



# A STUDY ON WET WASTE COMPOSTING TECHNIQUES AND ITS UTILITY

## Authors

Ms.Ramya Shetty  
Assistant Professor

SDMPG Centre for Management Studies and Research  
Mangalore

Dr.Prameela S Shetty  
Assistant Professor

SDMPG Centre for Management Studies and Research  
Mangalore

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## Abstract

Mangalore City is an educational hub, developing healthcare tourism and increasing software and manufacturing units which in turn increases the population and the households. A lot of waste is generated by the households. It should be a dire need for every household to adopt waste management techniques. It is needed for physical, mental, spiritual, and emotional well-being. today we see that there has been a major transformation through a regular cleanliness drive under the banner “Swachh Mangaluru Abhiyan” which has changed the mindset of every individual irrespective of age group. Each of us has the right to clean air, water, and food. This right can be fulfilled by maintaining a clean and healthy environment.

This study “A study on wet waste composting techniques and its utility” helps us in understanding the importance of cleanliness, developing awareness on segregation of waste, and techniques of wet waste management. Thus, this study helps to create awareness among youth and households by awakening a sense of responsibility towards maintaining a cleaner environment which will result in Swachh Bharath.

**Key words: Environment, composting, waste management, household**

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## Introduction

“Cleanliness is next to godliness”, as the saying goes cleanliness is a very crucial quality of our life. It is the state of maintaining cleanliness in individual household , society, environment, workplace and

community as a whole. Waste management is a major challenge in this era of overpopulation and also an aspect of today's generation. Wet waste management has been the most challenging issue in this highly populated country. India is currently facing environmental challenges with regard to managing waste, waste collection, waste segregation, treatment, and disposal. The disposal of waste in every household is done in an inappropriate manner. It was not a matter of concern till recent years. But now waste generation and disposal have become a matter of concern. Thus, this study aims at identifying the various wet waste management techniques in the city of Mangaluru . Nearly 70% of the waste generated is organic or wet waste that can be easily decomposed, while the remaining is dry which can be recycled. If the dry and wet waste are mixed without proper segregation, it emits greenhouse gases that are very harmful to the environment.

Thus, it is essential to create awareness among educated youth and households on simpler and cost-effective techniques of wet waste management. Waste can be defined as discarded as worthless, defective, or of no use. Waste is any substance that is discarded after primary use. It is worthless. Mainly wastes can be divided into two distinct categories biodegradable and non-biodegradable waste. Biodegradable materials are those materials made of organic waste such as plant and animal matter which can be easily broken down by nature. Kitchen waste mostly wet waste is biodegradable. Non-biodegradable waste which is also called dry waste which includes the following: Plastic, hazardous materials like containers, glass, rubbers, and rags, electronic items called e-waste, etc.

### **Waste management:**

Waste management has been the most challenging aspect of today's generation. Of waste management, Wet waste management has been the most challenging issue in this highly populated country. India faces environmental challenges with regard to waste, waste management, waste collection, waste segregation, treatment, and disposal. We all observe how waste is generated in our homes and how it is segregated, it emits greenhouse gases that can be lethal and pose environmental challenges with regard to health and climate.

Waste management saves the nature, resources and human life and it also has a positive impact on the economy. It improves the human living standard. Various health issues can be caused due to improper and unhygienic management and disposal of waste. It is high time that people should be made aware of the importance, of techniques to dispose the waste in order to avoid risk to mankind. Preserving the environment is equally important since the waste emits greenhouse gases that cause threats and also

effects the atmosphere on a daily basis.

### **Wet waste composting technique:**

Composting is a natural process of decaying and decomposition of plant and animal residues. In the process of decomposition, all the materials will be broken down into smaller particles and release nutrients into the soil which can be used as manure.

**Bin composting:** A compost bin is a container into which organic waste is dumped and it turns into compost over time. Compost bins hasten the process of decomposition through adequate aeration and moisture retention. Proper availability of air and moisture will enable the bacteria to transform the organic materials into compost. Compost bins at home that households use mainly are plastic buckets and containers. Well-maintained compost bins don't release a stinky odor. Anaerobic bins will produce a very bad odour which will last from a few days to a few weeks.

**Vermicomposting:** It is also called as worm composting. The biodegradable waste is converted into organic manure using earthworms. The waste food and other rotted wet waste is converted into valuable soil amendments called vermicompost using the help of earthworms. The process is faster because the waste material passes through the earthworm gut and the resulting earthworm castings is rich in nutrients. Earthworms will eat the organic component of the wet waste and reduce the quantity of waste to almost 40-60%.

