

Assistance for the Processing of Tofu Waste into Liquid Organic Fertilizer for Farmers in Sumberrejo District, Bojonegoro

¹Hamam Burhanuddin, ²Ahmad Manshur, ³Shofa Robbani ⁴Ummu Farhatin

^{1,2,3,4} Universitas Nadlatul Ulama Sunan Giri , Indonesia

Email : hamam@unugiri.ac.id, ahmanshur@gmail.com, shofa@unugiri.ac.id, ummu@gmail.com

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Abstrak: *Pendampingan ini dilakukan di Kecamatan Sumuragung Bojonegoro, sebagian masyarakatnya berprofesi sebagai petani dan produksi tahu, pada tahun 2019 terdapat sekitar 50 unit home industri. Kebanyakan produsen memproduksi secara terpisah. Pengrajin tahu di daerah Sumuragung kurang memperhatikan pembuangan limbah olahannya karena cara produksinya yang sederhana. Limbah produksi tahu meliputi limbah padat dan limbah cair. Limbah padat atau yang biasa disebut okara sering dijadikan pakan ternak, sedangkan limbah cair hasil proses pembuatan tahu langsung dibuang ke saluran pembuangan tanpa diolah terlebih dahulu. Limbah cair olahan berpotensi mencemari lingkungan karena masih mengandung senyawa protein dan karbohidrat yang dapat terfermentasi dan menimbulkan bau tidak sedap. Hasil dari pendampingan ini adalah pembuatan POC dari ampas tahu sehingga masyarakat lebih produktif*

Kata Kunci : *Limbah Tahu, Organik Cair, Petani*

Abstract: *This assistance was carried out in Sumuragung Bojonegoro District, part of the community who work as farmers and tofu production, in 2019 there were around 50 home industry units. Most manufacturers produce separately. Tofu craftsmen in the Sumuragung area pay little attention to the disposal of their processed waste because the production method is simple. Tofu production waste includes solid waste and liquid waste. Solid waste or what is usually called okara is often used as animal feed, while liquid waste resulting from the tofu making process is directly thrown into the drain without being processed first. Processed liquid waste has the potential to pollute the environment because it still contains protein and carbohydrate compounds which can ferment and cause an unpleasant odor. The result of this assistance is making POC from tofu waste so that people are more productive*

Keywords : *Tofu Waste, Liquid Organic, Farmers*

INTRODUCTION

The Sumuragung Bojonegoro sub-district is a part of the community who works as farmers and tofu production, in 2019 around 50 home industry units. Most manufacturers produce separately. Tofu craftsmen in the Sumuragung area pay little attention to the disposal of processed waste because the

production method is simple. Tofu production waste includes solid waste and liquid waste. Solid waste or commonly called *okara* is often used as animal feed, while liquid waste from the tofu-making process is directly discharged into the sewer without prior processing. Processed liquid waste has the potential to pollute the environment because it still contains protein and carbohydrate compounds which can ferment and cause an unpleasant odor.

Out of around 100 tofu producers in the Bojonegoro Regency area, only about 35% carry out waste management, while the rest dispose of production waste into public channels. This is due to limited knowledge and awareness of the importance of industrial waste management. Waste management facilities and infrastructure are still far from adequate to accommodate the production of tofu industry, causing more severe damage to natural ecosystems. The economic aspect of the existence of tofu craftsmen is that economic development is getting better, but on the other hand if it is not balanced with a good management system it can backfire which threatens the environmental ecosystem. This balance can be achieved through careful and wise management of by-products or production waste. (Wuryanto, 1998)

Solid waste (*okara*) is the result of extraction from soybean dregs. This type of waste has the characteristics of spoiling quickly and smells bad if not disposed of on time. *Okara* starts to smell after 12 hours of production ((Suprapti, 2005). The solid waste produced, or known as *okara*, does not have a negative impact on the environment because it can be used as animal feed, and *okara* is still suitable for consumption because it still contains around 5% protein. (Harmaizar, 2006)

