Aguidance In Utilizing The Waste Utilization of The Free Nutritional Meal Program And Trash Fish In Improving The Quality of Poultry Pellet Feed In The Merak Farmers Group, Labuhanbatu District

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Abstract.
The availability of affordable and high-quality feed is an important factor in the sustainability of poultry farming. The Merak Farmers Group in Labuhanbatu Regency faces high commercial feed costs, while food waste generated from the Free Nutritious Meal Program and locally available trash fish have not been optimally utilized. This community service program aimed to improve farmers' knowledge and practical skills in processing leftover rice, tofu, and tempeh from the Free Nutritious Meal Program, as well as trash fish, into raw materials for poultry pellet feed. The program applied a participatory approach through education, demonstration, hands-on practice, and production assistance. The implementation consisted of two main activities. The first activity involved sorting, drying, milling, and sieving food waste into feed meal. The second activity involved processing trash fish into fish meal, formulating the feed by adding rice bran, ground corn, and minerals, mixing the ingredients, producing pellets using a pellet machine, and drying the final product. The results showed that group members were able to carry out the processing stages and operate both the milling and pellet-making machines. The resulting pellets were relatively uniform, compact, easy to handle, and suitable for storage after drying. The utilization of locally available materials and previously underutilized resources reduced the amount of purchased feed ingredients, resulting in lower feed production costs compared with the full use of commercial feed. This program demonstrates that practice-based assistance can strengthen farmers' capacity to produce alternative feed while supporting productive and sustainable waste management.
Keywords: *alternative feed; fish meal; food waste; poultry pellets and trash fish.*

I. INTRODUCTION

Feed is a key component in poultry farming because it directly impacts growth, health, egg production, and business efficiency. Feed costs are also one of the largest expenses in poultry farming. This makes small-scale farmers highly sensitive to price increases for corn, concentrates, fish meal, and other commercial feed ingredients. Therefore, utilizing local raw materials is one strategy that can be implemented to reduce dependence on commercial feed.

Poultry rations should essentially provide energy, protein, amino acids, minerals, vitamins, and water in amounts appropriate to the type and stage of livestock rearing. These feed ingredients generally come from cereals, agricultural by-products, vegetable protein sources, animal protein sources, and minerals and vitamins. The use of alternative feed ingredients can help reduce costs, but they must be processed and formulated with attention to quality, safety, digestibility, and nutrient balance (FAO).

The implementation of the Free Nutritious Meal Program (MBG) generates a certain amount of food waste, especially when the food provided is not entirely consumed. This waste can include rice, vegetables, tofu, tempeh, eggs, meat, and other food ingredients. If not handled properly, food waste has the potential to produce odors, attract insects, increase microbial populations, and add to the environmental burden. Conversely, food that is still edible and has not decayed can be sorted and processed into feed sources.

Not all food scraps can be fed directly to poultry. Materials mixed with plastic, food skewers, chemicals, detergents, metal objects, moldy food, or rotting materials should be rejected. High water content also makes food scraps perishable. Therefore, their utilization must begin with sorting, reducing the water content, drying, grinding, and hygienic storage. This processing aims to extend shelf life, reduce particle size, facilitate mixing, and reduce the risk of damage during storage.

In this activity, the MBG food waste used for feed production was rice, tofu, and tempeh. These three ingredients were chosen because they are relatively easy to separate, can be dried, and can be ground into flour. Vegetable and animal side dish waste were still introduced in the sorting material, but not all of them were used in the demonstration formulation due to variations in water content, salt content, oil content, spices, and higher levels of damage. Selecting more uniform ingredients is the first step to producing feed with more controlled quality.

In addition to MBG waste, trash fish is a local resource with potential use as feed. Trash fish are small fish, bycatch, or fish with low market value for human consumption. These fish can still be used as a source of animal protein after proper handling. Fishmeal is commonly used to supplement protein and amino acids in poultry rations, but its quality is greatly influenced by the type of fish, freshness, processing method, and storage conditions (Apandi et al., 1974; Ravindran & Blair, 1993).

The Merak Farmers Group in Labuhanbatu Regency operates a poultry farm but faces limitations in providing affordable feed. At the same time, local resources, such as trash fish and food waste, remain underutilized. Initial identification results indicate that group members require practical knowledge regarding material sorting, drying, milling, feed formulation, flouring, pelleting, pellet drying, and product storage.

