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Strategies to prevent milk adulteration in livestock groups in Medowo Village, Kediri District, East Java, Indonesia

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Abstract

Objective: This community service conducted by lecturers and graduate students from the Faculty of Veterinary Medicine Universitas Airlangga aims to educate the prevention of milk adulteration in livestock groups in Medowo Village, Kandangan District, Kediri Regency. Milk quality is a crucial determinant of product selling value and consumer health, but the challenge of milk adulteration is still common, especially at the smallholder farm scale. This study aims to analyze and implement strategies to prevent milk adulteration in cattle groups in Medowo Village.

Method: The methods used included the delivery of educational materials on identifying the characteristics of pure milk, early detection of indications of adulteration, and effective post-milking handling to maintain milk authenticity and quality. Data were collected through direct observation and a survey of farmers' understanding before and after the educational intervention.

Result: The results showed a significant increase in farmers' understanding of the characteristics of real milk and counterfeiting prevention methods post-education. The majority of farmers showed a higher awareness of the importance of product integrity and potential losses due to counterfeiting. This improved understanding and practice is expected to contribute to increased consumer confidence, milk price stability and local food safety.

Conclusion: This study underscores the urgency of continuous education programs and strict supervision for farmers in an effort to eradicate agricultural product counterfeiting and improve community welfare, particularly in milk production centers such as Medowo Village.

Keywords: Education; Milk Counterfeiting; Milk Authenticity; Smallholder Farmers; Medowo Village

1. Introduction

Milk is one of the strategic agricultural commodities that has high nutritional value and plays an important role in meeting the animal protein needs of the community [1]. In Indonesia, milk production is mostly contributed by small-scale livestock farms. The increase in national milk production in recent years still faces quality challenges at the farmer level [2].

Medowo Village, Kandangan Subdistrict, Kediri Regency, located on the slopes of Mount Anjasmoro, is an area with high potential for dairy cattle development. The geographical and climatic conditions in this area are highly conducive to dairy cattle farming, so the majority of the community in this village engage in dairy farming in addition to rice farming.

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The milk produced in this village is significant and is collected by the local dairy cooperative, which then supplies it directly to dairy processing companies. However, knowledge about fresh milk is often not optimal.

Adulteration of fresh milk is one of the serious issues in the dairy agribusiness supply chain in Indonesia. Adulteration is typically carried out by mixing milk with water, preservatives such as formalin, baking soda, hydrogen peroxide, or other substances that can extend shelf life and increase milk volume illegally [3, 4]. Such actions not only reduce the nutritional quality and economic value of milk but also pose health risks to consumers due to the presence of harmful residues in the consumed dairy products. The main factors driving milk adulteration at the smallholder level include economic pressure, lack of strict quality control, and low awareness among farmers about the negative impacts of adulteration, both on public health and the sustainability of livestock operations [5]. Additionally, the low selling price of fresh milk at the producer level also contributes to this unethical practice, as farmers seek to increase their income through methods that do not comply with food safety standards.

Efforts to prevent milk adulteration must be carried out systematically and sustainably through education, training, and strengthening regulations at the livestock group level. Education for farmers are aware of the dangers of counterfeiting and the importance of maintaining the integrity of dairy products. It is essential to raise awareness and commitment to the implementation of honest farming practices and consumer health-oriented [6]. In addition, the establishment of an internal monitoring system based on livestock groups and the implementation of quality control standards are also important strategies in curbing counterfeiting practices.

This community service aims to evaluate the effectiveness of counterfeit prevention strategies through an educational and collaborative approach with livestock groups in Medowo Village. With this approach, it is hoped that a more responsible milk production system can be created, thereby increasing consumer confidence and market access for local milk products.

2. Materials and Methods

This community service was conducted on June 21, 2025. The location of the community service was in Medowo Village, Kandangan Sub-district, Kediri District, East Java Province. The selection of the location was based on Medowo Village's characteristics as a dairy cattle farming center with a dominance of smallholder farming and the presence of an active local dairy cooperative.

The target participants in this study were 31 dairy farmers who are active members of livestock groups in Medowo Village. Inclusion criteria for participants included being active farmers and willing to participate in the entire series of educational and monitoring activities planned.

2.1. Implementation Method

The educational implementation in this study was conducted through a participatory approach with structured stages. The initial stage, the pre-test, involved measuring the farmers' initial knowledge level through a structured questionnaire. The Likert scale questionnaire was designed to explore farmers' understanding of the characteristics of adulterated milk, prevention of adulterated milk, and the impact of adulterated milk on consumers [7].

