
“Solid Waste Management in Village Ambewadi Tal Karveer Dist Kolhapur”

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Abstract

Composting and Recycling Municipal Solid Waste is a comprehensive guide that identifies, describes, explains, and evaluates the options available when composting and recycling municipal solid waste (MSW). The organic constituents of municipal solid waste can be converted into compost for use as a safe, beneficial soil amendment, conserving landfill space. The solid waste must first be processed to remove contaminants and prepare the organics for composting.

In rural areas waste management is very important because, people suffer a lot of various diseases due to improper waste management. Solid waste management consists of various activities such as: collection, transportation, processing, recycling, processing, recovery and disposal of waste. But these activities aren't carried out in rural areas. These problems are related due to waste generated by human activities in their day to day life. Besides this the improper system has been occurring serious air as well as water pollution.

This project reveals, treating waste in rural areas with help of composting as means of preventing people in village from various diseases also improving aesthetic view of village and environmental pollution

Keywords: *Solid waste management, reduce, composting, collection system.*

INTRODUCTION

Now-a-days a major issue facing society is waste management. More simple what should we do with the waste produce? A growing emphasis has been placed on the three R's: Reduce, Reuse, and Recycle. Composting provides a means of accomplishing all the three of R's. Through composting the amount of garbage sent to the landfill is reduced, the organic matter is reused rather than dumped, and it is recycling into a useful soil amendment. Natural ecosystems have a proven method of breaking down organic materials into a useful end product. The decomposers found within the food chain breakdown natural organic waste and turn it into humus, the organic components of soil. Solid wastes are the organic and inorganic waste materials such as product packaging, grass clippings, furniture, clothing, bottles, kitchen refuse, paper, appliances, paint cans, batteries, etc., produced in a society, which do not generally carry any value to the first user(s).

Solid wastes, thus, encompass both a heterogeneous mass of wastes from the urban community as well as a more

homogeneous accumulation of agricultural, industrial and mineral wastes. While wastes have little or no value in one setting or to the one who wants to dispose them, the discharged wastes may gain significant value in another setting.

METHODOLOGY

The following steps may be followed for introducing community based Waste Management System: Information Collection, Participatory Planning and Preparation of GP level action plan.

Step 1: Information collection: In order to draw up a plan of action for community based SWM in an area, it is essential to know the exact number of houses, institutions and commercial establishments to determine the types and amounts of waste generated in the area.

The Survey findings through data collection will also serve as documents for introducing the system. For developing the SWM plan of the GP, the following information may be collected following rapid rural survey of the community. No. of Households

- Total Population

- Details about shops, marriage halls, market, commercial establishments, etc.
- Community map of the area
- Existing system and practice of waste management
- Quantum of solid and liquid waste generated per day
- Local body's approach and future plans for SLWM
- Details of vacant spaces available in the local body
- Details and activities of NGOs & CBOs, e.g. Women Self-help Groups etc. available in the village.

Step 2: Participatory planning:

- The data collected is to be analyzed along with the representatives of the community
- The community should be informed about various technology options for SWM both at household as well as community level and accordingly technology options should be decided

- Based on the discussions with the community, SWM action plan should be prepared.

Step 3: Preparation of GP level action plan:

GP/Block action plan should broadly contain the following:

- **Social mobilization and awareness generation:** It should focus on inter personal communication, focused group discussion, technology demonstration and exposure visits to successful sites
- **Technology options:** Household and community level technological options with approximate cost estimates should be worked out
- **Operation and maintenance:** Success of a technology depends upon proper O&M at the household and community level. This aspect should be discussed in detail during planning process and incorporated in the action plan.