Based on these issues, community service activities were conducted through mentoring on utilizing MBG waste and trash fish to produce poultry pellet feed. The mentoring focused not only on delivering material but also on positioning group members as key implementers in every stage of production. This way, the knowledge gained could be directly applied and developed independently.

The objectives of this activity are: 1) to increase the understanding of the members of the Merak Farmers Group regarding the potential and safety requirements of MBG waste and trash fish as feed ingredients; 2) to improve the group's skills in processing leftover rice, tofu, and tempeh into feed flour; 3) to improve the group's skills in processing trash fish into fish meal; 4) to improve the group's ability to mix ingredients and produce pellet feed; and 5) to help the group reduce feed costs through the use of local raw materials.

II. Implementation Method

2.1. Time, location, and participants

Community service activities are carried out on:

- Day and date: **Wednesday, July 1, 2026 – Saturday, August 1, 2026**
- Location: **Dano Bale Village, Labuhanbatu Regency, North Sumatra Province**
- Mitra: **Merak Farmers Group**
- Number of participants: **11 people**
- Types of livestock businesses:**Free-range chicken, duck and muscovy duck**

The implementation team consists of lecturers, students, technical staff, and members of the Merak Farmers Group. Roles are divided to ensure that extension activities, demonstrations, production practices, documentation, and evaluations can proceed in a focused manner.

2.2. Implementation approach

The activity uses a participatory approach and adult learning. Group members not only receive explanations but are also directly involved in material sorting, drying, milling, mixing, machine operation, pellet molding, and product evaluation.

The activity stages consist of:

1. Identify problems and sources of raw materials.
2. Coordination with group administrators.
3. Preparation of materials, machines, and activity locations.
4. Socialization of safety and quality of feed ingredients.
5. The first activity carried out was MBG waste processing.
6. The second activity was carried out in the form of processing trash fish and making pellet feed.
7. Evaluation of the process, product, participant skills, and production costs.
8. Follow-up assistance.

2.3. Tools and materials

Table 1. Tools used in activities

No.	Tool	Function
1	Scales	Weighing ingredients before and after processing
2	Container or bucket	Contain and separate materials
3	Gloves and masks	Protect materials and participants from contamination
4	Knife or chopping tool	Reduce the size of tofu, tempeh, and fish
5	Trays or drying racks	Place for drying materials
6	Clean tarpaulin	Drying mat when using sunlight
7	Oven or mechanical dryer	Drying materials when the weather is not favorable
8	Flour machine	Grinding dry ingredients
9	Sieve	Uniforming the size of flour particles
10	Mixing machine or mixing container	Homogenizing feed ingredients
11	Pellet making machine	Forming the feed mixture into pellets
12	small shovel	Taking and mixing ingredients
13	Sack or closed packaging	Storing flour and pellets
14	Product label	Record the production date and composition
15	Documentation tools	Recording the activity process

The materials used consist of leftover rice, tofu, tempeh, small fish, rice bran, ground corn, minerals or premix, clean water, and fuel or energy sources for drying and operating the machine.

2.4. First activity: processing MBG waste into feed flour

The first activity focuses on processing MBG food waste, particularly rice, tofu, and tempeh. The implementation stages are as follows.

2.4.1. Collection of materials

Food scraps should be collected as soon as possible after the distribution and consumption of food is complete. Collection times should be kept short to prevent excessive fermentation, spoilage, and contamination. Materials should be placed in clean containers and not mixed with inorganic waste.

The source, time of collection, and initial condition of the materials are recorded on the receipt sheet. This record keeping is essential for maintaining traceability of the materials used.

2.4.2. Sorting

Sorting is done to separate:

- Rice, tofu, and tempeh that are still suitable for processing.
- Leftover vegetables that are too wet.
- Leftover meat or side dishes that contain a lot of oil and spices.
- Plastic, paper, food skewers, disposable spoons, rubber, and foreign objects.
- Materials that are moldy, slimy, smell bad, or have abnormal color changes.

In the demonstration, the main ingredients that proceed to the next stage are rice, tofu, and tempeh. Leftover vegetables and meat are not used if they are too wet, oily, salty, strongly seasoned, or cannot be guaranteed fresh.

