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

**Lokmanya Tilak Municipal General Hospital, Mumbai**

**GGHH Agenda Goals**

- Waste

**Hospital Goal**

- On- site treatment of food waste through aerobic bacterial composting
- Reduce the solid waste load on municipal landfill and dump sites in Mumbai
- Utilize the generated manure from composting for the campus plantation area

**Progress Achieved**

- About 168 MT of total food waste generated annually can be treated at the hospital campus, reducing the waste load at the municipal dump site
- Manure generated from the composting is used for 128 trees planted across the hospital campus. This saves the cost of purchasing manure and encourages planting more trees.
- Due to the success of on-site waste treatment and generation of significant amounts of manure, hospital plans to develop their own organic kitchen garden.

**The Issue**

Reduction of food waste is environmentally important as it keeps food out of landfills which can contribute to the large methane emissions. Methane is considered as a more powerful greenhouse gas than carbon dioxide. Excess amounts of greenhouse gas emissions such as those of methane are responsible for the global warming and climate change. Food waste reduction also makes economic sense as its reduction or treatment at the source can reduce the transportation cost required to transfer it to the waste dump or landfill sites. This in turn can also reduce the maintenance cost of the dump sites as well as waste load on it.[1] Out of the 9,400 tonnes of waste that is send daily to Mumbai's dumping grounds, 73% comprises of food, vegetable and fruit waste, says the Brihanmumbai Municipal Corporation (BMC)'s latest Environment Status Report.[2]

In view of the above, recently there has been much emphasis given to the mandatory on-site disposal or treatment of waste, by the bulk generators that include government medical colleges, hospitals and government institutes. 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 the year 2017 to around 5000 bulk waste generating institutions across Mumbai. The notice was aimed at sensitizing the institutes to segregate and

appropriately treat their waste within their campus to reduce the waste load on overburdened landfill and 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 how to adopt appropriate waste management techniques.

Following this Lokmanya Tilak Municipal General Hospital (LMTMG), commonly known as 'Sion Hospital' also adopted on-site treatment of their food waste through aerobic bacterial composting. The hospital took a step further by treating both its dry and wet food waste, thereby reducing a major chunk of solid waste load on the municipal waste dump site. Food waste is one of the major components of the solid waste that usually is sent to the municipal dump sites. Biomedical waste, being among the other solid waste generated at the hospitals, is segregated and disposed of as per the Biomedical Waste Management Rules at LMTMG hospital.

**Sustainability Strategy Implemented**

The initiative of managing dry and wet food waste, collected from all the kitchen sources on campus, was taken up in November 2017, after the BMC notified Mumbai hospitals in early 2017. The municipal general hospital located in the heart of the city generates about 460 kg of food waste (dry and wet) per day from 3 of its bulk kitchen locations that include two on-campus canteens, 2 residential complexes and 1 urban health care centre.

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

- BMC officials and management team at LMTMG Hospital joined hands together in mid-2017, after receiving the BMC notice.
- Thirteen brick lined compost pits measuring 9 ft. in length, 4.5 ft. in width and 3.5 ft. in height were constructed for the treatment of both wet and dry food waste in the hospital campus.
- A local non-profit ECO ROX was signed up to manage and maintain the compost units.
- Three persons were employed by the hospital. These workers were trained by ECO ROX on how to collect waste and run it through the composting system. They work under the supervision of BMC.
- Manure generated after the treatment is collected and applied to the campus plantations maintained at the hospital.

**Implementation Process**

The total food waste generated from, 1462 bedded LMTMG hospital campus, is around 460 Kg per day. In absolute numbers the total wet and dry food waste generated from the hospital, which can undergo bacterial composting in a year is 168 MT. Five per cent of the total food waste put into the pits is converted into manure. As per the dimensions of the compost pits, the total volume of each of these pits is 141 $ft^3$ which can accommodate a total of 4 MT of waste in 8 days that undergoes composting.

- Food waste which comprises of raw vegetables, fruits, peels, meat pieces (cooked and uncooked), cooked food waste and leftover food is collected at the point of origin using large bins.
- Collected food waste is transferred and placed in the compost pits containing bacterial inoculums for decomposition. Waste is placed in alternate layers of 35-40 cm in width with the inoculum.
- Pits are filled one by one, where the time required in filling one pit is 7-8 days. Once the first pit is filled, fresh waste is placed in the second pit on the eighth day and subsequently other pits are also filled. On 41$^{st}$ day the first pit is emptied and refilled for next 8 days. Similarly other filled pits are also emptied after every 40 days and refilled with the fresh waste to continue the cycle.
- Food waste is rotated once daily to ensure optimum levels of aeration necessary for the aerobic bacterial decomposition.
- Pits are covered with an asbestos shed to prevent from extreme heat and temperature conditions. Moisture of 40-50 per cent is maintained within the compost pits for waste degradation.
- After 40 days the rich dark brown coloured manure is ready in the first pit which gets transferred to another location for maturing. Maturing takes about 15-20 days. Mature compost is stable complex organic material in which biological activity has slowed and all of the easily degraded molecules have been broken down. This mature compost is sundried for the final use.

