechnology lecturers have become the capital of the Benjor Village community in managing coffee into drinks that are favoured by all ages. The tools used to make kombufee are glass jars, cloth covers, wooden spoons, filters, and electric teapots, while the ingredients needed to make kombufee are scooby, sugar, and coffee powder.

2. Methods

The implementation method is in the form of activities to utilize coffee extract and scooby bacteria in kombufee

drinks, which are carried out using educational methods or counseling about the benefits of kombufee drinks and by demonstrating the method of making kombufee drinks. The method implemented to achieve the target precisely and systematically through several steps, such as: (1) preparation, (2) implementation, (3) evaluation, and (4) preparation of activity reports [8].

2.1. 2.1Preparation stage

In the preparation stage, team coordination is carried out to develop a schedule and equalize the stages, outcomes and objectives of the community service program. Division of tasks, discussions in finding information. At this stage, observations and research in making kombufee drinks using kombucha and coffee were made and tested to determine the most effective method. In addition, the preparation of manuals and socialization materials presented in the form of images in *Powerpoint*.

2.2. Implementation stage

The implementation was carried out through socialization by providing an overview to the mothers of Family Welfare Empowerment of Benjor Village regarding the community service program by the Biotechnology UM lecturer team. Socialization is given so that mothers of Family Welfare Empowerment have innovations in coffee processing that are not only used as brewed coffee. Preparation of tools and materials to be used in making kombufee such as the main tool in the form of a glass jar and the main ingredient of coffee powder.

2.3. Evaluation stage

The evaluation was carried out to find out testimonials from several representatives of Benjor Village residents who attended and to find out changes in the Benjor Village community in utilizing coffee beans and kombucha. This stage also involves mentoring by monitoring the development of the village community online through group chats as a medium for questions and answers.

2.4. Report on preparation stage

At this stage, the team will discuss in preparing a report on the results of the activity. The stages of preparation include discussions with team members according to their respective fields of expertise, preparing progress reports, final reports and finalizing outputs, disseminating outputs, and collecting outputs.

3. Results and Discussion

The community service in Benjor Village, Tumpang District, Malang Regency was carried out in the Benjor Village Hall offline, so that the community could see firsthand the procedure for making kombufee. In addition, direct training makes the material presented easier to understand and lecturers and students can interact more closely with the community (Figure 1a).

(a) (b)

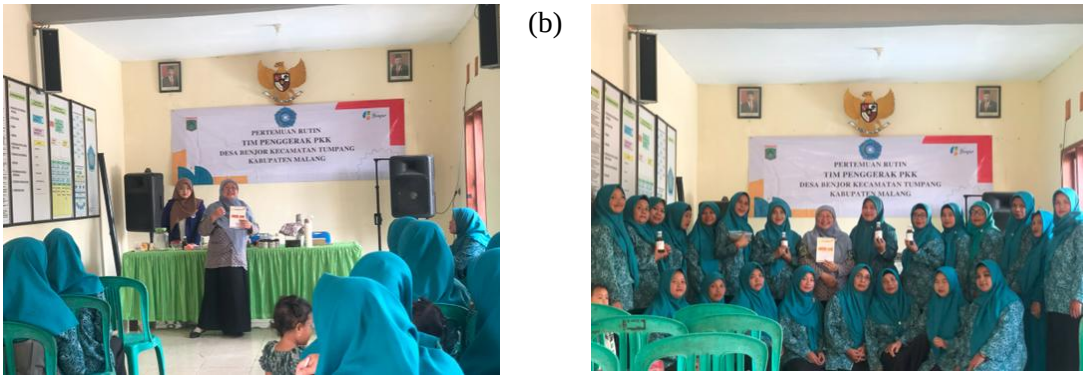

Figure 1. (a) Demonstration stage of making kombufee, (b) Service activities in Benjor Village.

The materials provided included insights on the utilization of coffee, the meaning and benefits of kombufee, and how to make kombufee from coffee powder. Then, the activity continued with a demonstration of making kombufee as a probiotic drink rich in antioxidants. At the end of the demonstration, a question-and-answer session was held to determine the level of understanding of the training participants. In addition, kombufee

that had previously been produced by the team was also given to participants who were active in the question-and-answer session. The event went smoothly, attended by 25 participants and 2 students from State University of Malang (Figure 1b). This target exceeded the desired number of 20 people. The supporting factor in the implementation of this service is the abundant natural resources in the form of coffee beans, while the inhibiting factor is that not all trainees have adequate storage facilities (for example, a refrigerator to slow down post-production kombufee fermentation).