2.4.3. Draining and chopping

Tofu and tempeh are drained to reduce surface water. The ingredients are then cut or crumbled into smaller pieces. The rice is flattened and any clumps are broken up. The smaller ingredients increase the drying surface area, allowing water to evaporate more quickly.

If any material is very oily or too salty, it should not be included in the process. Repeated washing is not recommended as it can increase the water content and produce new wastewater.

2.4.4. Drying

The material is arranged in thin layers on trays, racks, or clean tarps. Drying can be done using sunlight, an oven, or a mechanical dryer. During drying, the material must be protected from dust, rain, insects, wild birds, and other animals.

The material is turned periodically to ensure even drying. Drying is continued until the material no longer feels damp, does not clump when squeezed, and is easily broken or crumbled. If a moisture meter is available, drying should be controlled by measurement, not just visual inspection.

Drying is a critical step because wet materials are susceptible to mold growth and quality degradation during storage. Materials that are not yet completely dry should not be immediately packaged or milled in large quantities.

2.4.5. Milling

The dried ingredients are first cooled. Once they reach room temperature, the dried rice, tofu, and tempeh are gradually fed into the flouring machine. The ingredients are fed according to the machine's capacity to avoid overloading the motor. The resulting flour is collected in a clean, dry container. The machine is cleaned before and after use to prevent cross-contamination and the buildup of residual ingredients.

2.4.6. Sifting and mixing MBG flour

The flour is sieved to obtain a relatively uniform particle size. Particles that are too large are reground. The rice flour, tofu, and tempeh are then mixed thoroughly. The ratio of the three ingredients is recorded based on the weight of the available dry ingredients. Where possible, each ingredient is weighed separately so that the MBG flour composition can be replicated in subsequent production runs.

2.4.7. Temporary packaging

MBG flour is packaged in clean, sealed, and labeled packaging. The label should include at least the name of the ingredient, production date, source of the ingredient, net weight, and the name of the person responsible for production. The flour should be stored in a dry place, away from direct sunlight, away from the floor, and protected from rodents and insects.

2.5. Second activity: processing trash fish and making pellet feed

The second activity includes processing trash fish into fish meal, feed formulation, mixing, pellet molding, drying, and product storage.

2.5.1. Selection of trash fish

Trash fish are inspected based on their physical condition. The fish used must not have undergone severe decay, be excessively slimy, have a strong, foul odor, and be free from chemicals or waste. Decomposed fish should not be processed into feed. Using stale ingredients can reduce protein quality, produce a rancid odor, and increase the risk of microbiological contamination.

2.5.2. Washing

The fish is washed with clean water to remove mud, sand, blood, and surface dirt. The washing process should be done in moderation to minimize nutrient loss. After washing, the fish is drained until the surface water has reduced.

2.5.3. Initial cooking

Fish is steamed or heated until the fish tissue is cooked. Cooking reduces the number of microorganisms, facilitates water separation, and speeds up the drying process. Excessive heating is avoided, as excessive or prolonged heating can degrade protein quality. Cooking time is adjusted according to the size of the fish and the capacity of the equipment.

2.5.4. Draining and pressing

Drain the cooked fish. If a press is available, gradually press the fish to remove the water and some of the oil. Reducing the water speeds drying, while reducing the oil can help slow rancidity during storage.

2.5.5. Drying fish

The fish are arranged in thin layers on drying trays. They are dried using sunlight or a drying machine until the fish are completely dry and easily crushed. During drying, the material is protected from flies, dust, animals, and rain. Damp fish are not ground immediately, as they can stick to the machine and easily spoil during storage.

2.5.6. Milling and sieving

The dried fish is fed into a flouring machine in batches. The resulting flour is then sieved. Large particles, such as bones or other unrefined parts, can be re-ground. Good quality fishmeal is practically dry, free of clumps, free of foul odors, and free of mold growth. However, visual assessment cannot replace laboratory testing.

2.5.7. Preparation of feed formulation

The demonstration formulation was developed based on the availability of locally available materials. MBG waste flour was used as a source of energy and vegetable protein, fish meal as a source of animal protein, corn as a source of energy, bran as a source of energy and fiber, and minerals as a supplementary mineral.

