28TH WEDC CONFERENCE IN KOLKATA, 18-22 NOVEMBER 2002

Decentralised Composting in India – Lessons Learned

Chris Zurbrugg*, Silke Drescher*, Almitra Patel°, H.C. Sharatchandra°°

* Dept. of Water and Sanitation in Developing Countries (SANDEC), Swiss Federal Institute of Environmental Science and Technology (EAWAG), P.O. Box 611, 8600 Duebendorf, Switzerland. zurbrugg@eawag.ch, silke.drescher@eawag.ch

° 50, Kothnur Village, Bagalur Road, Bangalore 560 077, India. almitrapatel@rediffmail.com

°° **presenting author**: 66, 3rd Main Road, Cholanagara, Amarjyothi Lay out, Bangalore 560 032, India. sharatchandra@vsnl.net

Abstract

All around India, various small-scale decentralised composting schemes are already operating with various levels of success. Often initiated by Non-Governmental Organisations (NGO), Community-Based Organisations (CBO), or highly motivated individuals, the experiences gained at these existing sites are extremely valuable for municipalities, or other organisations and individuals wanting to participate in organic waste management. The paper presents the results of a study that assessed existing decentralised composting schemes in the cities of Bangalore, Chennai, Pune and Mumbai and collected information on their technical, operational, organisational, financial and social set up. Decentralised organisational structures include neighbourhood and community initiatives (Community-Based Organisations), company and institution initiatives for internal waste management, and private enterprise initiatives. Lessons learned from these composting experiences are briefly summarised in this paper, but have also been documented and distributed to the Urban Local Bodies. It is these authorities who are responsible for solid waste management and in charge of implementing solutions for improved organic - "wet" - solid waste management in order to comply with the Municipal Solid Waste Rules. The lessons learned can also benefit Non-Governmental Organisations (NGO), institutions, businesses, or private individuals interested in initiating or starting composting schemes.

Keywords Solid waste management, Waste recycling, Composting, Urban infrastructure, Community initiatives, Partnerships

Introduction

The garbage drama

Indian municipalities have the overall responsibility for solid waste management in their cities, however are currently unable to fulfil their duties in ensuring environmentally sound and sustainable ways of dealing with waste generation, collection, transport, treatment and disposal. This failing service of the Urban Local Bodies (ULB) in India results in serious health problems (Ghosh 1998) and environmental degradation (Rajagopal ….). Combined with the rapid urbanisation and unplanned development, the expected magnitude of problems give significant reason to initiate immediate action for improvement of this appalling situation.

It was this desperate waste situation of Indian cities with little hope for alleviation in the near future, which gave cause to a public interest litigation filed in the Hon'ble Supreme Court of India. A committee constituted by the Hon. Supreme Court of India was then established to look into all aspects of SWM in the class I cities of India and submit appropriate recommendations. On the basis of these recommendations (Committee Constituted by the Hon. Supreme Court of India 1999) national legislation was adopted with the "Municipal Solid Waste (Management & Handling) Rules 2000" (Ministry of Environment and Forests 2000). One section of the rules requires Urban Local Bodies to promote and implement waste segregation at source. *The segregated "wet" waste – the biodegradable organic fraction – has to be treated in an ap-*

propriate manner. With the existing legal backing, members of the community now have means to force municipalities to take action.

Why decentralised composting?

In the 70s the interest for large-scale highly mechanised MSW composting plants for urban areas grew world-wide. Most of these composting plants turned out to be serious financial failures (Dulac 2001). A study carried out in India (UNDP/WB RWSG-SA 1991), analysed 11 heavily subsidised mechanical municipal compost plants constructed between 1975 - 1985 ranging from 150 to 300 tons refuse handling capacity per day. The study concluded that in 1991 only 3 were in operating condition and that these plants were operating at much lower capacities than their design capacities. The study recommended: *"Instead of setting up one single large mechanical compost plant, it will be beneficial to set up several small manual composting plants.*

In the 90ies many small-scale composting initiatives were initiated by NGOs, or community groups often receiving some international assistance and/or advice (Furedy, ….). Some of these exist to date; others have disappeared after a few project years. This paper describes an evaluation study of existing composting schemes from southern India, which was conducted to identify problems and constraints that need to be tackled by the various actors in order to allow wide dissemination and replication of such decentralised composting activities.

Conceptually, decentralised composting schemes of municipal solid waste can be seen as a promising management and treatment options for urban areas as they:

- can enhance environmental awareness in a community
- can create employment in the neighbourhood/community
- are more flexible in their management and operation and can adapt rapidly to changes in user needs
- are close to the residents allowing close quality surveillance of the service and product
- are mostly small-scale, based on labour-intensive technology and better adapted to the local socio-economic situation
- can reduce waste management cost for the municipality as organic waste is diverted from the municipal waste stream thus reducing transportation and disposal costs
- when combined with primary collection services, can decrease dependency from malfunctioning municipal services.

