

## **Efficiency of Compost Production in Sidodadi Village: The Role of Organic Waste Chopper Machine Technology**

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### **ABSTRACT**

The size of organic waste affect the compost production process efficiency. There is a need to develop the chopper machine to chop the organic waste into smaller size. This study evaluates the application of Organic Waste Chopper Machine technology to improve the efficiency of the compost production process in Sidodadi Village, Ngantang District, Malang Regency. The results of the study indicate that the use of this organic waste chopper machine significantly increases the volume of compost production, shortens the composting time, and produces compost with higher nutritional quality. In addition, this technology also successfully reduces unprocessed organic waste, thus contributing positively to the environment and reducing production costs for the village community. Although this technology is effective, challenges in terms of access to spare parts and financing remain. Therefore, continued support from the government, technical training, and collaboration with educational institutions are needed to ensure the sustainability and further development of this program.

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## **INTRODUCTION**

Sidodadi Village is located in Ngantang District, Malang Regency, East Java. Ngantang itself is located in a mountainous area with an altitude of between 600 and 1,200 meters above sea level. This makes Sidodadi Village have a cool climate and fertile soil, suitable for agriculture and plantations.

Most of the population of Sidodadi Village works in the agricultural and plantation sectors, with crops such as rice, vegetables, and coffee as the main commodities. In addition, a small portion of the population also works as livestock breeders and craftsmen. The level of education of the community varies, with the majority having primary to secondary education.

Sidodadi Village has quite extensive and fertile agricultural land. However, the management of organic waste from agriculture and households is still a challenge. With a fairly high amount of organic

waste, there is great potential for processing the waste into compost that can be reused for agricultural land.

Infrastructure in Sidodadi Village still needs to be improved, especially in terms of road access and public facilities. Technology for processing organic waste such as the Organic Waste Chopper Machine is not yet widely known or used in this village. The community tends to use conventional methods in waste processing, such as burning or letting it rot.

One of the main challenges in Sidodadi Village is the lack of knowledge and access to modern technology for waste processing. However, with the introduction and application of technology programs such as the Organic Waste Chopper Machine, there is a great opportunity to increase the efficiency of compost production. This will not only reduce organic waste but also increase soil fertility and agricultural productivity.

Socially, Sidodadi Village residents tend to have a strong culture of mutual cooperation. This can be an important asset in implementing community-based programs such as organic waste management. Economically, community income generally comes from agricultural products which are often affected by seasons and weather conditions, so the use of compost can reduce production costs and increase farmers' income.

With the above conditions, Sidodadi Village has great potential to develop an efficient and environmentally friendly organic waste processing system, which will not only provide economic benefits to its residents but also improve the sustainability of the local environment.

Problems related to organic waste management in Sidodadi Village, Ngantang District, Malang Regency, East Java, can be explained as follows: 1) High Volume of Organic Waste: Sidodadi Village has a dominant agricultural and plantation sector, so it produces large amounts of organic waste every day. This waste comes from plant remains, leaves, straw, and food waste from households. With this large volume, organic waste management is a major challenge for the village community. 2) Inefficient Waste Management: Many residents still use traditional methods in managing organic waste, such as burning or letting it rot in open fields. This method is not only inefficient but can also cause air pollution and pollute the environment. Burning organic waste can produce smoke that is detrimental to residents' health and causes environmental damage. 3) Lack of Knowledge and Access to Processing Technology: Lack of knowledge about more environmentally friendly waste processing methods, such as composting, makes people tend to ignore the potential of organic waste as a source of natural fertilizer. In addition, access to modern technology such as the Organic Waste Chopper Machine which can speed up the process of processing waste into compost is still limited in this village. 4) Lack of Environmental Awareness: Public awareness of the importance of proper organic waste management still needs to be improved. Many residents do not yet understand the negative impacts of improperly managed organic waste on the environment and public health. 5) Economic Impact of Unmanaged Waste: Ineffective organic waste management can cause economic problems for farmers. Soil that is not enriched with

compost tends to lose its fertility, which has an impact on agricultural productivity. This can lead to higher production costs and lower yields, thus reducing farmers' incomes. 6) Lack of Infrastructure Support: Supporting infrastructure such as organic waste collection points, composting facilities, and access to processing technology are still minimal. This hinders community efforts to manage organic waste effectively and efficiently.

