



PBL Dissemination: Introduction of RABAL Probiotic to Livestock Farmers in Cibal Village, Manggarai District, NTT Province

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Abstract

The livestock subsector in East Nusa Tenggara (NTT) contributes 28.51% to the regional GDP and employs 51.4% of the workforce; however, its economic growth remains slow, ranking only seventh among 17 economic sectors. One of the primary causes of this slow growth is low livestock productivity, which is largely attributed to poor feed processing practices that limit nutrient absorption and result in suboptimal average daily weight gain in cattle. To address this root cause, students at Politeknik Pertanian Negeri Kupang introduced Rabal Probiotics to farmers in Rado Village through the Student Community Service Program (KKBM). Rabal Probiotics, a locally developed probiotic containing *Saccharomyces cerevisiae* and *Lactobacillus casei*, improves feed digestion and nutrient absorption, thereby directly enhancing livestock growth rates. The students conducted training activities comprising lectures, demonstrations, and hands-on practice to increase farmers' understanding and practical skills in producing Rabal Probiotics, promote sustainable livestock practices, and demonstrate successful project-based learning implementation. The results showed that all participating farmers (100%) mastered the theoretical aspects, while practical understanding of proportional scaling increased to 70%.

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INTRODUCTION

The livestock subsector is one of the leading components within the agricultural sector and plays a strategic role in increasing the regional income (PAD) of East Nusa Tenggara (NTT). In addition to providing nutritious animal-based food products, livestock farming also serves as a driver of rural economic empowerment through the sustainable utilization of local resources (Gaina, 2019). The agricultural and livestock sectors remain the economic backbone of NTT, contributing 28.51% to the regional GDP and absorbing 51.4% of the workforce in 2020 (Ester & Pramitha, 2023). Despite this considerable contribution, these sectors have not yet become the main engine of regional economic growth. In 2020, the growth rate of the agricultural-livestock sector was only 0.95%, ranking seventh among 17 economic sectors (Koyle et al., 2022).

The slow growth of the agricultural livestock sector also reflects structural issues in labor distribution. A labor surplus in agriculture suggests that labor transfer to the non-agricultural sector remains sluggish, likely due to limited industrial diversification

and the slow development of the non-agricultural economy (Koyle et al., 2022). Addressing these challenges requires strong synergy among government institutions, academia, and local communities to strengthen capacity and innovation in the sector (Moata et al., 2024; Vertygo et al., 2022).

The partner community in this activity consists of livestock farmer groups in Rado Village, Cibal Subdistrict, Manggarai Regency, who raise cattle, pigs, and poultry (mainly chickens) as their main commodities. These farmers predominantly use traditional feeding methods, such as providing raw forages or crop residues directly to the animals, or boiling feed ingredients with water without any fermentation or enzymatic treatment. While boiling may soften the feed, it often degrades heat-sensitive vitamins and does not effectively break down complex fibers, resulting in a low nutritional value for the final feed (Kim et al., 2021). Consequently, livestock experience slow growth rates, pigs take longer to reach market weight, and chickens exhibit poor feed conversion. This low productivity is further exacerbated by the high cost and limited availability

of commercial concentrates in remote areas (Kementan, 2019). Farmers lack access to simple, low-cost technologies that can improve feed digestibility using locally available materials. Therefore, the core challenge is not the absence of feed resources, but the inability to transform raw or boiled feeds into a more nutritious and digestible form. This gap directly justifies the introduction of RABAL probiotic as a fermentation-based solution that enhances feed efficiency, improves nutrient absorption, and accelerates livestock growth, all while utilizing affordable local ingredients (Vertygo et al., 2025).

One concrete manifestation of this synergy is the dissemination of a project-based learning (PBL) outcome in the form of RABAL probiotic, a locally developed probiotic designed to enhance livestock feed efficiency by optimizing digestion and nutrient absorption (Sukma et al., 2024). This model is specifically offered to address persistent technical issues in livestock farming observed in the Rado village, Subdistrict of Cibal, Manggarai regency, such as slow growth rates and high production costs due to reliance on expensive commercial feeds. Unlike conventional feed processing methods that only involve physical or simple cooking treatments, RABAL probiotic provides a low-cost, microbiological solution in animal husbandry that improves gut health and nutrient uptake in livestock through fermentation of animal feed, directly targeting the root causes of low productivity.