Table 2. Example of pellet feed demonstration formulation

Material	Proportion (%)	Amount for 100 kg
MBG waste flour	20	20 kg
Trash fish meal	10	10 kg
Ground corn	35	35 kg
Rice bran	33	33 kg
Mineral water premix	2	2 kg
Amount	**100**	**100 kg**

This formulation is a demonstration of processing technology and cannot yet be considered a complete ration for all types and stages of poultry. The final composition must be adjusted to suit broilers, layers, free-range chickens, and ducks, the age of the livestock, production objectives, proximate analysis results, and recommended livestock nutrition requirements.

Fish meal also needs to be used in a controlled manner. Too high a proportion can increase salt, ash, fat, fish flavor, and formulation costs. Therefore, the use of trash fish meal should be based on the results of tests for crude protein, fat, moisture, ash, and microbiological quality.

2.5.8. Weighing materials

Each ingredient is weighed according to the formulation. Weighing is done using the same units and recorded on the production sheet. Misweighing of minerals or premixes must be avoided because these ingredients are used in small quantities.

2.5.9. Mixing

Mixing begins with a preliminary mixture. The minerals are first mixed with some of the bran to ensure even distribution. Next, ground corn, MBG flour, fish meal, remaining bran, and the mineral mixture are gradually added.

The ingredients are mixed until the color and texture of the mixture are relatively uniform. Uneven mixing can result in some pellets containing too many minerals or fish meal, while others contain too little.

Clean water is added little by little until the mixture is moist enough to mold. Don't pour the water all at once, as a mixture that's too wet can clog the machine, produce soft pellets, and require a longer drying time.

2.5.10. Operation of the pellet machine

Before starting the machine, participants check:

- Condition of cables, motors, belts and drive parts.
- Cleanliness of the printing room.
- Bolt tightness.
- Availability of lubricants according to machine instructions.
- Position of the container.
- Work area safety.

The machine is started without a load to ensure normal rotation. The feed mixture is then gradually introduced. Operators are not permitted to insert their hands into the machine's hopper. If the material becomes clogged, the machine must be turned off and the power source removed before inspection.

The pellet diameter is adjusted according to the size of the mold hole and the type of bird. The resulting pellets are cut to a relatively uniform size. Any incompletely formed pellets can be returned to the mixture.

2.5.11. Pellet drying

The wet pellets are spread in a thin layer. Drying is carried out until the surface of the pellets is free of moisture, the pellets are sufficiently hard, do not deform easily when lightly pressed, and do not produce condensation when placed in a closed container. The pellets must be cooled before packaging. Packaging hot products can cause condensation, increased humidity, and mold growth.

2.5.12. Packaging and storage

The dried pellets are packed in padded sacks or sealed packages. The product label states:

- Product name.
- Composition of ingredients.
- Production date.
- Net weight.
- Production group.
- Storage recommendations.
- Note that the formulation still requires nutritional testing.

Products are stored on pallets, away from floors or walls, protected from water, and with good air circulation. The material usage system follows the principle of "first-produced materials used first."

2.6. Evaluation of activities

Evaluation is carried out at three levels, namely process, output, and initial results.

Table 3. Activity evaluation indicators

Evaluation level	Indicator
Process	Participant attendance, participant involvement, smooth use of tools, and implementation of occupational safety
Knowledge	Ability to explain which materials are suitable and unsuitable for use
Skills	Ability to sort, dry, grind, mix and mold pellets
Product	The formation of relatively uniform MBG flour, fish meal, and pellets
Economy	Reduced purchase of some feed ingredients and reduced feed manufacturing costs
Sustainability	The group's ability to plan the next production and divide up tasks

Data was obtained through observation, discussions, interviews, production records, photo documentation, and visual product assessments. Descriptive analysis was conducted by comparing conditions before and after the mentoring session.

Production costs are calculated using the formula:

Production cost per kilogram = total production cost ÷ number of dry pellets produced

The percentage reduction in costs can be calculated using the formula:

Cost reduction (%) = [(comparative feed price − independent pellet cost) ÷ comparative feed price] × 100%

Production costs include additional materials, labor, electricity or fuel, machinery depreciation, packaging, and transportation. MBG waste and trash fish still need to be assigned an economic value or collection cost to ensure the analysis doesn't produce an underestimate.

III. Results and Discussion

3.1. Initial conditions of partners

Based on initial coordination and observations, members of the Merak Farmers Group have experience raising poultry, but their feed still relies on purchased ingredients or commercial feed. Rising feed prices have increased production costs and reduced business margins.

