Case study: Decentralized organic waste management through Community Composting

Context and rationale for Community Composting

Wet waste i.e. the organic fraction of municipal solid waste mainly includes kitchen waste (vegetable and fruit peels, cooked food leftovers, tea/coffee grounds, eggshells, etc.) as well as garden waste (leaves, grass clippings, small twigs, and flower waste) and small amounts of soiled paper or similar biodegradable materials. At the level of individual households, this stream is produced in small but continuous quantities several times a day, while in apartments, residential complexes, hostels, hotels, canteens, institutions, markets, and other BWGs, the same types of waste accumulate in concentrated volumes that can easily cross 100 kg per day.

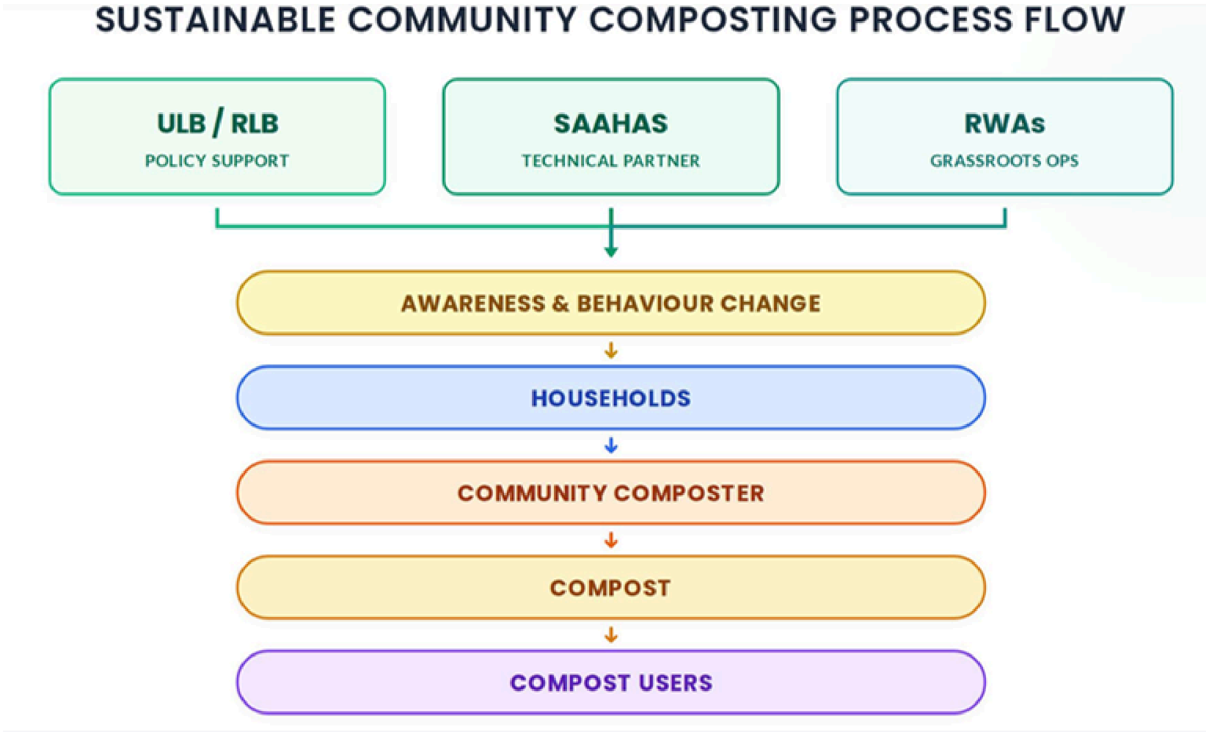
Under the provisions of the Solid Waste Management Rules 2016, source segregation and decentralized processing of biodegradable waste are encouraged to reduce the burden on municipal collection systems and landfills. Community composters have emerged as an effective decentralized solution that enables organic waste to be processed close to its source of generation.

Thus recognizing the potential of decentralized composting, Saahas, a non-profit organization established in 2001, has implemented community composting across more than 20 projects in diverse urban and rural settings in the last 2-3 years. Through partnerships with households, RWAs, institutions, schools, temples, and rural and urban local bodies, the organization has adopted a diverse range of composting technologies suited to varying waste generation levels, spatial constraints, operational requirements, and community contexts. This case study highlights the successful implementation of decentralized community composting and the practical insights gained from Saahas's projects to support the wider adoption of decentralized composting.

