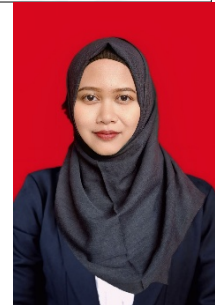




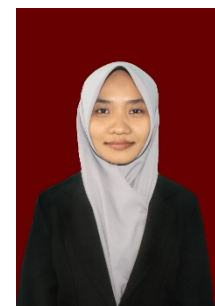
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## **SOCIALIZATION OF THE USE OF VEGETABLE WASTE IN NAWANGSASI VILLAGE FOR ANIMAL FEED IN THE FORM OF SILAGE**

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### **Abstract:**

Background: Organic waste, particularly vegetable waste, poses significant environmental challenges, including pollution and pest proliferation. Nawangsasi Village, with its high agricultural activity, generates substantial vegetable waste, which is often improperly managed.



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**Aim:** This study aims to develop an eco-friendly waste management strategy by converting vegetable waste into silage for animal feed, thereby addressing environmental issues and providing economic benefits to the community.

**Methods:** The study involved field surveys to identify waste sources, collection and sorting of vegetable waste, and silage formulation using two fermentation agents (tempeh yeast and tape yeast). The silage was evaluated through organoleptic tests and livestock feeding trials.

**Results:** Both silage formulations yielded high-quality products, with the tape yeast variant showing superior palatability. Livestock trials confirmed the acceptability of silage as feed, with no adverse health effects observed.

**Conclusions:** The study demonstrates the viability of vegetable waste silage as a sustainable solution for waste management and livestock feed. Community training and further research are recommended to optimize and scale the initiative.

**Involvement.** The silage formula can be applied to farmers.

**Keywords:** waste, organic, silage, socialization, breeders

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## INTRODUCTION

Nawangasasi Village is a village with high potential in the agricultural sector and market activities, particularly in the production and distribution of fresh vegetables. Every day, this activity produces organic waste in the form of vegetable residues that are not suitable for consumption in considerable quantities. The waste is often disposed of or left to rot without proper management. However, if used correctly, this vegetable waste can contain valuable nutrients and can be reused, one of which is as animal feed.

The problem of organic waste, especially that derived from vegetables, is a relatively important environmental issue. The accumulation of waste without proper treatment can cause pollution, unpleasant odors, and become a breeding ground for pests and diseases. Therefore, an environmentally friendly waste management strategy is needed and can also provide economic benefits for the village community. One innovative solution that can be implemented is to process vegetable waste into animal feed in the form of silage.

Silage is a product of the anaerobic fermentation of forage or organic matter that is preserved in a closed state without oxygen. The ensilage process allows vegetable waste to be stored for an extended period of time while still maintaining its nutritional value. Quality silage can be an effective and economical alternative feed source for farmers, especially when the availability of fresh forage is reduced, such as in the dry season. According to research by Hartadi *et.al* (2022), silage-based feed from organic waste can increase the productivity of ruminant livestock and significantly reduce feed costs.

The use of vegetable waste for silage aligns with the principles of sustainable agriculture and circular farming systems, where all by-products from agricultural activities and markets can be recycled and fed back into the production system. This supports resource efficiency, reduces environmental pollution, and strengthens food and feed security at the local level. In the context of Nawangsasi Village, this approach can be adopted as a strategy to enhance the village economy by leveraging appropriate technology and local wisdom.

Furthermore, these activities can encourage active community participation in waste and livestock management, as well as build collective awareness of the importance of innovation in the integrated agriculture and livestock sector. The implementation of this program also presents an opportunity to serve as an example for other villages with similar characteristics. Therefore, research and the application of the silage-making method from vegetable waste are vital to be carried out, so that the benefits can be felt in real terms by the people of Nawangsasi, both in terms of environmental benefits and economic welfare.

## **METHOD**

### **Field Identification and Survey**

Determine the type, quantity, and origin of vegetable waste in the village area. Collect information from local farmers about how to feed and the daily feed needs. Conduct a recording of the potential of organic waste and the technical challenges in the field.

### **Vegetable Waste Collection and Selection**

Vegetable waste is taken from farmers who are unable to sell their crops. The waste sorting process aims to separate materials that can still be reused from those that cannot. The selected waste must remain fresh, non-rotten, and free from chemical contamination.