On the other hand, leftover rice, tofu, and tempeh from MBG activities, as well as trash fish, are available locally. These materials have not been systematically utilized because the group lacks standardized procedures for sorting, drying, flouring, formulating, and pelleting.

Prior to the activity, some participants viewed leftover food as mere waste to be disposed of or fed directly to livestock. Providing wet feed actually has several drawbacks, including rapid spoilage, difficulty in storage, inconsistent composition, and the risk of contamination with foreign materials. The mentoring program then focused on shifting the utilization method from direct feeding to more controlled processing of the feed.

3.2. Implementation of MBG waste processing

The first activity began with an explanation of the difference between food waste that can still be processed and food that should be rejected. Sorting is crucial because feed safety is determined not only by nutrient content but also by the cleanliness of the ingredients and the absence of biological, chemical, or physical contamination.

Participants practiced separating rice, tofu, and tempeh from plastic, paper, overly wet vegetables, spoiled side dishes, and other foreign objects. This process fostered an understanding that not all MBG waste can automatically be used as feed.

After sorting, participants flattened the rice and reduced the size of the tofu and tempeh. This process helped speed up the drying process. Documentation of the activity showed that participants were able to follow the steps of draining, chopping, arranging the ingredients on the drying media, and turning the ingredients during drying.

The dried ingredients were successfully processed using a flouring machine. Using a machine speeds up the process compared to manual crushing and produces smaller particle sizes. A more uniform flour is easier to mix with other ingredients, reducing the chance of separation in the ration.

A key outcome of the first activity was not only the production of MBG flour, but also the group's increased ability to control material quality. Participants understood that drying should not be stopped when the outside of the material appears dry while the inside is still moist. This understanding is crucial to prevent mold growth during storage.

Fig. 1. Delivery of material on sorting and safety of MBG waste.

Fig. 2. Drying leftover rice, tofu, and tempeh.

Fig. 3. Grinding dry ingredients using a flouring machine.

3.3. Implementation of trash fish processing

The second activity began with the selection of trash fish. Participants were given an understanding that a low market value does not necessarily indicate a lack of nutritional value. However, fish that has rotted cannot be used simply because it will have undergone heating or drying.

Fish that meets the requirements are washed, drained, heated, and dried. The heating process helps reduce microbial contamination and facilitates drying. Once dried, the fish is ground using a flouring machine to form fishmeal.

Participants were able to distinguish suitable fishmeal based on its basic physical characteristics: dryness, no clumping, and no foul odor. However, the implementation team emphasized that visual inspection cannot confirm protein, fat, ash, salt, or microbiological safety.

Utilizing trash fish as fish meal adds value because this previously low-priced ingredient can be used as a source of protein in feed. Fish meal contains animal protein and can help supplement amino acids in rations based on corn, bran, and plant materials. However, the quality of fish meal is greatly influenced by the freshness of the fish and the processing method (Apandi et al., 1974; Ravindran & Blair, 1993).

Fig 4. Washing and initial processing of trash fish.

Fig 5. Rucah fish boiling process.

Fig 6. Mixing Trash Fish with Rice Bran

Fig. 7 Finished Fish Meal

3.4. Formulation and mixing of materials

Once the MBG flour and fish meal were available, participants weighed the ingredients based on the demonstration formula. The weighing process introduced the principle that feed production cannot be based solely on volume estimates or scoop counts.

The minerals are first mixed with some of the bran. This technique is used because the minerals are relatively small compared to the other ingredients. The pre-mixing helps distribute the minerals more evenly before being mixed with the corn, MBG flour, fish meal, and remaining bran.

Participants then mixed the ingredients until the color and texture were relatively homogeneous. Water was gradually added to achieve the desired moisture content for the pellet machine. At this stage, participants learned that a mixture that was too dry would be difficult to mold, while a mixture that was too wet would produce soft pellets and delay the drying process.

The demonstration formulation produced a mixture that could be molded into pellets. However, the feed quality improvements in this activity primarily referred to improvements in processing quality and physical form, namely, making the material more uniform, denser, easier to administer, and easier to store. The nutritional content of the pellets cannot yet be quantified because proximate analysis has not been performed.

3.5. Making pellet feed

Participants received explanations about machine components, start-up and stop procedures, material feeding capacity, handling blockages, and work safety. Following a team demonstration, participants took turns operating the machine with assistance.

