

Increasing farmer skills processing animal feed using fermentation methods to increase nutrition for livestock

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ABSTRACT

Feed is one of the things that really determines the success of a livestock business. In the rainy season, quality feed ingredients are difficult to obtain. This has the effect that farmers have a look alternative feed so that livestock feed needs can be met properly. One method that can be used to maintain the nutritional content of alternative feed is the fermentation process. This community service activity is part of the collaboration between the Pekalongan Regency Government and Diponegoro University. This activity will be carried out from June to December 2023 with service partners from the Tanjungkulon Village Livestock Group Kajen District consisting of 15 - 20 participants. Implementation of activities is carried out using counseling, practice and mentoring methods for livestock groups. This activity is considered very useful for improving the skills of farmer groups. Because livestock groups can use ingredients that are sold generally to make higher quality animal feed. This was reinforced during the monitoring process with the success rate indicator for making animal feed reaching 75-80 percent. It is hoped in the future this activity can continue, and quality animal feed products can be used as additional income for Livestock Group Kajen District, Pekalongan Regency.

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1. INTRODUCTION

During the dry and rainy seasons, providing quality feed is a challenge faced by farmers. One solution is to make fermented feed. This feed is made from green grass, leaves and straw which are considered to have high nutritional value. Fermentation is the process of utilizing microbial activity to produce metabolic products (De Roos & De Vuyst, 2018). Probiotics and their metabolites in fermented feed play an important role in reducing or replacing antibiotics in the feed fermentation process (Clavijo & Flórez, 2018; Sun et al., 2023). The practice of fermentation dates back thousands of years, when humans first started fermenting products using yeast. In the early 20th century, Finnish biochemist Artturi Ilmari Virtanen conducted groundbreaking research on silage feed fermentation (Kyle & Shampo, 1981). Virtanen developed a method based on this principle that prevents feed spoilage and preserves its usefulness and nutritional value. Fermentation is a dynamic process involving microorganisms, substrates and environmental conditions to convert complex substrates into simpler compounds (Niba

et al., 2009; Sugiharto & Ranjitkar, 2019). The outcome of the fermentation process can vary widely, and seems to depend on the nature and characteristics of the substrate used (Canibe & Jensen, 2003; Subramaniyam & Vimala, 2012).

A frequent finding in the field is the direct utilization of rice straw used for animal feed. This causes problems because the amount of rice straw is abundant, but in terms of quality it is still classified as low in nutrition because it only contains protein around 3-4 percent. Whereas if dry rice straw is processed with a fermentation process, it can be a higher quality feed that lasts throughout the season. Feed is an important nutrient for animals. Feed quality determines the quality of animal products (Marmion et al., 2021). Therefore, improving feed quality is a major challenge for every researcher in the feed industry. The role of the fermentation process, which is considered to produce higher quality feed products, is becoming a major concern for researchers. As science and technology advance, various disciplines, such as fermentation, genetics, and enzymatic engineering, continue to make improvements for more optimal results (Sun et al., 2023). This is also reinforced by farmers gradually shifting their focus to the application of fermentation technology on animal feeds. This evolution started with silage feed fermentation, progressed to fermentation of individual feed ingredients, and has recently been extended to complete feed fermentation (Yang et al., 2022). Because feeding higher quality feed can improve an animal's gut health, enhance growth performance, and improve immune function (Wang et al., 2020). Fermentation also offers many advantages, including improving feed palatability, eliminating anti-nutritional factors, improving animal gut health, and superior meat quality (Sugiharto & Ranjitkar, 2019).

2. METHODS

The implementation of this community service was carried out using a participatory method. This method is a way to build two-way communication between facilitators and participants. So that a more interactive atmosphere is obtained and knowledge transfer becomes faster. The implementation of this method is carried out in 3 stages, namely preparation, implementation of activities, and evaluation (Bhagawati et al., 2020). The framework for implementing the activity is described in Figure 1.