### **Silage Formulation and Manufacture**

The sorted vegetable waste will later be cut into small pieces using a knife or chopper. After the cutting process, the vegetable waste is dried for 2 to 3 hours until dry so that the water content is reduced. After drying, the first step is to mix 800 grams of vegetable waste with additional ingredients, including 80 grams of fine bran as an energy source and 8 grams of tempeh yeast. Furthermore, in the second step, 700 grams of dried vegetable waste is mixed with 70 grams of bran and 7 grams of tape yeast. The evenly distributed mixture of ingredients is placed into a tightly sealed plastic container, ensuring no air enters, and then stored in a dark location. Fermentation is carried out for 15 to 30 days, and checks should be carried out

periodically.

## RESULTS AND DISCUSSION

### Field Observation (Vegetable Waste Identification)

Observations were conducted directly in vegetable waste collection areas, including traditional markets, households, and several vegetable processing locations in Nawangsasi Village. The information obtained includes the various types of vegetables that are often wasted, the frequency of waste disposal, and the average daily volume of vegetable waste produced.

Based on a survey conducted in Nawangsasi Village, it was found that significant amounts of the main vegetable waste available came from crop residues that were not sold or did not meet market standards. The most dominant types of vegetables are kale, mustard greens, and spinach. This study focuses on the utilization of kale waste because of its abundant and consistent availability. On average, 5-10 kg of kale waste per day can be collected from one farmer who is still in good condition.

Table 1. Potential of Vegetable Waste in Nawangsasi Village

Types of Vegetables	Waste Sources	Average Availability (per day)	Condition
Water spinach	Crop residue	5 - 10 kg	Fresh, Nutritious
Mustard	Crop residue, market	3 - 7 kg	Quite fresh
Spinach	Crop residue	4 - 8 kg	Easily wilted

### Silage Fermentation

To demonstrate the success of using vegetable waste as silage, a series of fermentation experiments was carried out, consisting of several stages, starting with cutting the waste, mixing it with additional ingredients (such as bran, tape yeast, and tempeh yeast), and then storing it in a sealed container for 15 to 30 days. The process of making silage is carried out according to the method that has been designed. The vegetable waste that has been sorted will later be cut into small pieces using a knife or chopper. After the cutting process, the vegetable waste is dried for 2 to 3 hours until dry so that the water content is reduced. After drying, the first step is to mix 800 grams of vegetable waste with additional ingredients, including 80 grams of fine bran as an energy source and 8 grams of tempeh yeast. Furthermore, in the second step, 700 grams of dried vegetable waste is mixed with 70 grams of bran and 7 grams of tape yeast. The evenly distributed mixture of ingredients is put into a tightly sealed plastic clip container so that no air enters, and then stored in a dark place. Fermentation is carried out for 15 to 30 days, and checks should be carried out periodically. After 21 days of fermentation, the two

bags of silage are opened for analysis. Visually and sensorily, both formulations show successful fermentation results, characterized by the absence of spoilage and the appearance of a distinctive aroma of fermentation.

Formulation A (Tempeh Yeast): Produces silage with a drier texture and a less pungent aroma. The color of the silage tends to be brownish-green. Formulation B (Yeast Tape): Produces silage with a slightly wetter texture and a stronger sour-sweet aroma, typical of aroma tape. The color of silage is yellowish-green. This difference is thought to be due to the different microorganism activity between tempeh yeast (dominant *Rhizopus* sp.) and tape yeast (dominant yeast *Saccharomyces cerevisiae* and lactic acid bacteria).

**Silage Quality Analysis (Organoleptic Test)**

The assessment of silage is carried out by paying attention to the color, aroma, texture, acidity level, and the presence or absence of fungi. Quality silage will have a typical sour smell from fermentation, a smooth texture, a green color with a hint of brown, and a pH that ranges from 3.8 to 4.2. In this experiment, all these indicators were achieved, demonstrating that the vegetable waste used has good potential for use as fermented animal feed. Results: The silage quality assessment was carried out organoleptically (using five senses) presented in the following table: Based on the results of organoleptic tests, both formulations produce silage with good quality. However, silage from Formulation B (Yeast Tape) has a preferable aroma and is considered more attractive to livestock.

**Feed Trials on Livestock (Palatability Test)**

The trial was carried out by giving both types of silage to 3 goats belonging to local farmers. Feed is given separately to see the level of penchant (palatability) of the livestock.

