On-Site Dry Food Waste Management to Reduce the Waste Load On Municipal Dump Site

HBT Medical College and Dr RN Cooper Municipal General Hospital

GGHH Agenda Goals

- Waste

Hospital Goal

- Management and treatment of dry waste from the hospital
- Reduce the waste load on Municipal Landfill and Dump site in Mumbai
- Utilize the manure generated from vermicomposting for the plantation drive across the campus

Progress Achieved

- About 60 MT of waste is load is reduced from being dumped at the municipal dump site
- Two hundred kilograms of manure generated from vermicomposting is used for 2700 trees planted across 13 acres of the hospital campus. This saves the cost of purchasing manure from the market and encourages to plant more trees.
- In future, depending upon the quantity of manure generated from the vermicomposting, it may be considered to be sold out in the market for financial benefits.

The Issue

Increase in the global population and the rising demand for food and other essentials, has led to an increase in the amount of solid waste being generated daily at consumption level. This waste ultimately goes into the municipal waste collection centres and then after is further taken to the landfill and dump sites.[1]

Food waste that ends up being thrown into landfill sites produces a large amount of methane – a more powerful greenhouse gas than even CO_2. Excess amounts of greenhouse gases such as methane, CO_2 and chloroflurocarbons can absorb infrared radiation and heat up the earth's atmosphere, causing global warming and climate change.[2] Apart from this food waste thrown into the landfill or dump sites also contributes to the overall waste load at the dump site of a city. Out of the 9,400 tonnes of waste that is send daily to Mumbai city's dumping grounds, 73% comprises of food, vegetable and fruit waste, says the Brihanmumbai Municipal Corporation (BMC)'s latest Environment Status Report.[3]

Keeping these in view, lately there has been a lot of focus given to the contributions of the bulk waste generators such as public institutes including medical colleges, government institutes and hospitals. According to the recent amendments to Solid Waste Management Rules 2016, it is mandatory for the bulk waste generators to manage and treat their solid waste at the site of waste

generation. Due to the discrepancies in implementation of this law at the district level, BMC had sent notices in 2017 to 5000 bulk waste generating institutions across Mumbai. The notice was aimed at sensitizing the institutes to segregate and appropriately treat their waste on campus considering the over load created on the waste dumping sites of Mumbai. In regards to this several municipal general hospitals, being among the key bulk waste generators, were also sent specific notices on adopting appropriate waste management measures.

Considering the above HBT Medical college and Dr. RN Cooper Hospital, a municipal general hospital undertook vermi-composting to treat its dry food waste. Dry food waste is one of the components of the total solid waste generated at the hospital which includes wet food waste and biomedical waste as among the other components. Biomedical waste is segregated as per the law at hospital campus and is sent to a non-profit for further treatment and disposal. Wet food waste is also sent to another non-profit for the treatment and disposal.

Vermi-composting is the degradation of organic waste (from plant and/or animal origin) by earthworms. Vermi-compost generated as the end product of the process is used to improve growth and yield of different field crops including vegetables, flowers and fruit crops. Apart from providing nutrient to plants, vermi-compost also improves the soil structure leading to enhanced water and nutrient holding capacity of soil. Another advantage of vermi-compost is that it can be applied to crops at any stage. Vermi-wash is another by product of the vermi-composting which is a liquid collected after the passage of water through a column of worm action. It is a collection of excretory products and mucus secretion of earthworms along with micronutrients from the organic matter, popularly used as foliar spray.[4]

Sustainability Strategy Implemented

The initiative of managing dry food waste collected from kitchens and canteens of HBT Medical College and Dr RN Cooper Municipal General Hospital was possible only due to the efforts of Mr Subhash Dalvi, Officer on Special Duty, Swachh Bharat Abhiyan Division, BMC, Mumbai in collaboration with the Hospital Management. The municipal general hospital located in the heart of the city took initiative of managing its dry food waste from both its canteens and all the staff quarters and hostels in 2017.