Types of decentralised composting schemes

The 20 composting schemes assessed, are categorised according to their organisational set-up into:

- Neighbourhood initiatives and community based waste collection and composting schemes.
- Initiatives of companies and institutions composting on their premises.
- Medium scale private sector composting enterprises.
- Public private partnerships in large scale composting schemes.

Community based schemes

Key common features of community-based schemes are their small scale of operation and the high degree of public participation. They have all been initiated by residents as a response to a crisis in local hygiene and poor waste management, often in unserved Development Area or Improvement Trust areas on the fringe of cities. Thus the needs and priorities of the residents themselves set the framework of the scheme. Primary waste collection service is usually the core activity of the initiative for which residents can be motivated to pay fees. Although fee collection was mentioned to be a very tedious and time consuming task which is mostly conducted by voluntary core group members of the initiative or association, it is this financial contribution which often guarantees the financial viability of the whole scheme.

Figure : Composting bins at Kalyana Nagar, Bangalore

In these schemes composting was included as an activity to reduce waste amounts for further transport, a problem often persisting due to the unreliable secondary collection service of the municipal authorities. The act of composting however necessitates a higher level of participation by the residents as all schemes rely on waste where the "wet" biodegradable fraction has been kept separate from other wastes. As not all households in the collection area can be persuaded to segregate biodegradables, the waste collectors also sort mixed waste into different fraction during the collection process. Some schemes have even adapted their collection vehicle to facilitate this activity.

Biodegradable waste is composted in bins (figure 1) or by vermi-composting (see table 1). The scheme of EXNORA in Chennai has gone as far as to motivate the residents to participate by composting in their backyards (figure 2). It was observed that there is some confusion on the terminology concerning technological approaches as well as a general lack of scientific knowledge on the composting process. The term vermi-composting is very often used even when the amount of worms contributing to the process is minimal and the resulting process product did not consist of vermicastings (with the exception of Pammal, Chennai). Composting in bins, observed frequently, consists of filling the biodegradable fraction into brick-built bins constructed with aeration structures. During the composting duration of approximately 2 months limited turning and watering was noted which reflects the perceived "sideline activity" of composting.

Figure 2: Backyard 200 litre composting drum in Chennai

Produced compost is sold in the neighbourhood, whereby marketing strategies are limited to mouth-to-mouth information by the collectors or core members of the associations. SHOW in Bangalore has also been able to target companies for compost use in their gardens and parks. Compost prices are high, (up to Rs. 20 /kg in Mumbai) which also reflects the targeted users of middle and high income in which areas these schemes are often located.

Main challenges the schemes face are odour complaints of the residents living near to the composting site, and the lack of the municipal support and formal acknowledgement. Municipal support is often only limited to informal agreements of land provision for composting.

Mumbai has been successful in supporting neighbourhood schemes called Advanced Locality Management (ALM). This involves technical as well as organisational support. However these support structures are still provisional and unfortunately are not yet institutionalised into the regular municipal functions. ALMs are formed streetwise or small area wise. They consist of community-based structures or neighbourhood initiatives, which are formally recognised and supported by the municipal authorities. As support to these schemes the municipality provides a platform for exchange and communication for ALM representatives and municipal authorities. These meetings enable the residents to address their area-related problems such as waste collection, road repair, lighting, water supply or drainage problems in front of the municipal authorities. Waste collection and street sweeping are often considered the priority focus of ALMs. Composting activities usually follow at a later stage (often not without objections by the neighbouring residents). Out of the current 670 ALMs in Mumbai, 284 have incorporated vermicomposting activities. The municipal target is to have at least one vermicomposting site per ward. Even if composting is not on the list of priorities for ALMs it is important to recognise that the institutionally embedded structure of the ALM system sets the framework for such possible future activities.

Table 1: Overview of community based initiatives visited, sorted by the number of households serviced

Name of Site/ Company	Composting Technique	land space available m2	no. of households serviced	amount of waste composted kg/day
Sandu Lane ALM, Mumbai	Bin-composting	16	120	?
Diamond Garden Residents Forum (DGRF ALM), Mumbai	Bin-composting	100	125	60
Scientific Handling of Waste Society (SHOW), Bangalore	Bin-composting with active aeration	190	180	50
Sindh Colony, Pune	shallow windrows	150	264	200
EXNORA Ramanathan, Chennai	Bin-composting	40	300	300
Shyam Nagar Slum, Mumbai	Pit -composting	60	350	350
Pammal, Chennai	Vermicomposting in bins	300	476	100
CEE Kalyana Nagar Residence Association, Bangalore	Bin-composting	500	980	122
Residents Initiative for a Save Environment (RISE), Bangalore	Bin-composting	290	1200	300

Composting at companies and institutions

Similar in size and technology, the Orchid Hotel in Mumbai shows an interesting example of company-organised on-site composting where all kitchen wastes are segregated and then either sold as animal feed or composted on the hotel premises. The compost produced is used in the hotel gardens or for various planted traffic islands in Mumbai, which are maintained by the hotel gardening staff and serve as publicity for the Eco-hotel. Segregation and composting are promoted based on the company's philosophy and commitment to protect the environment. This, and the examples from a staff colony of "TATA power company" in Mumbai and the Central Leather Research Institute (CLRI) in Chennai show that there is also significant potential in promoting composting on company or institution premises. Such schemes usually have enough land to set-up their system and their central management and decision-making structure often facilitates the implementation procedures. However the challenge of participation of employees in segregating waste is crucial and there is a need for continuos awareness building campaigns.