**Pot composting:** Pot composting is compatible, requires less space, suitable for small families generating up to 2kgs of waste per day. The pot should be kept inside a shelter so that rainwater does not fall on it. In India more than earthen ware pots, terra-cotta pots are used. The urban dwellers create this kind of pot compost in their balconies or outdoor spaces. The clay pots are better because it has breathable pores and also it can be stacked. It is not easily available in stored. Online availability is seen or it should be customized with special orders to the potters.

### **Objectives of the study**

- To identify various wet composting techniques used in the households of Mangalore City
- To identify the most cost-effective and popular technique of wet-waste management in Mangalore.
- To study the utility of the manure generated in composting.
- To study the level of awareness and opinion of the people regarding waste management

**Methodology:**

- A structured questionnaire was used for data collection from selected households of Mangalore city.
- Convenience sampling method is used as a sample selection method.
- Two hypotheses were framed and tested using ANOVA
- Excel is used for the formation of pivot tables and charts.

**Literature review**

R. Geethamani, B. et.al., in the project Production of cost affordable organic manure using institutional waste by rapid composting method, have mentioned about the initiative to compost within a short duration of 14 to 18 days by rapid composting. The wet waste contained waste vegetables, dry and fresh waste leaves, grass cuttings and garden trimmings. Here organic waste is recycled through composting and the resulting product is made useful to improve soil quality and help plants grow. This project could be adopted in colonies, schools, and colleges where dry and wet wastes are easily available. The resultant product of compost could be used for the plants in the campus as manure.

Gil, M. Toledo, et. al., in their study, propose the combination of statistical analysis and a biodegradability test to find the optimal balance of nutrients for their joint bioconversion. For the study fifteen organic wastes were selected and different statistical analyses were performed on the physicochemical characterization and Respiro metric variables. A study was conducted on Liquid and solid waste management using principal components analysis. The analysis provided enough information about the predominant chemical composition of each substrate as well as their similarities and deficiencies to identify possible mixtures.

Sunil Kumar, et. al., have said that in the present scenario, waste management has become one of the main concerns for urban waste managers in the developing world. The article is about the trends and technologies related to the process of composting. The utilization of black soldier fly larvae can be one of the rapid methods for treatment of biodegradable wastes. BSF can transform biodegradable wastes into biofuels and byproducts at a minimal cost. The utilization of BSF for treating various organic wastes has been thoroughly studied and discussed in detail. The salient observations on the

factors affecting the growth of BSF larvae as well as a comprehensive analysis of patents on the breeding and utilization of BSF are also presented in this paper. This article also measures the effectiveness of various fast composting techniques and discusses about the experiments on planning and development of real-scale treatment systems by various researchers, environmental planners and the government to reduce or eradicate the problem of solid wastes.

J.K. Andersen, A. Boldrin, T.H. Christensen, C. Scheutz, in have studied six single-family households in a detailed manner. The composting units of these households were studied by observation for one year. Each unit was filled with around 2.6 - 3.5 kg of wet waste per week. The relevant consumptions and emissions of environmental relevance were studied life-cycle inventory was established for the six composting units. Water, electricity or fuel was not used during composting process. The environmental emissions were gaseous emissions to the air and emissions via leachate.

Raquel Barrena, et.al., found that biological stability determines the extent to which readily biodegradable organic matter has decomposed. This article contains an estimation of indices which are best for measuring the biological stability of the organic content in the solid waste samples. The process of organic matter biodegradation was identified in the Aerobic indices technique. There was high correlation between cumulative oxygen consumption and ultimate biogas production. The results of this study could be a base for measuring the efficiency of the stabilization of organic matter in waste treatment plants, including MBT plants, anaerobic digestion of MSW and composting plants.

### I Hypothesis

$H_0$ : There is no significance difference between the Type of property the respondents stay in and the type of composting techniques used.

$H_1$ : There is a significance difference between the Type of property the respondents stay in and the type of composting techniques used

<b>F-Test Two-Sample for Variances</b>		
	<b>TYPE OF PROPERTY IN WHICH THEY STAY:</b>	<b>THE TYPE OF COMPOSTING TECHNIQUES USED</b>

Mean	1.80733945	1.80733945
Variance	0.990316004	0.675501189
Observations	109	109
Df	108	108
F	1.466046278	
P(F<=f)	0.024003448	
F Critical one-tail	1.374307721	

Table 1: Table showing ANOVA

ANOVA test estimates the proportion of variation in the dependent variable that is explained by the variation on the independent variable. If the F value is large it could be concluded that there is variation. Thus rejecting the Null hypothesis. Here we can also observe that  $p < 0.05$  which calls for the rejection of the null hypothesis concluding that there is a significance difference between type of property the respondents stay in and the type of composting techniques used.