Following the motive to move towards proper and efficient handling of dry food waste following steps were taken:

- BMC officials and management team at HBT Medical College and Dr RN Cooper hospital joined hands together in early 2017, immediately after receiving the BMC notice
- One smart vermi-compost unit and four brick lined compost pits of 6 ft. length, 4ft. width and 2.5 ft. height were constructed in March 2017 for treatment of dry food waste
- A local non-profit Shree Aastha Mahila Bachat Gat was roped in by the BMC to manage this vermi-composting unit
- Three persons were employed by the non-profit under the supervision of BMC for waste collection and running it through the system
- Vermi-compost and vermi-wash generated from the vermi-compost system after treatment was collected and applied to the campus plantation along with the organic garden (total 2700 trees) maintained at the hospital

Figure 1: Vermi-compost unit at HBT Medical College and Dr. RN Cooper Hospital (NGO worker with the vermi-compost pit on the left and dry waste collection pit on the right)

Implementation Process

- All the food waste is segregated at the point of origin using separate bins
- Dry food waste such as uncooked vegetables and meat pieces, fruits, peels etc. are transported and placed in the compost pits containing different species of earthworms
- The four pits are interconnected with each other in a manner to enable free movement of earthworms between the chambers
- Dry food waste is rotated once daily to ensure optimum oxygen availability for the earthworms
- Pits are covered with an asbestos shed to prevent earth worms from extreme heat and temperature (<35◦C). Moisture of 50% is maintained within the compost pits for waste degradation.
- After a period of 45 days vermi-compost is collected which is used in form of manure for the campus plantation. On an average pits can process 30 MT of waste annually and from 100 Kg of waste, 10 kg vermi-compost is generated.

The total dry food waste generated from, 940 bedded HBT Medical College and Dr. RN Cooper hospital campus, spread over 10 acres of land, is around 100 Kg per day. In absolute numbers the total dry food waste generated from the hospital, (30% of the total solid waste) which undergoes vermi-composting, is 2925 Kg per month accounting to 35100 Kg of waste generated per annum. This waste is treated through four vermi-compost pits and one smart vermi-compost unit, another movable variant, installed in one corner of the organic garden, established in March 2017 on the hospital campus.

Figure 2: Smart vermi-compost unit and the organic garden at HBT Medical College and Dr. RN Cooper

Hospital (from left towards right)

The total cost of operating, maintaining and consumables is roughly INR 12.5 lakhs. Consumables include waste generated, biological inoculum required for composting, odour control agent, herbal repellent, saw dust and electricity charges.

Table 1: Total cost of vermi-composting system installed at HBT Medical College and Dr RN Cooper Hospital

Description	**Rate**
Cost of Organic Waste Converter "OWC60" model (total equipment+ taxes+ transport)	862784
Total operating and maintenance cost	260084
Consumable Cost for 5 year	119298
Total Cost	***1242166.05***

Tracking Process

Monitoring and supervision of the entire vermi-composting unit is taken care of by the BMC. They are also responsible for the employment of labourers for providing assistance in waste collection and treatment process. Cost of labour, operation and maintenance is budgeted under BMC's Swachh Bharat Abhiyan Division. The initiative is aimed at reducing the load at waste dumping site of Mumbai.

Challenges and lessons learned

The hospital is successfully able to manage entire dry food waste generated within the campus however there have been no steps taken towards management of wet food waste that includes cooked food waste. Entire wet waste goes off campus for the treatment. Wide media coverage on hospital's initiative to manage dry food waste has contributed to a lot of motivation and encouragement among the hospital community and BMC officials in Mumbai. As a result, several

other municipal general hospitals of Mumbai have also taken up steps towards on-campus food waste management.

Next Steps

The hospital management is considering to also set up composting facilities to treat the wet waste on campus.

Links

To know more about vermi-composting:

- http://agritech.tnau.ac.in/org_farm/orgfarm_vermicompost.html
- http://www.fao.org/docrep/007/y5104e/y5104e08.htm

To learn more about HBT Medical College and Dr. RN Cooper Hospital: http://hbtmc.edu.in/

Media reports:

- https://indianexpress.com/article/cities/mumbai/cooper-hospital-expands-eco-friendly-projects-4677090/
- https://swachhindia.ndtv.com/from-garbage-to-greenery-mumbais-cooper-hospital-leads-the-way-in-effective-waste-management-19474/

Health and Environment Leadership Platform's work and other case studies: https://www.ceh.org.in/activities/help/about/

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Keywords/topics: Vermi-composting and waste management

Submission date: October 2018

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[2] https://www.moveforhunger.org/the-environmental-impact-of-food-waste/
[3] https://www.hindustantimes.com/mumbai-news/bmc-finds-73-of-mumbai-s-garbage-is-food-waste-two-years-in-a-row/story-7Dls4uyotbmzUXuDULKGHI.html and https://www.pmc.gov.in/sites/default/files/reports_dpr/ESR%202016-17.pdf
[4] https://www.vknardep.org/sustainable-agriculture/technology/vermi-wash.html