Addressing the organic waste management gap and interventions:

Organic waste generated by households, residential communities, markets, and Bulk Waste Generators (BWGs) forms more than 50% of the municipal solid waste stream in most Indian cities. However, much of this waste is still collected, transported over long distances, and disposed of in centralized processing facilities or landfills. In many cases, wet waste processing infrastructure is inadequate or non-functional, leading to the accumulation of untreated organic waste. This results in foul odour, leachate generation, groundwater contamination, vector breeding, and methane emissions, all of which have significant environmental and public health implications. Methane released from decomposing organic waste is a potent greenhouse gas and a major contributor to climate change. Furthermore, transporting large volumes of wet waste places a financial and operational burden on urban local bodies and panchayats.

The need for decentralized organic waste management arises from the realization that transporting biodegradable waste across cities is both environmentally and economically inefficient. Community composting offers a practical alternative by processing waste close to the point of generation, reducing transportation requirements, lowering emissions, and recovering nutrients locally. Decentralized systems also improve source segregation, increase citizen participation, and create opportunities for a circular economy where waste is transformed into a useful resource.



To ensure the long-term effectiveness of decentralized composting systems, Saahas adopts an integrated implementation framework that combines technical interventions with community engagement and institutional support. This approach promotes source segregation, decentralized treatment of biodegradable waste, and resource recovery while strengthening local ownership of decentralized waste management systems. The implementation process typically involves the following stages:

- Baseline assessment: Assessment of waste generation patterns, quantity of wet waste generated, existing collection systems, and community readiness
- Community Mobilization and Awareness: Residents, RWAs, self-help groups, sanitation workers, and local authorities are engaged through awareness campaigns, workshops, and Information-Education-Communication (IEC) activities to promote source segregation and composting practices.
- Installation of Community Composters: Based on waste quantities and available space, Saahas facilitates the installation of community composters within residential communities, institutions, or panchayat-managed facilities.
- Technical handholding: Saahas provides continuous support during the initial composting cycles, helping communities address concerns related to odour, pests, operations, and compost quality.
- Monitoring and Performance Tracking: Waste diversion rates, compost production, system efficiency, and community participation are monitored to ensure long-term sustainability and operational effectiveness

- Resource recovery and local utilization: The compost generated is used for landscaping, gardening, agriculture, and green spaces, thereby returning nutrients to the soil and closing the resource loop locally.

Suitability and Adoption of Community Composters:

The community composters can be successfully deployed across a wide range of settings, including Gram Panchayats, residential welfare associations (RWAs), apartment societies, schools, temples, and other institutional premises. Across Saahas projects in over 12 states across India, it was seen that community acceptance is closely linked to awareness, ownership, and continuous engagement.

The selection of the composter type is largely influenced by the quantity of organic waste generated, availability of space, operational capacity, and community participation level. In rural Gram Panchayats, lane composters, home composters, and pit composters were found to be suitable due to the availability of land and relatively lower waste generation rates. In urban and semi-urban settings such as residential societies and RWAs, fabricated tank composters, mesh composters, and pipe composters were preferred because they require less space and offer a more organized processing system.

Different composter technologies are appropriate for different scales of waste generation. 3-bin/3-tier home composters are ideal for individual households and can manage approximately 500 g-1 kg/day of organic waste. Pipe composters, with a capacity of around 7 kg/day, are suitable for small institutions and low-waste generators. Fabricated lane composters can process approximately 15-20 kg/day, while meshed lane composters are designed to handle around 30 kg/day, making them suitable for neighbourhood clusters and community-level waste management. Tank composters can process approximately 55-60 kg/day of organic waste and are well suited for residential societies and institutions generating moderate quantities of wet waste. Pit composters generally cater to larger waste streams and can process up to 150 kg/day, depending on their dimensions, design, and level of customization. The availability of technologies across a wide capacity of range enables communities to select systems that best match local waste generation levels, space availability, and operational requirements while supporting decentralized waste treatment, resource recovery, and landfill diversion.

Fig1: Different types of composters installed across different projects of Saahas

Space requirements for community composting systems:

A key advantage of community composting is the availability of technologies that can be accommodated in both space-constrained urban areas and land-abundant rural settings. Across project locations, Saahas has piloted a variety of community composting systems suited to different waste generation contexts. Pipe composters require the least space, occupying approximately 1 sq ft, making them suitable for small institutions and locations with severe space constraints. Home composters require approximately 1-2 sq ft and can be easily accommodated in individual households, terraces, backyards, and small community spaces. Mesh composters and fabricated lane composters require around 16 sq ft per unit and can be installed in common neighbourhood spaces, roadside utility areas, or community corners.