The feed mixture is successfully molded into pellets. The product exiting the machine has a cylindrical shape and a relatively more uniform size than the powdered material. Any incompletely formed pellets are removed and fed back into the process.

Pelleting offers several practical advantages for poultry. Ingredients of different sizes and densities can be combined into a more compact form. It also makes it more difficult for birds to select specific ingredients. Furthermore, feed dust and feed loss during feeding can be reduced. Pellet quality is still influenced by particle size, moisture content, starch content, ingredient composition, machine conditions, and the drying process (Loar II & Corzo, 2011).

Pellets fresh from the machine still have a relatively high moisture content and temperature, so they must be dried and cooled. Once dry, the product is packaged and stored in a place protected from moisture.

Fig 8. Mixing MBG flour, fish meal, bran, corn, minerals

Fig 9. Practical operation of pellet making and machine

Fig 10 . Pellet feed products produced by the Merak Farmers Group.

3.6. Improving group members' skills

The success of the mentoring program is evident in the participants' involvement in all stages of production. After the activity, group members are able to:

1. Identify food waste that is suitable and unsuitable for processing.
2. Separate feed ingredients from inorganic waste and foreign objects.
3. Drying rice, tofu, tempeh, and small fish.
4. Operating the flouring machine.
5. Sift and store flour.
6. Weigh the ingredients according to the formulation.
7. Make a mineral primer mixture.
8. Regulate the moisture content of the mixture.
9. Operating the pellet machine.
10. Drying, packing, and storing products.

These changes demonstrate that the demonstration and hands-on practice methods are aligned with the partners' needs. Participants not only understood the concept of waste utilization but also gained experience in overcoming technical issues, such as materials being too wet, grinds that weren't smooth enough, mixtures that were difficult to mold, and pellets that crumbled easily.

Table 4. Changes in partner conditions after mentoring

Aspect	Before mentoring	After mentoring
Utilization of MBG waste	Not done systematically	Leftover rice, tofu and tempeh can be processed into flour.
Utilization of trash fish	Sold cheaply or unprocessed	Can be processed into fish meal
Use of a flouring machine	Capabilities are still limited	Participants are able to carry out the flouring process
Feed formulation	Based on estimates	Ingredients are weighed based on the formulation.
Feed form	Separate or powdered ingredients	Produced feed in pellet form
Storage	Don't have a procedure yet	The product is dried, packaged and labeled.
Feed costs	Depends on the ingredients or feed purchased	Some of the ingredients are replaced with local sources.
Waste management	More thrown away	Waste is utilized to become valuable products

3.7. Improving the quality of pellet feed

This activity improves feed quality across four aspects. First, the quality of raw materials improves because food scraps are no longer fed wet, but are sorted, dried, ground, and sieved. Second, the composition of the ingredients becomes more measurable because each ingredient is weighed. Third, mixing helps distribute energy, protein, and minerals more evenly. Fourth, pelleting produces a more uniform and practical feed.

The physical quality of the pellets was simply assessed based on uniformity of shape, density, aroma, color, degree of disintegration, and condition after drying. Based on documentation and observations during the process, the machine was capable of producing pellets from a prepared mixture of local ingredients.

The resulting pellets indicate that rice and corn flours contribute starch, aiding in the binding process. Bran helps form the mixture's structure, while fish meal and tofu and tempeh flour enhance the diversity of protein sources. Minerals are added as supplements, but their use should follow product recommendations and the animal's needs.

Statements of quality improvement at this stage do not yet include evidence of increases in crude protein, metabolizable energy, digestibility, body weight gain, egg production, or feed conversion. These tests require laboratory analysis and controlled animal feeding trials.

3.8. Reducing feed costs

The main result experienced by the group was a decrease in feed production costs. This decrease occurred because some of the required ingredients were replaced with locally available leftover rice, tofu, tempeh, and small fish. The group did not need to purchase all components of commercial feed. Using local ingredients also reduced dependence on market price fluctuations. However, the calculation of fixed costs must include material collection, transportation, water, drying energy, machine electricity, labor, packaging, and equipment depreciation. Based on records and statements from group members, feed costs decreased after some purchased ingredients were replaced with processed ingredients. The percentage reduction has not been included because detailed data on production volume and all components are available.