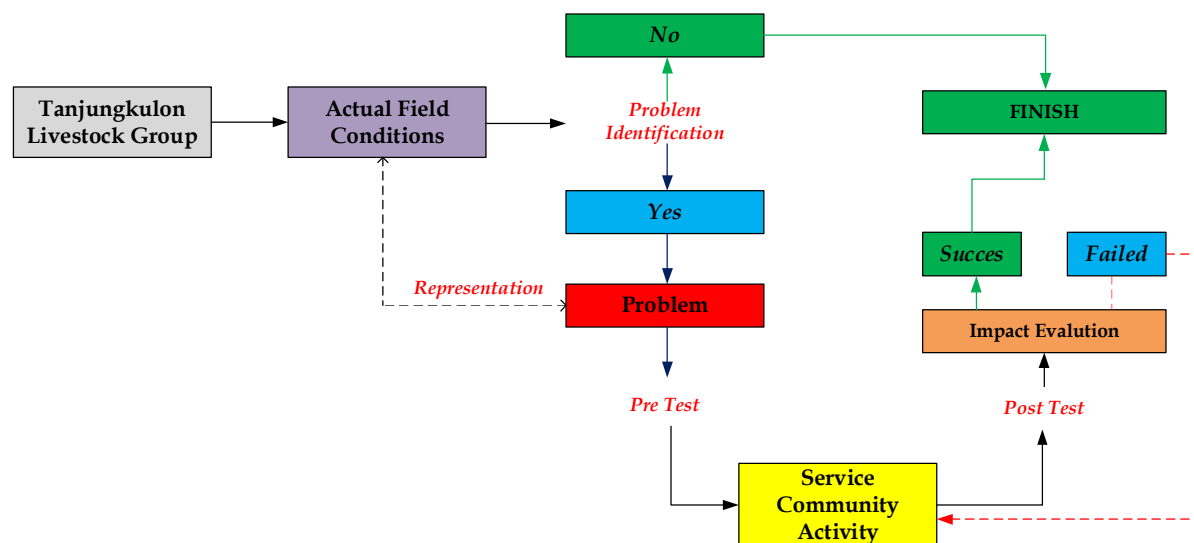


Figure 1. Framework activity

The framework is the basis of thought that is synthesized based on facts in the field (Syahputri et al., 2023). Therefore, the framework should be adjusted to the conditions found in the implementation environment. So that it can be relevant to the problem being studied. Figure 1 shows the stages of implementation which begin with conducting field observations to identify problems that exist in the service location. Observations and narrative interviews were conducted together with village officials and representatives of breeders, to dig deeper information on existing problems. The narrative interview method to farmer representatives is considered to be able to get in-depth information on the problems being faced (Vigors et al., 2023). The preparation stage is the identification of problems faced by partners. This stage is an important point so that the implementation of activities focuses on providing solutions to existing problems (Salim, 2019; Nasution, 2021). The implementation of activities is carried out with the concept of lectures, discussions and direct practice. This learning model is considered effective and efficient to increase one's understanding in the knowledge transfer process (Khoerunnisa & Aqwal, 2020). The last stage is evaluating the success of the activity implementation. Evaluation is carried out through pre-test and post-test assessments, to determine the level of understanding of the participants of the material presented (Kusmayadi et al., 2024). The purpose of learning evaluation is to obtain accurate information about the level of competence achievement of participants and the effectiveness of the learning process. One of the evaluation methods that can be used is giving pre-test and post-test. Pre-test is an evaluation conducted before the learning activity begins, while post-test is an evaluation after the learning activity takes place (Azim & Khan, 2012). Through the administration of pre-test and post-test, it can be seen the increase in participants' knowledge and understanding of the material provided (Siregar, 2023).