The initial phase involved preparation activities. During this stage, the community service team conducted an exploration and identification of the coffee varieties cultivated in Benjor Village. The findings revealed that Arabica and Robusta coffee, available in both raw and powdered forms, were among the village's main agricultural commodities. However, these products face challenges competing with commercially processed coffee products already available on the market. In response, the team conducted laboratory experiments to develop a new product—kombufee—from Arabica coffee. Kombufee was produced by adding 10% (v/v) kombucha starter culture from a previous fermentation batch and 0.5 g of Symbiotic Culture of Bacteria and Yeast (SCOBY) into a coffee infusion containing 8% (w/v) sucrose. The mixture was placed in a jar, covered with gauze, and incubated at 23°C for 14 days [9]. Following the laboratory trials, the service team prepared outreach materials, including a socialization module and pamphlets outlining the definition of kombufee, the tools and ingredients required, and step-by-step instructions for the fermentation process.

During the second phase, which encompassed the implementation stage, activities focused on socialization and training sessions. Prior to the start of the training, participants were asked to complete a questionnaire to assess their initial knowledge. According to the data presented in Figure 2, 86% of the participants had previously utilized coffee beans as an air freshener, while none reported using them as pest repellents or organic fertilizer. The participants' knowledge before the training regarding the kombufee-making process is summarized in Table 1.

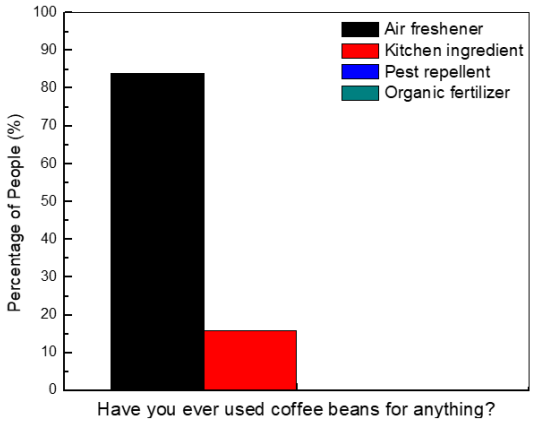

Figure 2. Forms of coffee bean utilization by trainees.

In the second stage, the implementation stage included socialization and training. Before the activity began, participants were given a questionnaire to fill in before the training. Based on Figure 2 data, 86% of the training participants had used coffee beans as an air freshener and none had used coffee beans for pest repellent and organic fertilizer. Participants' pre-training knowledge related to kombufee making is shown in Table 1.

Table 1. Results of kombufee knowledge questionnaire for participants before training.

No.	Questions	Scoring (%)			
		VA	K	KE	DNK
1.	Are you aware that Scooby is one of the ingredients used in making kombufee		20		80
2.	Are you aware that coffee beans can be used to make a drink rich in benefits		52	32	16
3.	Are you aware of the contents of kombufee made from coffee beans		16		84

Information: VA = Very Aware, K = Know, KE = Know Enough, DNK = Do Not Know

Based on the data Figure 3a. states that 50% of the training participants are very easy to find coffee beans in their neighborhood, but 100% of the participants have never made kombufee coffee before, which is shown in Figure 3b.

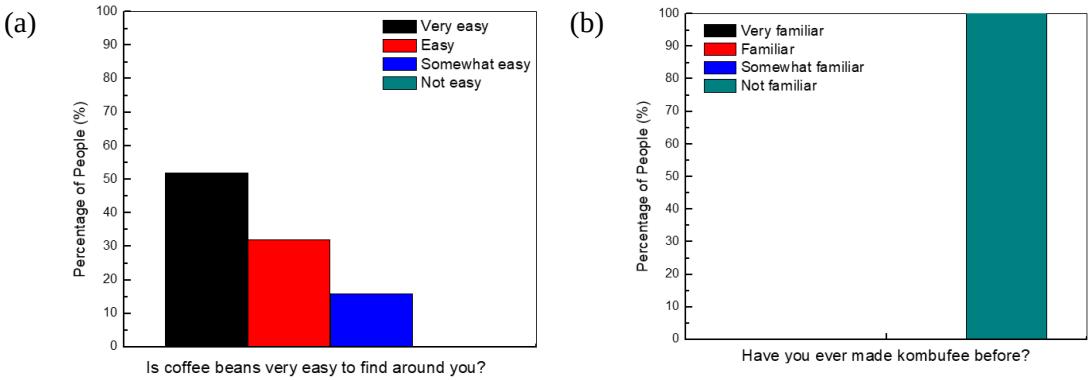

Figure 3. (a)Percentage of ease of finding coffee beans around the trainees' homes, (b) Percentage of ever made kombufee.

Furthermore, socialization activities were carried out by presenting material about kombucha drinks and introducing SCOBY which acts as a starter and helps the coffee fermentation process directly to the training participants. After the presentation of the material, continued with assistance and training in making coffee into kombufee until the final stage, such as packaging and labelling. Kombufee has high antioxidant activity [10]. Kombufee is safe to drink because the coffee's caffeine concentration will drop after it has been fermented for 12 days [11]. Participant representatives were given a scooby to make kombufee independently (Figure 5).

Figure 5. Scooby handover to trainees.