3.9. Environmental and institutional impacts

Utilizing MBG waste reduces the amount of food waste thrown away. Processing trash fish also increases the value of previously low-value fishery products. Both activities demonstrate the application of a circular economy, which returns organic materials to the production process as resources.

From an institutional perspective, collaborative activities encourage the division of labor within the group. Feed production can be divided into material collection, sorting, drying, milling, formulation, machine operation, packaging, record-keeping, and quality control. Division of labor is crucial because material processing cannot be dependent on one person. Continuity of production requires a schedule for material collection, availability of drying space, machine maintenance, inventory records, and agreements regarding feed use or sale.

3.10. Sustainability of the program

Sustainable activities require simple work procedures that can be implemented by group members. These procedures should include at least:

1. Acceptance and rejection criteria for materials.
2. MBG waste and trash fish collection schedule.
3. Drying method in sunny and rainy weather.
4. Machine cleaning schedule.
5. The formulation used in each production.
6. Recording the weight of the material and the pellet results.
7. Recording of production costs.
8. Checking the condition of the pellets during storage.
9. Warehouse pest control.
10. Reporting complaints if there are livestock health problems.

The group also needs to form a feed production team responsible for raw materials, machinery, quality, and administration. Part of the cost savings can be allocated to machine maintenance and laboratory testing.

3.11. Activity limitations

This activity still has some limitations.

- Firstly, the availability of small fish and leftover rice is still irregular, making the farmer group still feel a shortage of raw materials.
- Second, MBG flour, fish meal, and pellets have not been analyzed in a laboratory. Therefore, the moisture, crude protein, crude fat, crude fiber, ash, energy, salt, aflatoxin, and microbiological contamination content is not yet known with certainty.
- Third, no feeding trials have been conducted over a specific period. The impact of pellets on feed consumption, body weight gain, egg production, feed conversion, mortality, and poultry health cannot yet be concluded.

- Fourth, the group has experienced cost reductions, but not all cost components have been recorded. A more comprehensive economic analysis is needed to accurately determine the cost of production and the level of savings.

These limitations do not diminish the benefits of improving group skills, but should be stated openly so that the article's conclusions remain consistent with the available evidence.

IV. CONCLUSION

The mentoring program for utilizing MBG waste and trash fish within the Merak Farmers Group in Labuhanbatu Regency was successfully implemented through two main activities. The first activity developed skills in processing leftover rice, tofu, and tempeh through sorting, drying, milling, and sieving. The second activity developed skills in processing trash fish into fishmeal and formulating, mixing, molding, drying, and packaging pellet feed.

Group members are able to operate flour mills and pellet machines. A mixture of MBG waste flour, fish meal, bran, corn, and minerals can be successfully formed into a relatively uniform, dense, and more practical pellet feed for livestock.

Utilizing local ingredients reduces the need to purchase some feed ingredients, lowering production costs compared to relying entirely on commercial feed. The practice also provides environmental benefits by reducing food waste and increasing the value of trash fish.

The quality that can be inferred from this activity is still limited to the quality of the process and the physical characteristics of the product. Nutritional analysis, safety, livestock performance testing, and detailed economic calculations are needed to ensure the formulation's suitability as a poultry ration for a specific type and production phase.

V. RECOMMENDATIONS

- The Merak Farmers Group must implement strict material acceptance procedures. Material that is moldy, rotting, mixed with foreign matter, contains chemicals, or is of unknown origin must be rejected.
- Drying should be done using mechanical dryers or simple drying houses to avoid production being completely dependent on the weather. The use of moisture meters is also necessary to improve quality consistency.
- MBG flour, fish meal, and pellets require laboratory testing. Priority parameters include moisture content, crude protein, crude fat, crude fiber, ash, energy, salt content, aflatoxins, and microbiological contamination.
- Formulations need to be developed with a livestock nutritionist based on the type of poultry and production phase. Formulas for starter chickens cannot be compared to those for grower chickens, layers, adult free-range chickens, or ducks.
- Feeding trials should be conducted on a limited basis initially. Observations should include consumption, weight gain, egg production, feed conversion, fecal condition, mortality, and health symptoms.
- Groups need to record the weight of input materials, flour yield, pellet quantity, production costs, feed usage, and livestock performance. These records will serve as the basis for business evaluation and the development of subsequent research or community service articles.

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