Tabel 1. Implementation evaluation design

Respondents	Design Evaluation Plan		
	Pre-Test	Treatment	Post-Test
The target respondents of community service consisted of 15-20 cattle, buffalo, and goat farmers, but also provided opportunities for poultry farmers to participate in the event.	Measuring the understanding of the participants before the community service event with 3 indicators assessed Theme interest, understanding of how to process fermented animal feed and fermented animal feed results.	Community service activities were carried out for half a day which was divided into 2 sessions. The first session was 2 hours of material from resource persons. The second session was a hands-on practice of making animal feed.	Measuring the understanding of the participants after the community service event with 3 indicators assessed. Theme interest, understanding of how to process fermented animal feed and fermented animal feed results.

The indicator of success is if the average post test score of the participants is above 75. In addition, the participants are also given about 30 days to practice their knowledge in their respective places. On the appointed day, the facilitator team will evaluate the impact of the activity. The indicator of success is assessed by the level of similarity of the products produced with the samples/props shown during the implementation of the activity.

3. RESULTS AND DISCUSSION

Results

This community service program aims to provide skills training practices and new knowledge to partners about making quality animal feed in the rainy and dry seasons and assisting in the utilization of

other agricultural waste. The implementation of this activity was carried out in 3 (three) stages, namely: problem solving, mentoring, and evaluation. The problem networking stage begins with a location survey in Tanjungkulon Village, Kajen District, Pekalongan Regency, which is a service partner. Socialization of activities was carried out by the Service Team to capture problems in accordance with the themes raised. The results obtained were that the community did not have knowledge in the practice of processing organic waste and agricultural waste. Organic waste and agricultural waste in general can be reprocessed by adding microbes that are useful for providing higher quality feed so that the increase in livestock weight can be optimized (Ali et al., 2018; Budiyanto & Aini, 2021; Ekawandani, 2019). Furthermore, the Community Service Team helped farmers by providing material and practice of making animal feed with the fermentation process. The assistance was attended by around 15-20 farmers. The last stage evaluates 1 month after the assistance. The evaluation was carried out by conducting a tasting test on one of the farmers to see the application of the results of the mentoring implementation.



Figure 2. Problem identification

Problem identification is the initial stage to identify the core problems that occur at the location. This stage is an important point so that the implementation of activities focuses on providing solutions to existing problems (Salim, 2019; Nasution, 2021). Figure 2 is a forum group discussion activity to confirm the results of observations of field problems that have been carried out previously, so that more objective information is produced (Setyobakti, 2017).



Figure 3. Material practice processing animal feed

Figure 3 shows the tools and materials used in the practice of making animal feed with fermentation techniques. The main ingredients used are dry straw and biostarter. Biostarter is a solution containing microorganism's degraders/decomposers that are useful for decomposing organic waste. Biostarter from fruit vegetable waste is considered safe because biostarter does not contain E.colli and Salmonella

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bacteria so it is safe to be given to livestock as probiotics (Fadlilah et al., 2024). Biostarter can be used as a fermenter in making liquid fertilizer from ruminant urine into biourine and making compost from livestock manure and silage feed fermentation so that biostarter is multifunctional (Sukmawati et al., 2019).



Figure 4. Socialization and practice processing animal feed

Figure 4 is the implementation of community service which consists of material delivery sessions and fermented feed making practices. The main core of this community service is the practice of making animal feed by fermentation. The practice of fermented feed processing or what is often known as silage feed uses agricultural waste materials (Fadlilah et al., 2024). Fermented feed processing aims to increase livestock digestibility and to preserve feed during the rainy season and harvest season so that a lot of agricultural waste is produced that can still be used as animal feed, especially ruminants (Sukmawati et al., 2019).



Figure 5. Monitoring progress and results

Figure 5 is the monitoring and evaluation stage 30 days after the implementation of community service. The success indicator is the darker color of the straw and has a more fragrant smell when compared to the previous condition of the straw. Successful fermented feed has a fragrant smell of sugar (molasses), no pungent sour odor, not watery and not moldy (Sukmawati et al., 2019). The longer the fermentation time, the higher the nutrient content and the softer the straw fiber. The best time of straw fermentation process was reached on the 15th day with a change in color and a more fragrant smell (Sarungu et al., 2020).