3.1 Background & History - Ambewadi Village.

Ambewadi is a Village in Karveer Taluka in Kolhapur District of Maharashtra State, India. It belongs to Desh or Paschim

Maharashtra region. It belongs to Pune Division. It is located 4 KM towards west from District headquarters Kolhapur. 11 KM from Karveer. 343 KM from State capital Mumbai Ambewadi Pin code is 416229 and postal head office is Ambewadi (Kolhapur). Wadanage (1 KM), Tarabai Park (1 KM), Uttreshwar Peth (2 KM), BudhwarPeth (2 KM) D Ward (2 KM) is the nearby Villages to Ambewadi. Ambewadi is surrounded by Karveer Taluka towards South, Panhala Taluka towards west, Hatkanangale Taluka towards East, Ichalkaranji Taluka towards East. Kolhapur, Uchgaon, Vadgaon Kasba, Ichalkaranji are the nearby Cities to Ambewadi. (See figure: 3.1)

3.1.1 Demographics

Ambewadi is a large village located in Karveer of Kolhapur district, Maharashtra with total 312 families residing. The Ambewadi village has population of 2203 of which 1145 are males while 1058 are females as per Population Census 2011. In Ambewadi village population of children with age 0-6 is 223 which make up 10.12 % of total population of village. Average Sex Ratio of Ambewadi village is 924 which are lower than Maharashtra state average of 929. Child Sex Ratio for the Ambewadi as per census is 890, lower than Maharashtra average of 894. Ambewadi village has higher literacy rate compared to Maharashtra.(See figure:3.2 , Table 3.1)