In the third stage, the activity evaluation stage. This activity provides an opportunity to ask questions for training participants, discussion of follow-up that will be carried out by participants after mentoring and socialization activities, and training participants are given a questionnaire sheet after training as a form of the extent of the success of the implementation of mentoring and service activities that have been carried out [12]. Table 2. shows the results of a questionnaire of participants' knowledge and interest related to kombufee to be developed as a new business, after the training was conducted.

Table 2. Knowledge and interest in kombufee questionnaire results after training.

No.	Questions	Scoring (%)			
		VA	**K**	**KE**	**DNK**
1.	After this training, will you know the contents of kombufee	8	32	56	4
2.	After this training, will you know the benefits of kombufee for the body	12	56	24	8
		VI	**I**	**SI**	**NI**
3.	Are you aware of the contents of kombufee made from coffee beans	4	84	8	4

Information: VA = Very Aware, K = Know, KE = Know Enough, DNK = Do Not Know, VI = Very Interested, I = Interested, SI = Somewhat Interested, NI = Not Interested

Based on the questionnaire results, this activity was beneficial for participants in terms of insight and experience. The data in Table 1 and Table 2 shows that there was an increase in participants who knew the kombufee content of coffee beans from 16% to 88%. The data in Figure 6a shows that 48% of participants are interested in innovating coffee beans that are usually only brewed and ready to drink into new products. Through the kombufee training and mentoring, 80% of the participants were also interested in training other biotechnology product innovations with different ingredients as shown in Figure 6b.

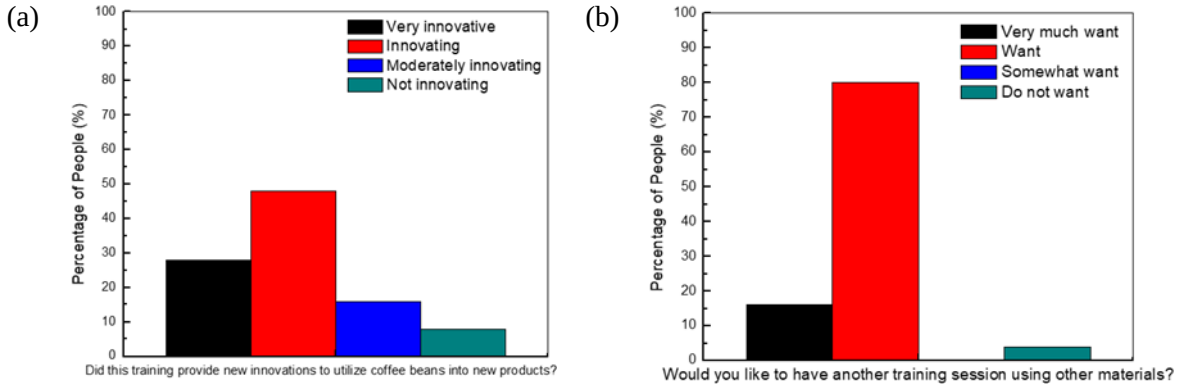

Figure 6. (a) Percentage of number of people interested in innovating coffee beans, (b) Percentage of people who wanted training with other material.

Training and mentoring activities, as part of the community service program, play a crucial role in optimizing the utilization and processing of Benjor Village's local coffee beans, which have strong potential to support sustainable business development. These efforts not only offer practical solutions for increasing community income but also contribute to improving the livelihoods of local coffee farmers and women's empowerment groups. A follow-up plan for this initiative includes facilitating the process of obtaining product distribution permits through local government channels.

Although Benjor Village has a relatively strong agricultural and plantation sector—particularly in Arabica and Robusta coffee production—local supply is still insufficient to meet broader demand. Coffee farmers must harvest cherries only at full ripeness to ensure quality, with Arabica taking approximately 6–8 months and Robusta 8–11 months to mature [13]. This reality aligns with the post-training questionnaire results, which showed that 84% of participants expressed interest in developing kombufee as a new entrepreneurial opportunity. The program is expected to proceed with the completion of progress reports, submission of final reports, dissemination of outcomes, and documentation of community service outputs.

4. Conclusions

Community assistance activities for processing coffee into kombufee using fermentation methods in Benjor Village, Tumpang District, Malang Regency, are highly relevant to the needs of local residents. Based on questionnaire data analysis, it was found that members of the Family Welfare Empowerment (PKK) group in Benjor Village primarily utilized coffee as air fresheners or for conventional brewing, highlighting the urgent need for training in value-added processing such as kombufee production. The number of training participants exceeded initial expectations. Following the training, participants' skills in processing coffee into kombufee increased by 72%. Mentoring was conducted over a two-month period through both offline meetings and

online guidance via a WhatsApp Group, enabling participants to produce kombufee independently. A key follow-up to this initiative includes facilitating the process of obtaining distribution permits. It is hoped that the community will continue producing kombufee independently and sustainably, allowing it to evolve into a viable business that contributes to improving the economic welfare of residents in and around Benjor Village.

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