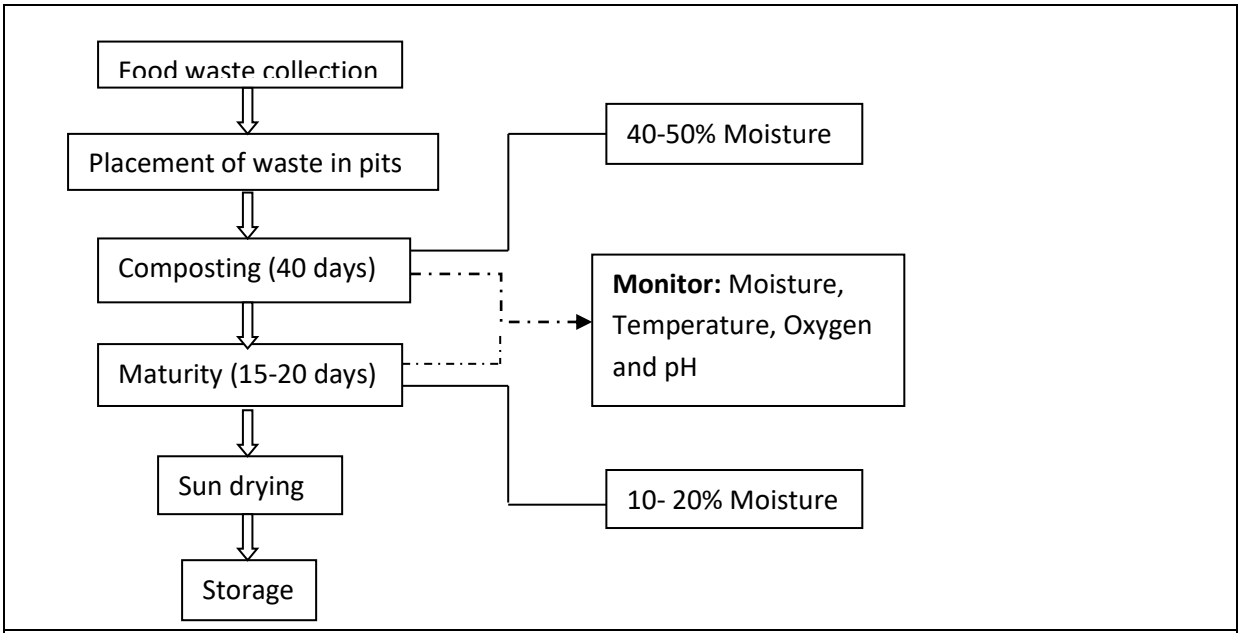


Figure 1: Stepwise process involved in bacterial composting

**Tracking Process**

Technical monitoring and supervision of the entire bacterial composting unit is taken care of by the ECO ROX and BMC jointly. BMC is responsible for the employment of labourers that are deputed for waste collection and running it through the system. Cost of labour, operation and maintenance is budgeted under BMC's Swachh Bharat Abhiyan Division.

**Challenges and lessons learned**

The hospital is successfully able to manage their entire food waste within the campus through aerobic bacterial composting. This has contributed to a lot of motivation and encouragement among the hospital community and BMC officials in Mumbai.

**Next Steps**

As a result of success of this waste management project, the hospital management is planning to set up a large scale on-campus plantation block and organic kitchen gardens for meeting the consumption needs of the hospital canteens.

**Links**

To know more about aerobic bacterial composting:

- http://mohua.gov.in/upload/uploadfiles/files/chap14(1).pdf
- https://www.unescap.org/sites/default/files/Operational%20Manual%20Composting%20and%20IRRC_FINAL.pdf

To learn more about LMTMG Hospital:
http://ltmgh.com/FrontView/inner.aspx?Mkey=MTE=&lKey=Mg==

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

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[2] a. https://www.hindustantimes.com/mumbai-news/bmc-finds-73-of-mumbai-s-garbage-is-food-waste-two-years-in-a-row/story-7Dls4uyotbmzUXuDULKGHI.html b. https://www.pmc.gov.in/sites/default/files/reports_dpr/ESR%202016-17.pdf