Based on the pre-test results and needs identification, the educational materials were comprehensively developed and tailored to the farmers' level of understanding. The educational implementation focused on interactive discussions and question-and-answer sessions between the community service team and participants. The educational topics included prevention and the impact of milk adulteration on consumers.

After all education sessions were completed, the post-education phase began with regular monitoring of the farmers' application of the new knowledge through follow-up discussions and observations. To measure the improvement in knowledge, a post-test was conducted on participants using the same questionnaire as the pre-test. Pre-test and post-test questionnaire data will be analyzed quantitatively to compare the increase in knowledge scores.

The indicator of success in this community service activity centers on the increase in pre-test and post-test scores, which reflects the participants' increased understanding of the characteristics of adulterated milk, prevention of counterfeit milk, the impact of counterfeit milk on consumers. This educational method was designed to ensure the sustainability of the positive impact on farmers and support the development of dairy farming in Medowo Village, Kandangan District, Kediri Regency.

3. Results and discussion

This series of community service activities focused on counseling on the characteristics of falsified milk, prevention of counterfeit milk, the impact of counterfeit milk on consumers. This activity was carried out with the main target of local farmers in Medowo Village, Kandangan District, Kediri Regency (Figure 1). The event began with remarks by the Chief Executive Officer, the Chairman of Kertajaya Cooperative and the Vice Dean of the Faculty of Veterinary Medicine, Universitas Airlangga, marking the start of this educational initiative. Furthermore, the event continued with counseling, interactive discussions and questions and answers from the participants' complaints.

Figure 1 Documentation of dairy farmers in Medowo village, Kediri

Figure 2 Documentation of the provision of materials and discussion to farmers in Medowo village, Kediri

Based on the pre and post-test data, the educational intervention on prevention of counterfeit milk showed a significant improvement in farmers in Medowo Village. The results of the analysis showed a significant increase in farmers' understanding of counterfeit milk identification after the educational activities were implemented. Knowledge of the difference between pure and adulterated milk increased sharply from 16% before the training to 98% afterwards (table 1), indicating that participants already had the basic ability to distinguish milk based on its purity level.

Farmers' ability to recognize physical signs of adulterated milk such as discoloration, pungent aroma, and unsuitable consistency also increased rapidly, from only 23-26% to 97-100%. Recognition of these sensory characteristics is very important as it can be used as a simple and easy-to-implement early detection method in the field, without the need for laboratory testing equipment. According to Wibisono et al [8], changes in milk color, odor, and viscosity are often the first signs of milk contamination or adulteration, so training based on sensory recognition can help reduce the risk of distribution of milk unfit for consumption.

In addition, farmers' knowledge of practical milk purity testing techniques also improved significantly. Whereas previously only 32% of participants understood this method, after the training all participants (100%) were able to apply it. This increase reflects the success of the educational program in equipping farmers with applicable skills that are relevant to the needs in the field. According to Hapsari et al [9], sensory-based training significantly increased farmers' awareness in identifying milk quality and became the first step in a farm-based quality control system.

Table 1 Before and After Understanding of Milk Adulteration Prevention Strategy

No.	Indicator	Initial Comprehension	Final Comprehension
1.	Do you know the difference between whole milk and milk that has been mixed with water or other ingredients?	16%	98%
2.	Have you ever seen milk that has an unusual color (too pale or cloudy)?	23%	100%
3.	Did you know that a strong or unnatural milk odor can be an indication of adulterated milk?	26%	97%
4.	Do you know what the consistency of real milk should be (not too runny or too thick)?	19%	100%
5.	Do you know a simple way to test the purity of milk?	32%	100%
6.	Do you conduct regular screening and inspection of milk before delivery to cooperatives or consumers?	48%	100%
7.	Do you understand the importance of sanitizing milk equipment and containers to prevent contamination or adulteration?	45%	97%
8.	Have you attended any training on milk quality assurance and purity?	52%	100%
9.	Do you maintain milk quality to avoid the need for blending to improve appearance or volume?	29%	100%
10.	Do you know the legal actions against milk adulteration?	35%	98%
11.	Did you know that adulterated milk can cause indigestion in children?	48%	98%
12.	Are you aware of the long-term health risks of consuming fake milk (e.g. chemical/preservative poisoning)?	45%	97%
13.	Are you aware that counterfeit milk can reduce consumer confidence in local dairy products?	52%	100%
14.	Do you understand that poor milk quality can negatively impact the farmer's selling price and income?	26%	100%
15.	Do you agree that maintaining milk purity improves consumer welfare and farmer reputation?	39%	97%

A significant improvement was also seen in the aspect of implementing preventive practices against milk contamination and adulteration. After the implementation of the education program, the number of farmers who routinely check milk before distribution increased from 48% to 100%. This shows that farmers are now more proactive in ensuring that the milk they market is fit for consumption. This practice is critical for early detection of possible spoilage or adulteration and is part of the farm-level quality system.