Tank composters require a moderate footprint of approximately 40-45 sq ft and are well suited for residential societies or locations generating moderate quantities of organic waste. Pit composters require the largest area, averaging around 80-85 sq ft, and are therefore more suitable for panchayat lands or rural areas where land availability is less constrained.

These demonstrate that the availability of land is not a limiting factor for decentralized organic waste management, as composting technologies can be selected based on local space availability and waste generation levels. Compact systems are particularly useful in dense urban neighbourhoods, while larger systems can cater to community-scale waste streams in peri-urban and rural areas.

One of the strongest observations from these initiatives is that the long-term success of community composters depends less on the technology itself and more on the ecosystem surrounding it. Appropriate technology selection, regular source segregation, community ownership, trained operators, and institutional support collectively determine whether a composter becomes a sustainable waste management solution or an underutilized asset. When these elements come together, community composters offer an effective pathway for reducing organic waste, recovering resources locally, and strengthening decentralized solid waste management systems.

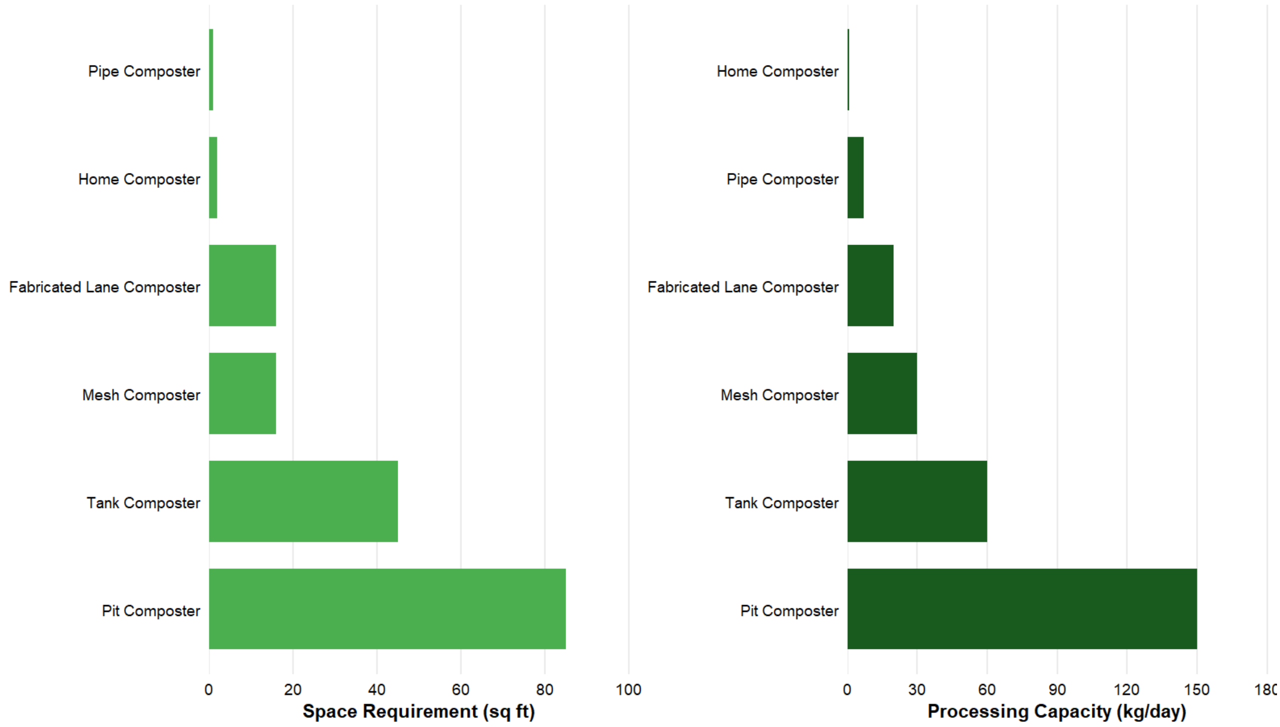


Fig 2: Comparison of community composters based on space requirement and processing capacity (Source: Based on Saahas' community composting projects)

Key challenges faced during installation of community composters:

The implementation of community composters highlighted that the major challenges were largely social and operational rather than technical. Community acceptance emerged as the most significant challenge, with substantial effort required to build community awareness, encourage ownership, and convince residents to adopt source segregation and composting practices. This was followed by segregation issues, particularly in residential societies and temples, where the mixing of biodegradable waste with plastics, packaging materials, incense sticks, and other non-compostable items affected the quality of composting. Manpower shortages also influenced system performance, as regular monitoring, follow-up, and training of waste collection vendors and compost operators were necessary to ensure proper segregation and composting practices. Maintenance was another important consideration, requiring periodic monitoring of composting operations to address issues related to odour, moisture, and overall system performance. Although space constraints were comparatively less challenging, this influenced the selection and placement of composters, especially in dense urban neighbourhoods where community acceptance and suitable site selection were critical.