## II Hypothesis

H<sub>0</sub> : There is no significance difference between the type of property they stay and the utility of the compost manure produced.

H<sub>1</sub> : : There is a significant difference between the type of property they stay and the utility of the compost manure produced

### Anova: Single Factor

#### SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>		
Type of property in which you stay:	109	197	1.807339	0.990316		
For what purpose do you use wet waste compost manure?	109	248	2.275229	0.73836		
<b>ANOVA</b>						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>

Between Groups	11.93119 2	1	11.93119	13.8038	0.0002 5	3.884 8
Within Groups	186.6972	216	0.864339			
Total	198.628	217				

Table 2: Table showing ANOVA

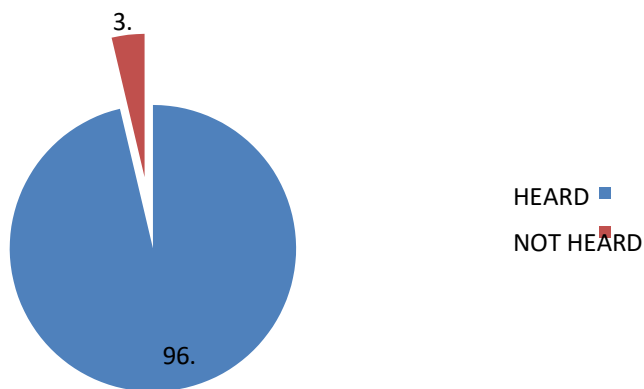
The above table shows that out of the 109 samples  $p$  value  $< 0.05$ , therefore, suggesting to reject the null hypothesis and concluding that there is a significant difference between the type of property they stay and the utility of the compost manure produced. This is because the kind of garden depends on the type of property in which they stay.

	<b>Apartment / Flat</b>	<b>Bungalow</b>	<b>Terrace House</b>	<b>Tiled house</b>	<b>Total</b>
<b>Agriculture</b>	0	0	8	3	<b>11</b>
<b>Environmental issues</b>	0	0	1	0	<b>1</b>
<b>Gardening</b>	10	6	39	18	<b>73</b>
<b>Household</b>	1	0	5	2	<b>8</b>
<b>Municipality</b>	0	0	0	1	<b>1</b>
<b>SELL</b>	8	1	6	0	<b>15</b>
<b>Total</b>	<b>19</b>	<b>7</b>	<b>59</b>	<b>24</b>	<b>109</b>

Table 3: Table showing the type of house the respondents stay and the utility of the manure they produce in composting.

<b>HEARD/NOT HEARD</b>	<b>NO. OF PEOPLE</b>	<b>PERCENTAGE</b>
HEARD	104	96.3%
NOT HEARD	4	3.7%

Table 4: Table showing percentage of awareness people have about wet waste management.

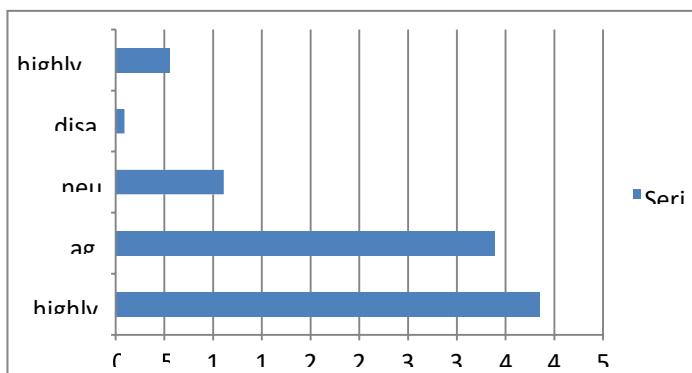


**Chart 1 :** Chart showing awareness people have on wet waste management.

From the above table and chart it is understood that major proportion of the who have heard of wet waste management. It is observed that 96.3% of the people have heard about wet waste management whereas the remaining 3.7% have not heard about wet waste management. Hence it is observed that majority of the respondents are aware of wet waste management.