- Initial Response: Cattle were initially hesitant to eat silage because it was a new type of feed.
- After Adaptation: After a while, the cattle begin to taste both types of silage.
- Observations: Goats show a higher preference for silage Formulation B (Yeast Tape). Cattle eat it more voraciously and in greater quantities than Formulation A. The sweet-sour aroma of yeast silage tape is thought to be the main attraction factor.

These results indicate that silage from kale waste is acceptable to livestock and has the potential to serve as an effective alternative feed.

Table 2. Results of Organoleptic Tests of Kale Waste Silage

Parameters	Formulation A (Tempeh Yeast)	Formulation B (Yeast Tape)	Information
Color	Brownish Green	Yellowish Green	A good color indicates no decay
Aroma	Fresh sour, not pungent	Sweet and sour, typical tape	Sour aroma indicates successful lactic acid fermentation
Texture	Compact, slightly dry	Compact, slightly wet	Compact and non-slimy texture indicates good quality
Mushroom	None	None	The absence of fungi indicates that the anaerobic process is running perfectly



**Figure 1.** Raw Material Collection



**Figure 2.** Shredding of Vegetable Waste



**Figure 3.** Mixing Ingredients



**Figure 4.** Anaerobic Fermentation Process



**Figure 5.** Silage Finish



**Figure 6.** Feed Trials on Livestock

Activity Documentation



Figure 7. Socialization of the Utilization of Organic Waste into Silage

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**Sosialisasi Pembuatan Silase dari Limbah Sayur  
Desa Nawangsasi Kec. Tugumulyo**

NO	NAMA	UTUSAN	TANDA TANGAN	
1	FERDI OKTAVI	Mahasiswa	1	2
2	Mu'awiyatu Al laitsi	Dosen ITMS		
3	Eko Agus Susanto	Kadus	3	4
4	DIAN			
5	Warsiem	PKK	5	6
6	Pannem			
7	Wagiman	Petani	7	8
8	Budrauto			
9	Agus Winanda		9	10
10	SUYANTO	PETERNAK		
11	Rifki Ahi Saputra	Pengepul	11	12
12	Ngoto	Petani		
13	Dur Kumowon	Pengraja Sayur	13	14
14	Epi	PETERNAK		
15	Sutinem	PKK	15	16
16	Sri Lestari	Petani		
17	Maeni	Petani	17	18
18	FIRMAS	-		
19	BIUKARAINO	Petani	19	20
20	Kemiguan	Pengraja		

## CONCLUSION

The use of vegetable waste in Nawangsasi Village as animal feed in the form of silage shows great potential to overcome the issue of organic waste while increasing local feed resilience. Nawangsasi Village produces a considerable amount of vegetable waste from agricultural and market activities, which was previously often disposed of without proper control, thus causing environmental pollution.

The test results showed that the resulting silage was of good quality with the characteristic sour odor of the fermentation process, smooth texture, brownish-green color, and a pH that was between 3.8 to 4.2. Acceptance tests by farm animals also showed satisfactory results, where goats and cows were willing to consume silage without causing negative effects on their health. The potential for silage production from one location can reach 18–25 kg per day with 20–30 kg of vegetable waste collected as raw materials.

## INVOLVEMENT

Overall, this MBKM project has demonstrated the importance of bioengineering in creating new solutions to environmental and food problems. I hope that this report not only serves as a form of accountability for the activities I have done, but can also serve as a useful reference for readers as well as a first step for further developments in the future. I recognize that there are still some shortcomings in the writing of this report, and constructive criticism and suggestions would be greatly appreciated for future improvements.

- 1 Encouraging the expansion of the program to utilize vegetable waste into silage to all Nawangsasi Villages and even other villages that have similar characteristics.
- 2 Conduct further research to test other types of organic waste that have the potential to be processed into silage, such as fruit waste or other agricultural by-products.
- 3 Conduct long-term studies on the impact of silage application on livestock health and productivity (e.g., weight gain, milk/meat quality, and reproduction).
- 4 It is necessary to perform a proximate analysis to quantitatively determine the nutritional content (crude protein, crude fiber, etc.) of silage.
- 5 Socialization and training to farmers in Nawangsasi Village need to be carried out so that this technology can be widely adopted.
- 6 Further research can be carried out by using other types of vegetable waste or a combination of several types of waste to obtain more optimal feed quality.

### Acknowledgement:

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