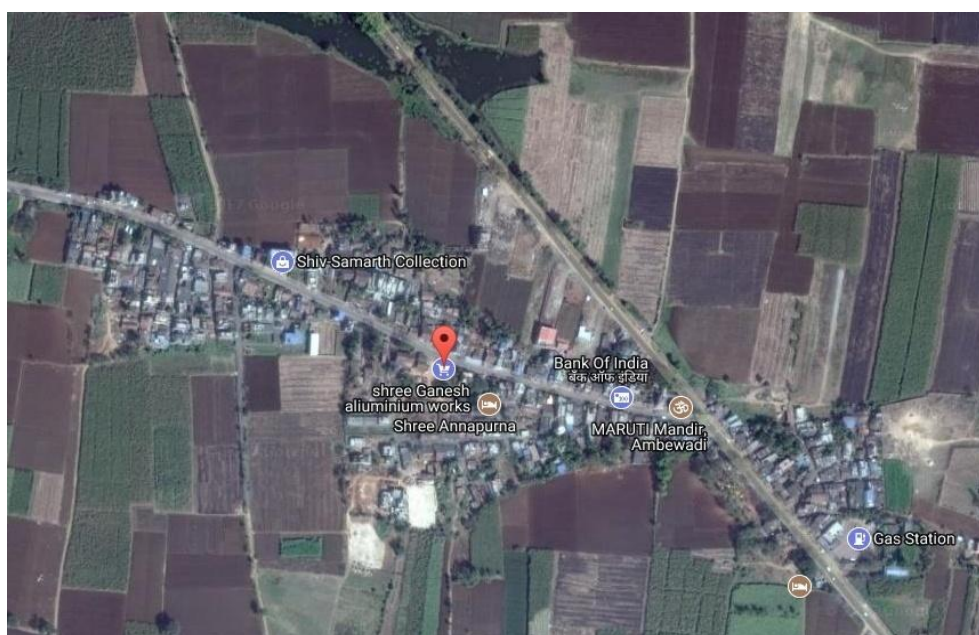


Figure 3.1: Location Map of Village Ambewadi

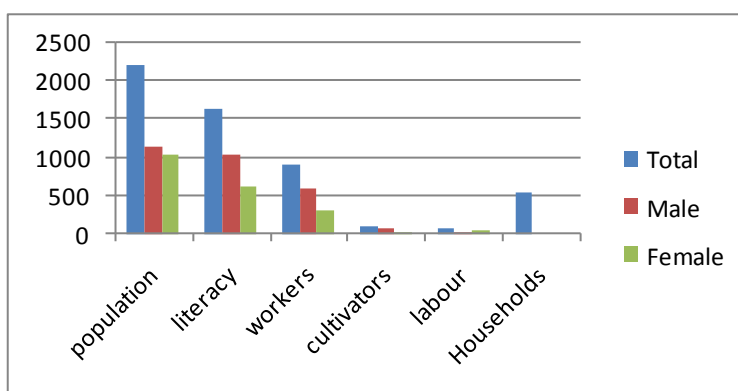


Figure 3.2: Graph of village

Table 3.1: Brief information of town

Sr. no.	Names	Details
1	Type of the City or Town	Town Panchayat, Ambewadi
2	Population (As per census)	2011 year- 2203
3	Area Coverage	175.62 Hec
4	No. of Wards	3
5	Male	1145
6	Female	1058
7	Child(0-6)	223
8	No of households	502

3.1.2 Data Collection by Primary Survey

To draft the detailed project report for village Ambewadi the following sets of activities have been done by me by visiting the village. I visited various parts of the village to understand the existing structure and SWM mechanism in the village. I also had an interaction with the Head of the

Village- Sarpanch, the Gram sevak, and clerk of the Gram panchayat and also with various stake holders of SWM system. I even observed and studied the type of waste generated and also the waste collection and disposal system in the village and identified the problem

Table 3.2: Primary data collection

Sr. No.	Information	Nos
1.	No of Families	312
2.	Total no. of Cattles	60
3.	Use of Pesticides	Yes
4.	Use of Chemical Fertilizer	Yes
5.	No. of Marriage Hall	3
6.	No. of Lodge/Hotels	3
7.	No. of Clinic(General)	3
8.	General Stores	6
9.	Temple	2
10.	Anganwadi (Kinder Garden)	3
11.	Total length of road	10km
12.	Waste generated per day	0.700 TPD
13.	Vehicles and Transportation	Ghanta gadi- 1

3.1.4 Problem Identification

There are all together 502 houses in village. During survey a lot of problems were identified in village. Some of the major problems the village facing is, there is no proper system for collection of various types of wastes in village. No segregation of waste is done. There are also no bins in village for disposal of waste. There is one vehicle known as ghanta gadi for collection of all types of waste in overall village.

The vehicle moves in village for collection of waste 3 times in a day. It collects the waste from all sources from village such as household waste, market waste, waste

from marriage halls, waste from hotels etc. and dumps it to the dumping site which is approximately 1.5 km away from village. The present situation of dumping site is very miserable



Figure 3.3: Collection system in village



Figure 3.4: Disposal site

3.2.1 Segregation of waste

To know the actual quantity and percentage of different type of waste generated in the village, segregation of waste was done by me with the help of the person collecting waste in village. Segregation was done and average daily quantity of different type of waste was estimated.

The daily waste generated in village is about 600-700kg. From which the quantity of kitchen waste or degradable waste is about 220-230kg(36.67%), plastic waste was estimated about 250-260kg (41.67%), the quantity of paper, cardboard, decoration items of themocol etc. waste was estimated about 80-90 kg(13.33%), the quantity of waste such as glass bottles, metals etc. was about 50-60 kg(8.33%) approximately.

3.2.3 Sample Composting by Aerobic method

The organic waste of 5kg was taken and the process of composting was started. The organic waste was placed in a pit of size 100x50x10cm. The organic waste of 2.5 kg was placed in the pit in an even layer over which a little amount of water was sprinkled. Over it a layer of cow dung was placed. Again the remaining 2.5kg layer of organic waste was spread evenly over it. Even a thin layer of cloth was placed over the waste so that the waste won't scatter. The ideal limits of parameters for composting through which the microorganism survive were studied. Adequate moisture content is required for microorganisms to survive and composting to take place. So considering it adequate amount of water was sprinkled on regular interval basis. Provision was made for collection of leachate through waste.

After the process started, on the 7th day the compost was given a proper aeration by turning it upside down. And the test of different parameters such as ph, temperature, moisture content, c/n ratio, total nitrogen, total phosphorous, total potassium were carried out and readings were taken. The same tests were carried out after intervals of 7 days such day 14th day 21st and 28th day. After 28th day the

compost manure was ready and also final readings were taken.