Studies on RABAL probiotics have demonstrated their potential to improve animal productivity, digestive health, and feed utilization efficiency. Sahara et al. (2023) reported the use of RABAL probiotics (yeast and lactic acid bacteria) as a livestock probiotic for KUB chickens, highlighting their potential to improve feed digestibility, nutrient absorption, and poultry productivity through enhanced gastrointestinal microbial activity. Riyadi et al. (2022) reported that supplementation with RABAL Plus significantly increased egg production and improved egg quality in laying ducks, indicating its potential as a probiotic additive to enhance poultry productivity. A study on weaned pigs by Kim et al. (2023) demonstrated that daily administration of this microbial combination via drinking water significantly increased daily weight gain and improved feed efficiency without adversely affecting hematological parameters or immune response.

In the field, this model is currently implemented through an experiential learning approach involving direct collaboration between academia (Politani Kupang), local government, and farmer groups. The implementation stages include the following: (1) counseling sessions to build conceptual understanding, (2) live demonstrations (demlots) of

probiotic production using locally available ingredients (coconut water, molasses, tapai yeast, and Yakult), (3) hands-on practice by farmers in small groups, and (4) ongoing monitoring and follow-up by extension workers. The fermented product is applied to cattle feed at a recommended dosage (without tapai yeast for cattle), and early results show improved feed intake, animal health, and reduced dependence on external inputs. Thus, RABAL probiotic serves not only as a technical innovation but also as a vehicle for community empowerment and institutional synergy, directly responding to the structural challenges of labor surplus and low diversification by creating local value-added activities (Aprilia & Suhartono, 2023; Vertygo et al., 2023, 2025).

Previously, RABAL probiotic was developed within the Animal Feed Technology Study Program of Politani Kupang through PBL during the 2022/2023 academic year. It was further advanced in 2024 through the Student Entrepreneurship Project (PKWM) and continued as part of the Independent Business Project course in 2024/2025. It was also introduced in other rural areas around Timor Island in the Nusa Tenggara province (Vertygo et al., 2024, 2025). Building upon these successive developments, its introduction to rural communities was considered relevant and practical, as well as aligned with local needs for sustainable livestock productivity.

The purpose of this community service activity is to transfer applicable technology and knowledge to local farmers through the introduction and production of RABAL probiotics, thereby empowering communities to independently produce probiotic-based feed additives that can improve livestock performance and support the economic sustainability of rural farming systems in NTT.

MATERIALS AND METHODS

The materials and tools used in this community service activity included a 5-liter jerry can, clean water, Yakult drink, 'tapai' yeast, mature coconut water, molasses, turmeric, and brown sugar, which were used to produce the Rabal Probiotic. The method applied was experiential learning.

Materials

The main materials and tools used to produce Rabal Probiotic were a Jerry can (5-liter capacity), clean water, Yakult drink, tapai yeast, mature coconut water, molasses, turmeric, and brown sugar.

Methods

The method used in this community service activity is the experiential learning (EL) approach, as developed by Kolb in 1984 (Kong, 2021). This method emphasizes learning through direct experience,

Table 1. Solution of dedication

Problem	Solution	Output
Low livestock productivity owing to traditional feeding methods, resulting in slow growth rates and high dependence on expensive commercial concentrates.	Introduction and training on RABAL probiotic production using locally available ingredients (coconut water, molasses, tapai yeast, and Yakult) through an experiential learning approach	Farmers engaged in independent probiotic production
Low understanding of the concept of fermentation as a feed processing method that can improve digestibility and nutritional value.	Counseling and live demonstration of the 7-day anaerobic fermentation process, including gas release every 2 days, and an explanation of the role of microorganisms (<i>Saccharomyces cerevisiae</i> and <i>Lactobacillus casei</i>) in feed processing.	Farmers understand the principles of fermentation.
Non-optimal knowledge or awareness that local ingredients could be formulated as a probiotic for feed processing.	Demonstration of how to combine local ingredients (coconut water, molasses, tapai yeast, and Yakult) to produce a fermented probiotic product, emphasizing the function of each ingredient and the synergistic effect of yeast and lactic acid bacteria	Farmers recognized that local ingredients can be transformed into a high-value feed additive; ability to independently formulate RABAL Probiotic from locally available materials

reflection, conceptualization, and application, allowing participants to gain both theoretical understanding and practical skills through active participation. The stages of the activity were designed to follow the principles of experiential learning, which include concrete experience, reflective observation, abstract conceptualization, and active experimentation. Dedication to the solution is shown in Table 1.

Activity Design

Introduction of RABAL Probiotic for Livestock Farmers in Cibal Village, Manggarai District, NTT Province," was conducted from 2 to 6 July 2025 in collaboration with local livestock farmer groups in Rado Village. The design aimed to introduce and train farmers to independently produce RABAL probiotics as an alternative natural feed additive that supports livestock health and productivity. The overall learning framework was structured to promote active community participation, critical reflection, and skill mastery through hands-on practice.