Overall, sustained community engagement, regular monitoring, and continuous awareness-building emerged as the most critical factors for the successful operation of community composting systems.

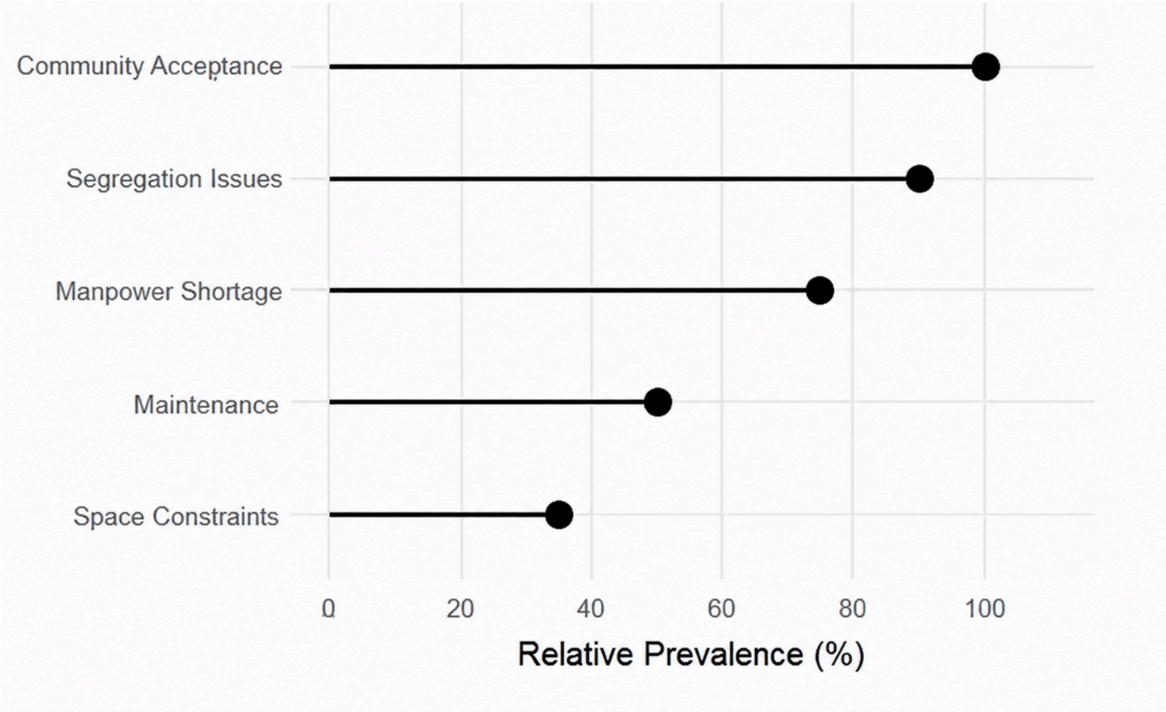


Fig 3: Prevalence of key challenges in adopting a community composting system

Creating value from organic waste streams:

Compost produced through community composting systems has the potential to be marketed as a value-added product. Across a few projects, ULBs/RLBs have successfully sold compost to local farmers and govt. nurseries at approximately Rs. 10-20 per kg, generating an estimated revenue around Rs. 15,000 over a period of 10-12 months. However, despite the Government of India's Policy on Promotion of City Compost (2016) encouraging the production, marketing, and utilization of compost derived from organic waste, the sale of compost remains limited across most community composting initiatives. In many cases, the compost is primarily utilized for landscaping, gardening, and local agriculture rather than being marketed commercially. Strengthening market linkages, improving compost quality assurance, creating awareness among potential users, and encouraging ULBs, Panchayats, and community institutions to actively market compost can enhance resource recovery while generating an additional revenue stream to support the long-term sustainability of decentralized composting systems and offset the operation and maintenance costs associated with these facilities.