Figure 3.12: Sample composting



Figure 3.14: Compost manure (Final product)

3.2.4 Test and procedure carried out:

There are following parameters required for composting and the test of these parameters should be carried during the composting process.

1) Moisture Content

Moisture content of solid wastes is usually expressed as the weight of moisture per unit weight of wet material.

$$\text{Moisture Content (\%)} = \frac{\text{Wet weight} - \text{Dry weight}}{\text{Wet weight}} \times 100$$

2) Temperature

Municipal solid waste is known to have good insulation properties and hence the released heat results in increase in temperature of the decomposing mass. As some of the heat loss occurs from the exposed surface, the actual rise in temperature will be slightly less.

3) Carbon/Nitrogen (C/N) Ratio

The organisms involved in stabilization of organic matter utilize about 30 parts of carbon for each part of nitrogen and hence an initial C/N ratio of 30 is most favorable for composting. Research workers have reported the optimum value to range between 26-31 depending upon other environmental conditions.

4) Aeration

It is necessary to ensure that oxygen is supplied throughout the mass and aerobic activity is maintained. During the decomposition, the oxygen gets depleted and has to be continuously replenished.

This can be achieved either by turning of organic waste. During the turning, it is necessary to bring inner mass to the outer surface and to transfer the outer waste to the inner portion.

5) Nutrient content (N-P-K)

Nitrogen (N), Phosphorus (P, usually expressed as P₂O₅), and Potassium (K, usually expressed as K₂O) are the three nutrients utilized by plants in the greatest quantities, and therefore, are the nutrients most often contained in commercial and retail fertilizers. When purchased in bags of fertilizer, these three nutrients are measured and expressed on a dry weight basis, in the form of a percentage (%).

6) pH

PH is the measure of acidity (or alkalinity), or hydrogen ion activity of a soil or compost (on a logarithmic scale).

The pH scale ranges from 0 to 14, with a pH of 7 indicating neutrality. Most compost has a pH of between 6 and 8. Each specific plant species requires a specific pH range. Based on the amount of compost applied, as well as its pH, its addition can affect the pH of the soil or growing media.

4.1.1. Population forecast

The design population will have to be estimated with due regard to all the factors governing the future growth and development of the village area in the basic aspects. Special factors causing sudden emigration or influx of population should also be foreseen to the extent possible. As per census the current population of village ambewadi is 2203. By using the “Arithmetic Increase Method” the future population was carried out and mentioned below-

Total population

Table 4.1: Increase demand population of village ambewadi

Year	Population
1991	2077
2001	2160
2011	2203
2021	2266
2031	2329 Approx.

4.1.2. Total Population Per capita per person waste generated

Total solid waste generation as per census 2011 is 600-700kg approximately per day. And the waste generated per capita per day is about 0.27gms.

Hence from the above data we can calculate the total solid waste generated per day for year 2031. So in year 2031 the average waste generated per capita per day will be about 0.32-0.35gms. Therefore considering the population at year 2031 we can calculate the average solid waste generated per day for year 2031.

- Population in 2031 = 2329
- Per capita per day average total solid waste collection = 0.32gms
- Total solid waste = population x per capita per day solid waste

$$\text{Total solid waste} = 2329 \times 0.32$$

$$\text{Total solid waste} = 745.28\text{kg}$$

- The total solid waste generated at year 2031 is approximately 745.28kg per day. For year 2031
- Total solid waste = 745.28kg
- Increase by 10%

- Total solid waste = 1.1×745.28
Total solid waste = 819.80kg
Total solid waste = 850kg

Therefore the total solid waste generated at year 2031 will be approximately 850kg per day. As per the results of collected samples of solid waste, the percentage of different type of wastes was done and estimated as below-

- Organic waste/degradable waste (kitchen waste) = 36.67%
- Plastic waste = 41.67%
- Paper waste, cardboard, etc. = 13.33%
- Glass and other waste = 8.33%

So, organic waste as kitchen waste was estimated as 36.675% of total solid waste.