Discussion

The implementation of this service uses Kirkpatrick's four-level evaluation model as the basis for conducting the evaluation (Hati & Kurnia, 2023; Kirkpatrick & Kirkpatrick, 2007). The aim is to determine the level of understanding of the trainees of the information that has been provided. The evaluation model used is the pretest and posttest model. The model is very easy and considered more effective to see the results of the delivery of information provided to the participants at the same time (Hati & Kurnia, 2023; Pasaribu, 2023; William & Hita, 2019).

The One- Group Pretest-Posttest Design		
O	X	O
Pretest	Treatment	Posttest

Figure 6. One-group pre-test-post-test design

The technical implementation is divided into two, namely the initial test (pre-test) and the final test (post-test). The initial test was conducted before conducting the activity because it was to determine the initial ability of the participants. While the final test is carried out to measure participants' understanding of the learning process provided. There is 3 indicators assessed in pre test and post test such as Theme interest, understanding of how to process fermented animal feed and fermented animal feed results.

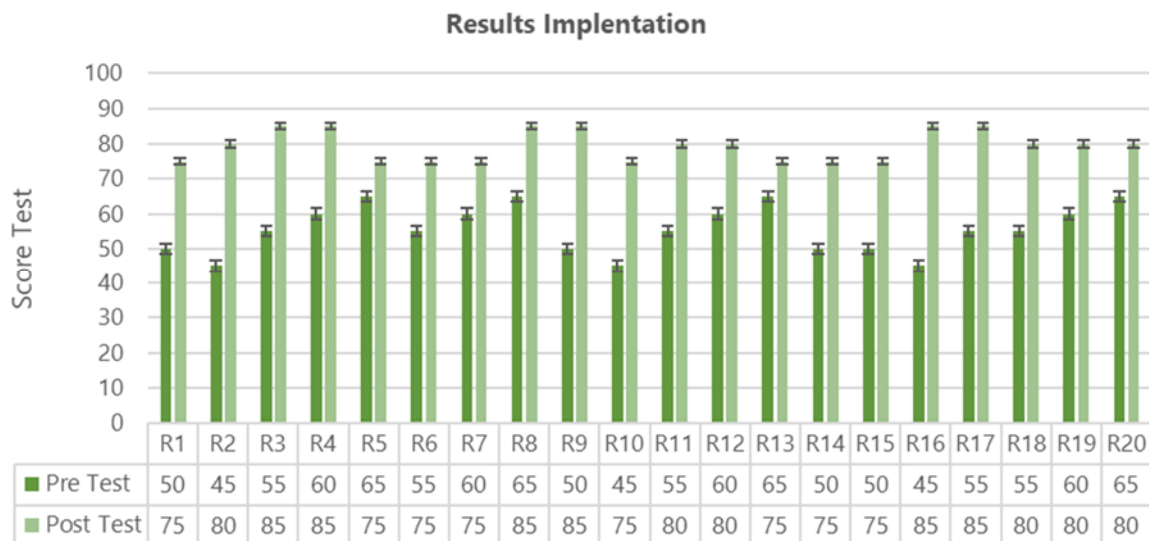


Figure 7. Results implementation program

To increase livestock productivity, animal feed is one of the main keys. The availability of forage, which is the main feed, is the main capital for farmers. Tanjung Kulon Village has good potential in the availability of forages. Because this village still has a lot of forage land that has not been cultivated by residents. However, forage feed makes livestock develop in a non-standardized way. In addition, farmers must look for forage every day so that the forage is still in good and fresh condition (Sihombing et al., 2020). Not to mention that the location of the forage sometimes has a hilly soil structure. So that the farmer's time and energy are drained. Seeing this condition, it is very important for farmers to utilize the availability of other feed around the village during the rainy season. This supplementary feed is a reinforcing feed to improve animal feed nutrition and as a companion to forage feed (Sodiq & Abidin, 2008). This feeding is not done all at once, but is given interspersed with forage feed, because forage feed is the main feed for livestock (Sarwono, 1991).