Tofu dregs liquid is liquid waste produced in the process of making tofu in liquid form. (Gultom et al., 2021) Liquid waste contains suspended and dissolved solids that undergo physical, chemical and biological changes that produce toxic substances or become a medium for the growth of bacteria that may exist in the form of pathogens or bacteria that are harmful to tofu itself and the human body. In addition, the liquid waste produced by the tofu industry is a serious environmental pollution problem because it produces an unpleasant odor and water pollution. Liquid waste produces a foul odor and can cause river pollution if it is disposed of in the river. Liquid waste left over from tofu water which is not coagulated, cubes of tofu which are crushed during processing due to imperfect agglomeration process. The liquid waste produced also contains suspended solids, physical, chemical and biological changes occur. Estimated amount of liquid waste = 100 kg of soybean material will produce 1.5–2 m³ of liquid waste (Nurhassan, 2021).

METHOD

The approach developed in Sumberrejo District is community-based research, by carrying out a community assistance process using the ABCD (Asset Based Community Development) method. In general, the meaning of ABCD is an approach by making the community the basis for development based on the local assets found in that place. These assets can be developed as well as possible in the hope that they can solve problems in the area where the empowerment process is carried out. ABCD assistance prioritizes the use of assets and potential that are around or owned by the community. (Pusbangtepa, n.d.) The people here can be a very valuable asset for the village. The diversity that exists in society can be combined by paying attention to the skills and expertise of each community. The skills and expertise of some people can be grouped together. With the existence of a group forum can make progress for the community to improve the economy.

1. Pre-activity Activity

Starts with a need analysis of the problems or obstacles faced by manufacturers knowing related to liquid waste. The service team performed observations and interviews with some UMKM know. Servant communicate directly with potential partners to learn about the potential of resource and natural resources available by forming Focus Group Discussion (FGD) with representatives of the police, public figures, enterprise groups. Once observations are made and the problem and eligibility are considered, the program or solution that forms the basis for determining the material of socialization is submitted to the partner.

2. Implementation

This dedication activity is carried out through the participatory approach of the community and empowerment. Empowerment is done with the intention of involving direct partners to build independence and improve skills. The program of dedication to the community uses several methods, among others facilitation, implementation of technology, decoding and practicing live on the ground. Design aims to raise awareness, insight and skills to handle waste know. Facilitation facility is assistance in the provision of equipment and sludge. Application of technology is carried out through training and practical practice to improve knowledge and skills of processing waste know into organic fertilizer.

3. Evaluation

Positions evaluation is carried out to measure the understanding and success of activities. This is done by dividing pre-test and post-test to target partners. (Susilawati et al., 2023)

FINDINGS AND DISCUSSION

Tofu liquid waste is the remaining waste generated during tofu production. (Mufarida & Setiawan, 2020) In general, the waste generated in the process of making tofu includes two types of waste, namely solid waste and liquid waste. (Faisal et al., 2016) Solid waste is generated from the filtering and agglomeration process. While the liquid waste is produced from the process of washing, boiling, pressing and printing tofu. (Septifani et al., 2021) Solid waste from tofu has been widely used as animal feed, cork tempeh, tofu dregs crackers and dry bread. Meanwhile, tofu liquid waste is mostly still disposed of for nothing. The following is the process for making tofu. (Pusbangtepa, n.d.)



Figure 1. Industrial Tofu in Sumuragung

Tofu industrial liquid waste has several characteristics, namely physical and chemical characteristics. In the physical characteristics there are total solids, temperature, pH, colour, and Odor. While in chemical characteristics there are organic materials, inorganic materials, and gases. Tofu liquid waste has the characteristics of containing high organic matter, having temperatures reaching 40°C-46°C, levels of Biological Oxygen Demand (BOD) of around 6,000-8,000 mg/1, Chemical Oxygen Demand (COD) of around 7,500-14,000 mg/1, Total Suspended Solid (TSS) of around 30 kg and a pH of around 3-5. If it is directly discharged into water bodies, it will reduce the carrying capacity of the environment. So that the tofu industry requires a waste treatment that aims to reduce the risk of existing pollution loads. The gases commonly found in tofu waste are nitrogen gas (N₂), Oxygen (O₂), hydrogen sulphide (H₂S), ammonia (NH₃), carbon dioxide (CO₂) and methane (CH₄).