- Total organic waste = $36.67 \times \frac{1}{100} \times 850$
 $= 0.3667 \times 850$
 $= 311.695\text{kg}$
 $= 320\text{kg}$

Therefore the organic waste collected per day in year 2031 will be 320kg approximately. So now we have to calculate the organic waste collected per week

- Total organic waste per week = organic waste per day x 7

Total organic waste per week = 320 x 7

Total organic waste per week = 2240kg

4.1.3. Calculation and layout for composting bed

Let us provide 7 no of beds for composting with dimensions such as

- Depth = 1m
- Breath = 2.8m
- Length = 8m.

And provide 1 bed as standby with the same dimensions.

- Calculation of area and volume of single bed
- Volume of single bed = $8 \times 2.8 \times 1$
= 22.4m³
- Area of single bed = 8×2.8
= 22.4sq.m

5.1 Economic viability

To carry out this essential activity provision for expenditure is made. Since most of the work is carried out manually. A proportion of the total expenditure is incurred on segregation and sorting of solid waste and collection of the organic waste separately and taking it to the composting pit and handling the overall process with maintenance. A bit lesser

amount on transportation. Therefore looking out the overall process is economically viable and also profitable according to the estimated expenditure.

5.2 Feasibility of project

Seasonal variations in waste quantities were also considered and taken in account while designing the management system. They arise from seasonal factors with respect to both climates, cultural and religious events. It was also taken into account that during monsoon, the waste becomes wet and heavy and total tonnage increases. Quantities of solid waste may also increase during cultural and religious festivals. Sometimes Climate may affects the generation and the time required for composting in different season due to change in temperatures but the conditions are always favorable and most suited for composting.

5.3 Environmental Control

All area should be provided with an impermeable base. Such a base should be made of concrete, 15 centimeters thick, having permeability less than 10 centimeters/second. The base must be provided with 1 to 2 percent slope and must be encircled by lined drains for collection of leachate/surface water runoff.

All lined drains should be connected to a lined collecting tank

On such days when the waste cannot be accepted at the compost plant or if shutdown occurs for extended period due to rains/cold climate/major breakdown or annual maintenance, the waste should be diverted to a properly designed and operated MSW landfill.

RESULT & DISCUSSION

Properties of sample compost

The compost prepared from organic waste from village ambewadi is somewhat black brown or black in color. It is crumbly in nature with an earthy odor. The pH is 7.9. The compost is neither completely dry nor lumpy. It is in such a way that water won't come out of the mass when squeezed. The compost has a good odor. (See Table :6.1)

CONCLUSION

Based on the study done it can be concluded that the organic waste from the

village Ambewadi can be used for composting to reduce the overall percentage of total solid waste from village. Composting will be the best way to reduce the waste in village with benefits to the people in village. The method suggested is aerobic method and is simple to operate the overall process. This method of composting is recommended because the land and labor can be easily available in village. The labor requirements are relatively not high but compost preparation can help the unemployed in villages to earn a living. A considerable amount of water is needed which is easily available in village. The tests of sample composting of organic waste from village were carried out and the readings were obtained. With the help of reading it is known that the organic waste from village is best to use in agricultural fields as organic fertilizer rather than using chemical fertilizer. This project is more profitable to people in village considering their economic viability.

Table 6.1: Results of Aerobic Condition

Parameters	Initial	7 th Day	14 th Day	21 st Day	28 th Day
pH	6.9	7.1	7.4	7.7	7.9
Temperature °C	32	28	29	28	30
Moisture Content (%)	55.36	52.93	49.07	48.51	46.19
C/N Ratio	20.32/1	21.12/1	22.89/1	25.34/1	27.89/1
Total nitrogen (N)	0.67	0.75	0.84	0.97	1.08
Total phosphorus (P)	0.48	0.55	0.67	0.71	0.75
Total potassium (K)	0.70	0.81	0.87	0.94	1.05

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