In addition, farmers' awareness of the importance of sanitizing milking equipment and milk storage containers increased sharply, from 45% to 97%. Unhygienic equipment is one of the main sources of cross-contamination and reduced milk quality. According to Wardhana and Kusumawardhani [10], routine sanitation of milking equipment can reduce the incidence of subclinical mastitis by 40%, while extending the shelf life of fresh milk and maintaining its microbiological quality.

Improvements were also seen in farmer participation in milk quality assurance training, which increased from 52% to 100%. This indicates that all participants have been actively involved in training activities that discuss milking operational standards, storage procedures, and how to prevent mixing of foreign materials in milk. Putri et al [11] mentioned that active involvement of farmers in field practice-based training was able to increase compliance with milk hygiene and quality protocols to more than 85%.

Educational activities were able to increase farmers' awareness regarding the importance of the health risk aspects posed by the consumption of counterfeit milk. An initial understanding of 45-48% realized that milk that has been mixed with foreign ingredients can cause digestive disorders, especially for children and the elderly. However, after the educational activity's farmers' awareness increased to 97-98%, indicating that farmers' collective awareness of the importance of maintaining food safety.

This finding of increased awareness is in line with FAO research [12] which states that impure milk can have a high risk of causing gastrointestinal infections, and even harmful chemical contamination can have long-term side effects. Farmers realize that the practice of adulteration not only harms consumers, but also reduces the selling price of milk. This can be seen from the initial understanding of the economic impact of counterfeit milk distribution ranging from 26-39% to 97-100% in the final understanding. Awareness of the long-term economic impact of fraudulent practices in milk distribution is essential to create a culture of quality in farms and Village Unit Cooperatives (KUD) [13].

The materials and discussion sessions implemented in this study were crucial interventions in mitigating milk fraud in livestock groups in Medowo Village, Kediri District. The materials presented comprehensively focused on milk adulteration prevention strategies, which included identification of pure milk characteristics, simple detection methods at the farm level, as well as the multi-dimensional impacts of adulteration practices on economic, health and reputation aspects. The relevance of this material is very high, given that field findings show that most farmers still have limitations in distinguishing pure milk from milk that has been mixed [14]. An in-depth understanding of the physical characteristics of whole milk-such as color, aroma, and ideal viscosity-as well as mastery of simple tests, such as alcohol or boiling tests, are essential to improve early detection capabilities among farmers [15].

The interactive discussions that developed during this session not only served as a medium for knowledge transfer, but also as a platform to identify real challenges and authentic experiences faced by farmers. Various crucial issues were revealed, including a deficit in technical knowledge related to milk quality, economic pressures that often encourage unethical practices on the part of collectors, and limited access to sophisticated laboratory testing equipment. In addition, there was a collective concern about the potential degradation of the reputation of the livestock group as a whole due to the actions of a few individuals. However, amidst these challenges, the discussion also generated optimism through the initiation of a collective awareness of the importance of collaboration between farmers in building an internal monitoring system. This synergy is a vital foundation in strengthening resistance to counterfeiting practices [16].

From this productive interaction, several practical and solutive recommendations were formulated. First, the urgency for continuous education and systematic technical assistance on milk post-harvest handling and quality control. Second, strengthening the role of livestock groups as information facilitators, conflict mediators and initiators of internal quality assurance system development. Thirdly, providing access to simple test kits that are affordable and easy to use at the group or individual farmer level. Finally, the establishment of an effective information network between farmers and relevant institutions, such as the livestock service office or research institutions, to facilitate the exchange of data and experiences related to counterfeiting practices. The enthusiasm and active participation of farmers in all of these activities indicates that they are key proactive agents of change in combating milk adulteration. Therefore, the sustainability of the education program, dissemination of simple technology, and institutional strengthening of livestock groups will be the determinant factors in the successful implementation of the milk adulteration prevention strategy in Medowo Village on an ongoing basis [17].

4. Conclusion

The milking technique education program implemented in cattle groups in Medowo Village, Kandangan District, Kediri Regency, proved to be effective in improving farmers' knowledge and skills. This improvement is significantly positively correlated with improvements in the quality of milk produced. The results of this community service indicate that educational interventions and technical assistance are vital strategies to increase the productivity and competitiveness of smallholder farms, while ensuring the safety and quality of dairy products at the consumer level. Similar programs are highly recommended to be implemented in other livestock centers.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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