These gases come from the decomposition of organic materials contained in wastewater. High TSS values cause rivers to become cloudy making it difficult for microorganisms to photosynthesize. (Pusat Penelitian Dan Pengembangan Teknologi Pangan, IPB, 1989) A higher BOD

value will produce a foul Odor in the river, because dissolved oxygen in the water will be consumed by bacteria in the process of decomposing organic matter. As a result of the oxidation process of organic matter contained in tofu liquid waste, the high COD value causes a reduction in dissolved oxygen in the river. From the description above, it shows that there is a need for technology that can reduce the value of the characteristics of tofu liquid waste.



Figure 2 : Process of Tofu Waste to be POC

The process of tofu liquid waste using 5 liters of buckets/jerry cans, add 150 ml/3 tablespoons (tbsp) of EM4 probiotics, 150 gr/5-7 tbsp of granulated sugar, 2 liters of coconut water and enough water, then mix well. These ingredients are fermented in a closed container for 14 days and stored in a place protected from sunlight. After 14 days, the POC resulting from tofu liquid waste fermentation can be utilized. Given the current cost and difficulty of obtaining fertilizer, the fermented tofu liquid waste which has become POC can be used as an alternative liquid fertilizer for the community for the next 3 years, especially for farmers. POC resulting from the fermentation of tofu liquid waste is able to improve the physical, chemical and biological properties of soil, increase production, and can nourish plants.



Figure 3 : Result of POC

CONCLUSION

Tofu liquid waste contains quite high organic compounds and will pollute the environment and endanger human health if it is discharged into rivers without undergoing a waste treatment process. From the results of the analysis, tofu liquid waste contains carbohydrates, proteins, fats and contains nutrients, namely N, P, K, Ca, Mg, and Fe. If you look at the nutrient content in this tofu waste, it has the potential to be developed as liquid fertilizer. Tofu liquid waste can be used as a new alternative to be used as fertilizer because in the tofu liquid waste has the availability of nutrients needed by plants. The nutrient content of tofu industrial wastewater before and after the liquid fertilizer is made must meet the liquid fertilizer quality standards set by the Minister of Agriculture Number: 28//SR.130/B/2009 so that it can be used for organic liquid fertilizer that can be used to fertilize lettuce plants. Tofu liquid waste that has experienced a decrease in its characteristics will indicate the conversion of dissolved organic matter into biofloc. Bioflocs are living organic materials that float in the water in the form of small lumps. Biofloc is separated from wastewater due to precipitation.

Organic materials that have turned into biofloc will be ready to be used as plant nutrients or fertilizers. Before being used as a nutrient or fertilizer for plants, it is necessary to first analyse the nutrient content contained in the tofu industrial wastewater to determine the needs of the plants. TDS, temperature and pH values in tofu liquid waste have an important role for plant growth needs because they can affect the availability of nutrients for plants. Tofu liquid waste has a TDS value of 6060 mg/l or 6060 ppm, the temperature value of fresh tofu waste is around 37°C-45°C and has a pH value between 3-4. Whereas in the process of applying fertilizer/nutrition to the hydroponic system, especially salad plants, it requires a TDS value of around 560-840 ppm, a temperature value of 25°C-28°C and an optimum pH value ranging from 6-7 because the nutrients in the nutrient solution can be absorbed properly by plants. Therefore, it is necessary to treat tofu liquid waste which is processed through a process of controlling the TDS value, temperature and also the pH value so that it can adjust to the needs of the plants.

Suggestions for handling tofu waste into liquid fertilizer can be an alternative to the use of medicines for farmers, in ideal use it can have a positive impact on plants and fertilize the soil. In the future, the production of tofu waste into POC liquid fertilizer can be mass produced through cooperation with various industrial parties.

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