Activity Procedures

The implementation of the activities consisted of four main stages aligned with the experiential learning cycle.

Extension (Abstract Conceptualization)

The activity began with a counseling session designed to build foundational knowledge and conceptual understanding among participants. The material covered the definition, composition, and

benefits of Rabal probiotics in livestock production. The delivery was concise and interactive to stimulate curiosity and engagement. Supporting materials, such as leaflets containing summarized information, were distributed to serve as reference guides for later independent practice.

Demonstration Plot (Concrete Experience)

Following the extension session, the activity continued with a live demonstration of the preparation of Rabal probiotics. The facilitator demonstrated each step of the process, from ingredient selection and mixing to fermentation, while encouraging participants to observe carefully. This hands-on demonstration enabled participants to directly experience the process and connect theoretical knowledge with real-world applications.

Community Practice (Active Experimentation)

Following the demonstration, the participants were divided into small groups to practice producing RABAL probiotics independently. This stage allowed them to apply what they had observed and conceptualized earlier. Through group collaboration, the farmers developed practical competence, problem-solving skills, and confidence in reproducing the probiotic autonomously after the program.

Discussion and Evaluation (Reflective Observation)

The final stage involved a reflection and evaluation session in which participants, student facilitators, and farmer group representatives discussed the activity outcomes. Participants shared

their learning experiences, challenges, and insights. Feedback was collected to assess their understanding, participation level, and readiness for independent application. The discussion also served to identify follow-up actions or support needed for sustainable implementation. Success was measured through direct observation and structured questioning during and after the training. For theoretical understanding, farmers were asked to explain the definition, benefits, and production steps of RABAL Probiotic during the counseling session, and their responses were recorded qualitatively. For practical understanding of independent production capability, facilitators observed each small group completing the entire fermentation without step-by-step prompting.

RESULTS AND DISCUSSION

Rado Village Profile

Rado Village has one of the highest numbers of farmer groups, after Wudi Village (Fig. 1). In Rado Village, there are six farmer groups: Maju Bersama Farmer Group, Ana Rona-Wina Farmer Group, Watu Renang Farmer Group, Unggul Rakas Farmer Group, Doyo Farmer Group, and Wae Ri'i Farmer Group. Each group consists of 10 members; however, only a few representatives from each group participated in activities.

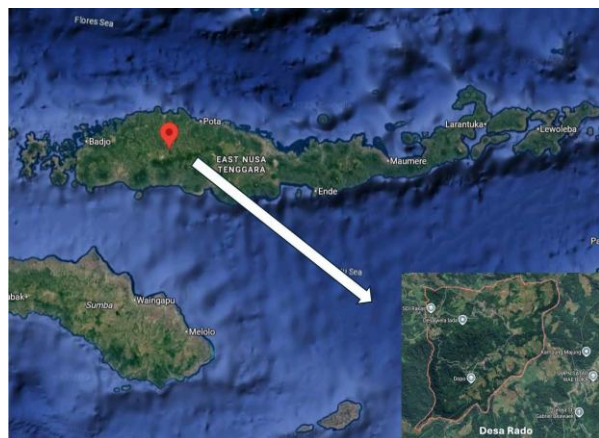


Fig. 1. Location of Rado Village

The common livestock commodities raised by group members were pigs and chickens. All groups were gathered and involved collectively without distinction, creating a collaborative atmosphere throughout the activity. All activities were centered at the house of one of the group leaders as a form of togetherness and to support a more conducive process of knowledge and experience transfer.

Counseling Session

The activity began with the distribution of leaflets by the implementing team to members of the

livestock farmer groups as supporting materials to aid understanding. The leaflets contained brief information about Rabal Probiotics, including its definition, benefits, and preparation steps (Fig. 2). It was expected that these leaflets could later serve as practical guides when farmers independently produced the probiotics.