Figure 7 shows the normal distribution of the participants' final scores on the pretest and posttest. In the figure, the graph is also shifted to the right with an increase in the mean score and the shape of the graph is narrower. This can be interpreted that the average posttest score is higher than the pretest and with the narrower curve, it can be interpreted that the level of understanding of the participants is more evenly distributed than at the time of the pretest. In this graph, it can be concluded that this service activity was able to increase the participants' understanding of the material provided during the implementation of the assistance.

Changes in behavior and knowledge in managing livestock farming have a significant impact on animal welfare. By developing a more comprehensive understanding of what symbolizes good farmer (welfare). This corresponds with the study of Scottish farmers' perceptions of 'positive animal welfare' and revisits it through a more than representational, theoretical lens (Sutherland, 2021). Good animal husbandry reflects the farmer's behavior as a result of the farmer's cultural process and identity (Naylor et al., 2018). The concept highlights breeders' practices and work-related behaviors shaped by what is considered to be indicative of a good breeder in a particular farm context. "The basic premise of the good breeder concept is that breeders gain symbolic capital from demonstrating skillful role performance, which is evident to themselves and other breeders in visual representations of their practices" (Sutherland & Calo, 2020). As animals are an integral part of any farmer's working life and work situation (Beaujouan et al., 2021), it is not surprising that sociological research has found that caring for animals is part of the farmer's identity and has socio-symbolic value within the farming community (Naylor et al., 2018; Shortall et al., 2018). Thus, researching what makes a farmer a "good farmer" will shed light on the actions, behaviors, principles, ideals, and symbols (among others) that are meaningful and have social significance to farmers (Burton, 2004; Sutherland, 2021) and, therefore, how sociocultural factors may influence their actions and behaviors.

Several studies have revealed that factors relevant to animal welfare can act as symbols of good farmers; ways in which farmers can demonstrate and assess skilled role performance in relation to animal welfare. For example, livestock keeping skills are an important symbol of good farmers (Burton, 2004; Butler & Holloway, 2016; Haggerty et al., 2009; Naylor et al., 2018; Shortall et al., 2018) where skilled role performance is demonstrated through farmers' tacit knowledge of their animals and their ability to assess animal health and welfare 'by eye'. Furthermore, owning and keeping healthy livestock is a means by which farmers can be seen as good farmers and judge and assess the livestock keeping abilities of others (Burns, 2021). Minimizing animal health problems and stress (Haggerty et al., 2009) and addressing animal disease and biosecurity (Naylor et al., 2018; Shortall et al., 2018) have also been found to inform farmers' good farmer identity. Given the limited attitudinal focus of existing welfare

literature and considering human-animal interactions as relational practices mediated by the farmer's work context (e.g. social norms, identity, role construction), the concept of the good breeder provides a useful lens through which to explore how sociocultural processes, and work-related identities underlie and influence breeders' approaches to animal welfare.

4. CONCLUSION AND RECOMENDATIONS

Many scientists note the lack of implementation of animal welfare best practices among farmers (Balzani & Hanlon, 2020; Green et al., 2012; Peden et al., 2018) and see this as an obstacle to welfare improvement on the farm (Glanville et al., 2020; Peden et al., 2018). Clearly, there is a gap between what science defines as ideal animal welfare or 'best practice' and what farmers practice. This is the main purpose of this community service. The target to be achieved in this program is that participants can process and make quality animal feed using the fermentation method using ingredients that are easily found in the surrounding environment. In the end, their livestock will grow more optimally. Because the interaction and good relationship between farmers and livestock is one of the keys to improving the welfare of livestock (Cornish et al., 2016; Hemsworth, 2003). In addition, this activity formally reorganized and reactivated farmer groups that had been inactive for a long time. This aims to facilitate the coordination process if there are further activities. The recommended training theme proposed by partners next year is "overcoming disease problems in livestock". It is hoped that this follow-up activity can be carried out immediately so that the problems that occur in the livestock environment can be resolved immediately.

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