With the various problems above, Sidodadi Village faces major challenges in managing organic waste. However, this also opens up opportunities to develop a better waste management system by utilizing modern technology and increasing public awareness and knowledge about the importance of environmentally friendly waste management.

To design an efficient organic waste shredder, it is essential to consider the specific characteristics of the waste being processed. Organic waste, especially large and clay-like ones, can be challenging to shred effectively to meet the standards of compost briquettes and fuel briquettes (Sugandi, 2024). Technologies such as roll-type organic waste shredders can provide more precise shredding to achieve optimal results in processing these waste materials.

In the context of agricultural waste, machines such as rotary type machines can play an important role in shredding organic waste from plantations, including leaves, twigs, stalks, and other agricultural waste. These machines not only help in waste management but also help in preparing plantation land for the next planting by accelerating the decomposition process (Marthiana et al., 2018).

Furthermore, the integration of innovative technologies such as vermicomposting machines can offer rapid processing of organic solid waste, maximizing the benefits of high-grade vermicomposting methods (Tauseef et al., n.d.). Such machines can efficiently convert organic waste into valuable compost, thereby promoting sustainability in waste management practices.

In addition, ergonomic design considerations play an important role in the development of organic waste shredder machines. Machines designed with ergonomic principles aim to improve user comfort and safety during operation, ensuring efficient waste processing while prioritizing user welfare (Susanto, 2024).

In addition, the use of bioreactors can contribute significantly to accelerating the composting process of various organic residues. Bioreactors are versatile systems capable of efficiently processing large amounts of organic waste, making them suitable for handling various types of waste, including meat, manure, food waste, and bio-solids (Alkoaik, 2019).

In conclusion, the design and development of an effective organic waste shredder requires a comprehensive understanding of waste characteristics, ergonomic considerations, innovative technologies such as vermicomposting, and the utilization of advanced systems such as bioreactors to ensure efficient and sustainable waste management practices.

## **METHOD**

Organic Waste Chopper Machine Technology is developed through the following steps: 1) Literature Study: a) reviewing existing literature on agricultural waste shredding technology, and b) identifying technical needs and specifications for the development of Organic Waste Chopper Machine Technology; 2) Prototype Design: a) designing the initial design based on the results of literature studies and user needs studies, and b) developing a prototype design with a focus on portability, safety, and operational efficiency; 3) Prototype Testing: a) conducting a prototype trial of Organic Waste Chopper Machine Technology by considering various operational conditions, and b) evaluating the effectiveness and reliability of the technology in shredding agricultural waste efficiently; and 4) Improvement and Further Development: a) Making improvements based on test results and feedback from users, and b) providing suggestions for further development to improve the performance, efficiency, and safety of the technology.

After the technology is completed, the next step is to implement the Technology in the Farmer Group in Sidodadi Village; through the following methods: 1) Preparation and Approach of Farmer Groups: a) collect data on the needs and readiness of farmer groups related to Organic Waste Chopper Machine Technology, and b) approach farmer groups to explain the benefits and objectives of implementing the technology; 2) Training and Socialization: a) provide training to farmer group members related to the use, maintenance, and safety of using Organic Waste Chopper Machine Technology; and b) provide socialization about the benefits and optimal ways to integrate this technology in agricultural waste management; 3) Implementation and Monitoring: a) implement Organic Waste Chopper Machine Technology in the field with the help of technicians or development teams, and b) directly monitor the implementation process to ensure effective use and overcome obstacles that may arise; and 4) Impact Evaluation and Further Development: a) evaluate the efficiency and benefits obtained by farmer groups after using this technology, and b) carry out further development based on input from users and evaluation results to improve the sustainability of technology use.

This method is designed to ensure systematic development and effective implementation of Organic Waste Chopper Machine Technology, as well as to support the process of adaptation and acceptance of this technology by Farmer Groups in Sidodadi Village.

## **RESULTS AND DISCUSSION**

After the application of Organic Waste Chopper Machine technology, the volume of compost production in Sidodadi Village has increased significantly. Previously, the manual composting process produced around 200 kg of compost per month, but after the use of the chopper machine, compost production increased to 350 kg per month. This increase shows that the technology is able to increase efficiency in the process of chopping organic materials, thereby accelerating the decomposition process.

One of the main benefits of implementing the Organic Waste Chopper Machine is the reduction in time required for the composting process. Before the use of the machine, the composting process took

up to 6-8 weeks. However, with the presence of the chopper machine, the time is reduced to 4-5 weeks. This is due to the smaller particle size resulting from the chopping process, which increases the surface area of the material and accelerates decomposition.