Opinion	Percentage
Highly agree	43.5%
Agree	38.9%
Neutral	11.1%
Disagree	0.9%
Highly disagree	5.6%

**TABLE NO 5 :** showing the opinion of respondents regarding the necessity to adopt wet waste composting in households



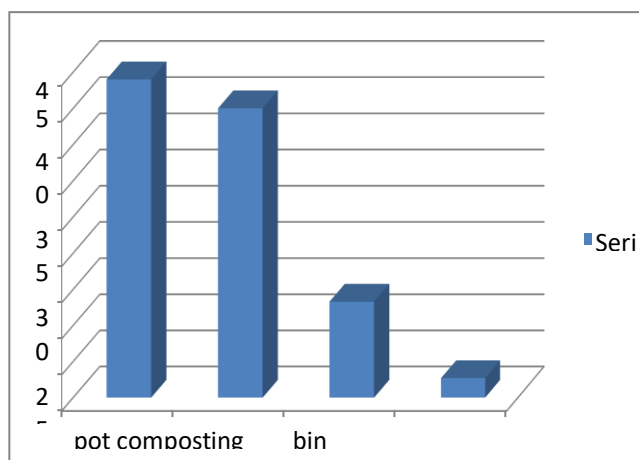


**CHART NO 2** showing the opinion of respondents regarding the necessity to adopt wet waste composting in households

The above chart and figure represents the percentage of people who feel it is necessary to have wet waste composting in every house. It is clear that 43.5% of the respondents highly agree while 38.9% of the respondents agree that it is necessary to have wet waste composting in every house. 11.1% of the respondents are neutral and the remaining 0.9% & 5.6% disagree.

Particulars	Percentage
Pot composting	44%
Bin composting	40%
Vermicomposting	13.3%
Others	2.7%

**TABLE NO 6** showing different types of composting techniques used by people



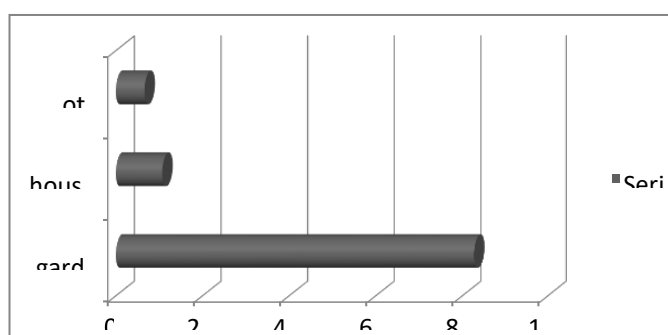
**CHART NO 3** showing different types of composting techniques used by respondents.

The above table and chart represent the types of composting used by the respondents in Mangaluru. It is observed that majority of the respondents use pot composting since it is having benefit from both cost and maintenance point of view while 40% and 13.3% of the respondents use bin composting and vermicomposting. Less percentage of people use vermicomposting has it involves high cost and maintenance.

PURPOSE	PERCENTAGE
GARDENING	82.7
HOUSEHOLD	10.7
OTHER	6.6

**TABLE NO 7** showing utility of manure produced from composting.

**CHART NO 4** showing utility of manure produced from composting.



The above table and figure represents the percentage of households that use the manure produced for various purposes. It is found out that 82.7% of the respondents use the manure produced out of wet waste for the purpose of gardening. 10.7% use it for household purpose and remaining 6.6% use it for other purpose like for selling and agricultural purpose. Thus people have to compost at home so that we save the mother nature.

### Recommendations

The observations in the study help the researcher to suggest and recommend a few ideas.

- More awareness has to be created among the public about the segregation of waste.
- Government should initiate the practice of wet waste composting by making it mandatory in all households.
- Creating awareness among the schools and college students through conduct of various workshops and demonstration on various wet waste composting techniques
- Government should take up the initiative to purchase manure directly at a high price from the

households which will motivate each household to convert wet waste into manure

- Government should give subsidies to SHG's to manufacture clay pots and promote the same, so that a large population will adopt this system

## Conclusion

The waste generated irrespective of its nature is harmful to the environment. So proper treatment of the waste is necessary before disposing it off. This is not only the responsibility of the Government but the individuals as well. The three R's- Recycle, Reuse, and Reduce are the simplest steps that can be followed by each person to do their part of the job. This study has made us understand the significance of cleanliness and to awaken people about various techniques of wet waste management that can be adopted by them. It is realized that the majority of the houses adopt pot composting technique which is eco-friendly and user-friendly as it involves less cost and maintenance. Pot compost is highly effective with regard to cost and maintenance.

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