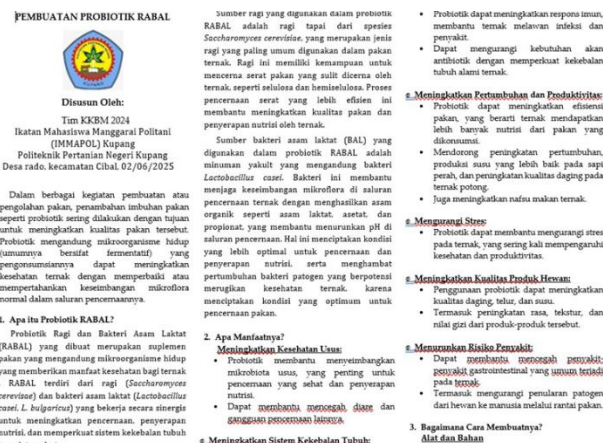


Fig. 2. Example of the leaflet distributed

After distributing the leaflets, the session continued with material presentation by the resource person. The material was delivered concisely yet comprehensively, covering the definition of Rabal probiotics, their benefits for livestock health and productivity, and the stages of the production process (Fig. 3).



Fig. 3. Material presentation session

The participants showed high enthusiasm from the beginning of the activity. This was demonstrated when one group member asked about the dosage of probiotics to be mixed into the feed, even before the practical session began. In response, the facilitator provided an initial explanation and decided to hold an open discussion in parallel with the practice session. This approach was intended to make the learning process more interactive and applicable.

Demonstration Plot (Demplot)

A demonstration of the Rabal probiotic preparation (demplot) was conducted openly in the front yard of one of the group leaders' houses. The activity was directly guided by the resource person, while other team members prepared the required tools and materials. During the session, each step of the probiotic preparation process was explained in detail, along with the function of each ingredient used (Fig. 4).



Fig. 4. Demonstration plot of Rabal Probiotic preparation

The tools and materials required for making Rabal Probiotics included a 5-liter jerry can as a fermentation container, clean water as a solvent, Yakult drink as a source of lactic acid bacteria, tapai yeast as a fermentation starter, mature coconut water as a growth medium for microorganisms, molasses as an energy source, and additional ingredients such as turmeric and brown/palm sugar as natural antibacterial and carbon sources.

All materials were measured precisely and mixed according to the procedure to ensure an optimal fermentation process. The procedure for probiotic preparation introduced to the farmer groups is as follows (Vertygo et al., 2024):

- Prepare a 5-liter jerry can as a container and ensure that it is clean and free from contamination.
- Pour approximately 4 liters of clean water into the container.
- Add water from one mature coconut.
- Add one bottle of fermented milk drink (Yakult).
- Add half a piece of tapai yeast (previously crushed).
- Add yeast powder to the container.
- Add two bottle caps of molasses.
- Stir the contents slowly until all ingredients are evenly mixed.
- Close the container tightly to prevent contamination from air.
- Allow the mixture to ferment for 7 days (1 week).
- Every 2 days, open the lid for 5–10 minutes and close it again. This process helps release fermentation gases to prevent pressure buildup inside the container.

Community Practice (Work Performance by Residents)

The villagers showed very high enthusiasm during the practice session. To enhance participant involvement, the facilitator organized them into several working groups. Two groups were responsible for measuring the required ingredients, while three groups focused on preparing the tools for the mixing process.

As the production of Rabal probiotics was a new experience for most participants, all livestock farmer group members appeared eager and actively participated in every stage of the activity (Fig. 5).



Fig. 5. Work performance by residents

Probiotics are primarily recommended for use in broiler chickens rather than laying hens, as the appetite-stimulating effect of probiotics may affect egg production consistency. In addition to poultry, these probiotics can also be given to other livestock such as cattle, goats, and pigs, using dosages equivalent to those used for poultry. However, for cattle, probiotic preparations do not require the addition of tapai yeast (Salam, 2018). In fish culture, probiotics can be applied directly to pond water at a rate of 2–3 bottle caps per 1,000 liters of water (Salam, 2018). For mixing with fish feed, the recommended dosage is approximately 100 mL of probiotics per 1 kg of feed, with a feeding frequency of twice daily (Haqiqiansyah & Padang, 2023).

Discussion and Evaluation

The evaluation revealed that all participating farmers (100%) had mastered the theoretical aspects of the training. They were able to explain what a probiotic is, the general steps of making Rabal Probiotic, and its benefits for livestock health and productivity. However, when it came to practical understanding, specifically the ability to adjust ingredient compositions when the production scale or total volume changes, only 70% of farmers demonstrated adequate comprehension. The