In addition to volume and time, the quality of the compost produced has also increased. Laboratory analysis shows that compost produced with the help of the Organic Waste Chopper Machine has a higher nutrient content, such as nitrogen, phosphorus, and potassium. The finer and more uniform organic material content also makes the compost more easily absorbed by the soil, thereby increasing the fertility of agricultural land.

Before this technology, much organic waste in Sidodadi Village was not processed properly, often burned or dumped carelessly. With the implementation of the organic waste shredder, the amount of unprocessed waste has been drastically reduced. This not only helps reduce air pollution from burning waste, but also helps maintain the cleanliness of the village environment.

The use of Organic Waste Chopper Machine also has a positive impact on the cost of compost production. Although the initial investment for purchasing the machine is quite large, in the long term, the operational costs for the composting process are lower. This is due to the reduction in time and labor required to process organic waste, resulting in significant savings for farmers.

Initially, the implementation of this technology received various responses from the community, especially due to limited knowledge about its use. However, after socialization and training, the community began to accept and adapt this technology in their daily activities. The training provided by the village and experts succeeded in increasing the understanding and skills of residents in operating the machine.

The implementation of Organic Waste Chopper Machine technology has a positive impact on the environment around Sidodadi Village. With the reduction of organic waste being burned, the air quality in the village has improved. In addition, the use of high-quality compost also helps reduce the use of chemical fertilizers, which often contribute to soil degradation and water pollution.

Despite the many benefits felt, the implementation of this technology also faces several challenges. One of them is limited access to spare parts and machine maintenance. In addition, not all villagers have the financial capacity to buy their own shredders, so solutions are needed such as the formation of cooperatives or joint business groups to utilize the machines collectively.

To maintain the sustainability of this program, ongoing support from the local government and related parties is needed. Further development can include increasing technological capacity, providing subsidies for purchasing machines, and more intensive mentoring programs. In addition, collaboration with educational and research institutions can help optimize the process and results of compost production.

Overall, the implementation of the Organic Waste Chopper Machine in Sidodadi Village has had a significant positive impact in increasing the efficiency of the compost production process.

However, to ensure sustainability and long-term benefits, there needs to be strengthening in terms of management, training, and technical and financial support. The main recommendation is to increase community involvement in organic waste management and expand access to this technology so that more residents can feel the benefits.

## **CONCLUSION**

### **Conclusion of Applied Technology**

The application of Organic Waste Chopper Machine technology in Sidodadi Village, Ngantang District, Malang Regency, has proven effective in increasing the efficiency of the compost production process. Through the use of this machine, the volume of compost production has increased significantly, while processing time can be shortened. In addition, the quality of the compost produced has also increased, with higher nutrient content and a smoother texture, making it more beneficial for agricultural land. The application of this technology has also succeeded in reducing the amount of unprocessed organic waste, providing a positive impact on the environment, and increasing the efficiency of production costs for village communities. However, challenges in terms of machine maintenance and limited financial access are still obstacles that need to be overcome.

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## **REFERENCES**

- Alkoaik, F. (2019). Integrating aeration and rotation processes to accelerate composting of agricultural residues. *Plos One*, 14(7), e0220343. <https://doi.org/10.1371/journal.pone.0220343>
- Marthiana, W., Arman, R., Mahyoedin, Y., & Wardiyanto, D. (2018). Design and production of rotary type machine for chop up organic waste plantation. *Matec Web of Conferences*, 248, 01010. <https://doi.org/10.1051/mateconf/201824801010>
- Sugandi, W. (2024). A comprehensive design and performance assessment of a reel-type blade organic waste chopper machine. *Journal of Advanced Research in Applied Mechanics*, 115(1), 166-180. <https://doi.org/10.37934/aram.115.1.166180>
- Susanto, A. (2024). Mini organic waste chopper design with ergonomic techniques. *Iop Conference Series Earth and Environmental Science*, 1324(1), 012066. <https://doi.org/10.1088/1755-1315/1324/1/012066>
- Tauseef, S., Abbasi, T., Abbasi, T., Patnaik, P., & Abbasi, S. A novel vermicomposting machine for rapid processing of phytomass and other organic solid waste.. <https://doi.org/10.22541/au.157935993.31461521>