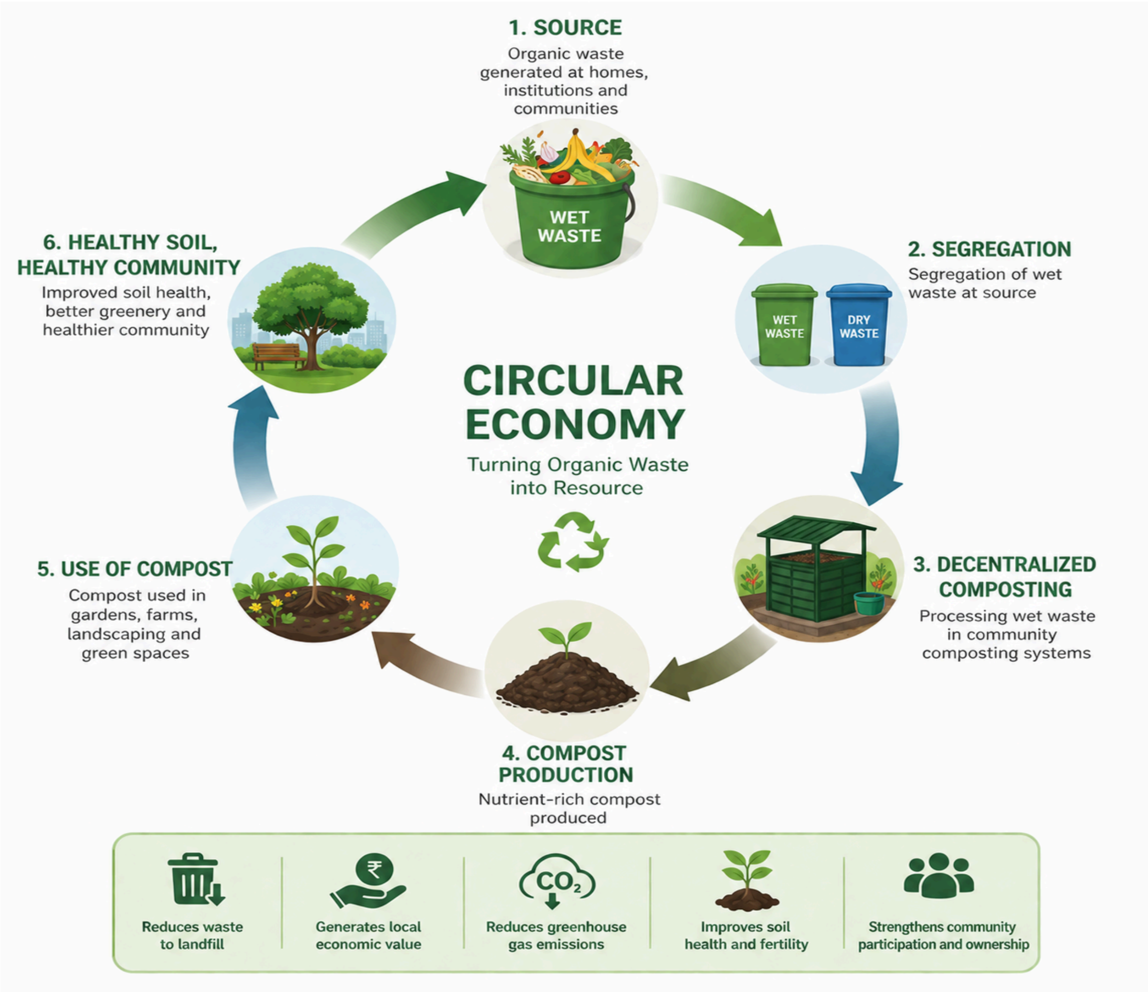


Fig 4: Circular pathway of organic waste from generation to resource recovery

Conclusion:

The case study demonstrates that the successful implementation of community composting across a diverse range of urban and rural settings is determined by social and institutional factors rather than technological complexity. The most significant challenges were building community acceptance, ensuring consistent source segregation, addressing manpower limitations, maintaining composting systems, and identifying suitable sites for installation. Across the projects, sustained community engagement, public awareness, technical support, regular monitoring, and local institutional ownership emerged as the critical success factors that enabled long-term operation. These experiences highlight that when these enabling factors are in place, community composting becomes a practical and scalable solution for decentralized organic waste management. Such an approach not only supports the objectives of the Solid Waste Management Rules, 2016, but also strengthens preparedness for the mandatory decentralized processing of wet waste introduced under the Solid Waste Management Rules 2026.