Table 2. Changes resulting from service activities

Initial Condition	Intervention	Condition Change
Little to no knowledge about the use of local probiotic in feed processing.	Educate on the concept of fermentation during probiotic use in feed processing.	100% (19 participants) understood about the concept of fermentation and probiotic (especially RABAL probiotic) use.
No knowledge about the production of local probiotic (RABAL probiotic)	Training on RABAL probiotic production	100% (19 participants) understood about the concept of fermentation and probiotic (especially RABAL probiotic) use.
Farmers struggled to adjust ingredient composition when changing production volume (e.g., from 5L to 10L batch).	Targeted reinforcement on proportional scaling using 5L and 10L batches, plus distribution of leaflets.	The practical understanding of scaling increased to 70%.
Farmers were unaware that probiotic ingredients are available at the local market, even though they travel there daily to sell livestock.	Awareness-raising session explicitly pointing out ingredient availability at the regular market	Increased farmer awareness: Farmers now recognize that all necessary ingredients are readily available at the market they already visit daily.

remaining 30% struggled with proportional scaling, for example, how to modify the recipe if they wanted to produce a 10-liter batch instead of the standard 5-liter batch, or a smaller volume for personal use.

To address this gap, the implementing team provided additional topic reinforcement focused on scaling. Two alternative scales that are most familiar to farmers, 5 liters and 10 liters, were practiced during the session. Farmers were guided step-by-step on how to proportionally increase or decrease each ingredient. At the very end of the training, every participant received a leaflet containing summarized instructions and practical scaling tables that they could take home as a reference. After this reinforcement and distribution of leaflets, the farmers' practical understanding improved noticeably, and the team observed that most participants felt more confident to replicate the process independently (Table 2).

During the discussion session, farmers identified that the main challenge in producing Rabal Probiotic independently was not the physical distance to the market, but rather the lack of awareness and habit of purchasing the required ingredients. Although the village is located in a remote area, farmers confirmed that they travel to the local market every day to sell their livestock commodities. At the same market, all the necessary ingredients for Rabal Probiotic—mature coconut water, molasses, tapai yeast, and Yakult—are readily available for purchase. However, farmers had never considered buying these items together because they were not accustomed to associating market trips with procuring probiotic production materials. To overcome this challenge, the implementing team raised farmers' awareness by explicitly pointing out the availability of these ingredients at their regular market. Further service activities are also recommended to focus on

establishing local supply chains for probiotic materials, developing small-scale production units, and conducting continuous mentoring. Future work may expand the scope to include product quality testing, economic feasibility analysis, and the application of Rabal Probiotics in a wider range of livestock systems to strengthen its commercial and scientific value.

Although no experimental data collection or controlled feeding trials were conducted during this community service activity, indirect evidence suggests that the intervention provided tangible benefits to the farmers. Based on informal follow-up interviews conducted several weeks after the training, all participating farmers reported that they continued to produce and use RABAL Probiotic independently. Their sustained production behavior serves as a strong indirect indicator that the probiotic is perceived as beneficial for their livestock, as farmers would not continue investing time and local resources into a practice that yields no observable advantage. Nevertheless, while this sustained practice implies improved feed digestibility and animal health, the specific impact on cattle growth rates remains unquantified. Therefore, periodic evaluations are strongly recommended, particularly to assess growth rate parameters in the medium term. Future follow-up activities should include simple, farmer-participatory growth monitoring (e.g., using body condition scoring or estimated live weight from heart girth measurements) to generate more direct evidence on how continued use of RABAL Probiotic affects cattle growth performance over time. The use of this probiotic in fermented or semi-moist feed also improves feed efficiency indirectly by reducing feed wastage through improved texture, palatability, and cohesiveness of the feed. This is also beneficial as farmers typically provide their feed to livestock in the

form of raw materials that are often very dry, which would increase feed wastage.

CONCLUSION

Based on the community service activities conducted in Rado Village, data were collected through direct observation, interviews, and the participatory involvement of farmer groups during training and demonstration sessions. The implementation method combined counseling, demonstration plots (demlots), and hands-on practice to ensure effective knowledge transfer. The main measurable contribution of this activity is the increased knowledge, understanding, and practical skills of farmers in independently producing and utilizing Rabal Probiotics using locally available materials, which positively impacts livestock productivity and supports sustainable farming practices. All participating farmers (100%) mastered the theoretical aspects of Rabal Probiotics, including its definition, production steps, and benefits for livestock. However, only 70% demonstrated adequate practical understanding, particularly in proportional scaling when the production volume changed. However, limitations were identified, particularly in the limited accessibility of several key ingredients owing to the village's remote location, which may hinder continuous production. Therefore, further service activities are recommended to focus on establishing local supply chains for probiotic materials, developing small-scale production units, and conducting continuous mentoring. Future work may expand the scope to include product quality testing, economic feasibility analysis, and the application of Rabal Probiotics in a wider range of livestock systems to strengthen its commercial and scientific value.

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