Middle-scale business enterprises

These systems are not run by residential groups but by individual entrepreneurs, who have identified the organic waste treatment as a business opportunity or expect a market for the end product. These schemes can be considered profit-oriented enterprises focussing on sales of compost or sales of consulting expertise around composting.

Many entrepreneurs have invested private money in the business or taken loans while mortgaging private property. Banks consider investments in solid waste management projects as high-risk businesses due to a lack of experience and proven winners in this field. The high cost of land is a major obstacle for the set-up of a viable composting plant in urban areas. Therefore it is not surprising that many plants use municipal property which is provided for free or at moderate rents.

Scales of operation observed are approximately 5 t/day – with the exception of Terra Firma in Bangalore processing up to 95 t/day. Although Terra Firma can not be classified as a decentralised approach it is mentioned in this paper given the interesting marketing concept used. Technologically, vermicomposting using shallow windrows was observed most frequently.

All composting business approaches observed do not use household wastes as feedstock. They all focus on "pure organic" waste streams such as waste from vegetable, flower or fruit markets as well as residues from agro-industries. As for these wastes there is often already intense demand, the composting businesses have to compete for waste provision. Household waste is not used as mixed waste sorting is too time consuming and source segregation is not commonly practised. Even though there is a potential for using segregated waste, building awareness and implementing such systems are too challenging and expensive for enterprises.

The assessed composting enterprises have difficulties in covering their costs through the sale of compost. This can be attributed to the difficult market situation or their inadequate marketing strategies. With the exception of Terra Firma in Bangalore, which markets the compost through a large fertiliser distribution company, the schemes do not fully exploit the compost market. For additional income many entrepreneurs act as consultants for associations or companies wanting to start with composting activities.

Table 2: Overview of assessed composting business enterprises

Name of Site/ Company	*Composting Technique*	*Amount of Feedstock t/day*	*Organisational Setup*
Dadar Pumping Station, Vermigold, Mumbai	Vermicomposting in windrows	5	Business Approach Contractor of Municipality
Varsova, Green Cross, Composting Site, Mumbai	Vermicomposting in windrows	5	Business Approach,
Clean Air Island, Colaba Composting Site, Mumbai	Vermicomposting in windrows	5	NGO as Contractor of Municipality
Terra Firma, Bangalore	Vermicomposting in bins with precomposting in windrows	96	Business Approach

Results and Conclusions

For large cities and towns, decentralised small scale composting in combination with large scale centralised composting schemes seems to be an ideal organic waste management strategy. For small towns it may even suffice to rely solely on decentralised composting schemes. Common challenges for all decentralised composting schemes were identified that constrain the replication of such activities on citywide level. A main common difficulty of all decentralised schemes is considered the lack of municipal acceptance and support.

Municipal support

With the exception of the ALM-strategy in Mumbai, municipal support for small, decentralised schemes was observed to be limited to the provision of land. However even these provided and earmarked sites are usually allocated in an informal manner and do not give the composting schemes any legal backing.

The study recommends municipalities to ensure:

- Political will and continuity of policy. The Commissioner / Chief Officer and the Standing Committees should pass resolutions to promote decentralised composting and be willing to support it at all levels as needed, promptly.
- Development of strategies and action plans on how to ensure appropriate organic waste management (e.g. which system or combination of systems is appropriate for the city, timeframe for implementation, etc.))
- Household segregation of wet and dry waste and separate collection to keeps debris, road dust, drain silt, and commercial waste out of the biodegradable waste stream. This can be organised with the help NGOs working with waste-pickers and waste-buyers (kabadiwalas).
- Waste streams consisting predominantly of biodegradable waste are not mixed with other waste streams (park and garden waste, market waste, hotels, eateries, street-food stalls, marriage-halls, and/or mass feeding locations. Enforcement can be easy since all these establishments require municipal permission to operate.

- Education and training of the entire SWM personnel, from Health Officer down to the supervisors and sweepers, on the importance and advantages of composting and the importance of collecting and transporting biodegradable waste unmixed and on the importance of prompt and regular lifting of compost rejects from decentralised composting sites.
- Encouragement of institutions, companies and citizens to take up any of the composting methods determined appropriate by recruiting or promoting a resource person who can provide sound technical guidance on composting.
- Buy-back by the city authorities of locally produced compost for use in its parks, gardens, traffic islands and dividers, with prompt lifting and spot payment.
- Promote and assist with marketing activities for compost use in private gardens as well as for agricultural purposes.

If there are financial profits from composting activities, they are very small. Currently it is not possible to achieve “gold from waste”, as is sometimes stated. However if economic and environmental benefits are taken into account composting can certainly be a viable waste management option and self-sustaining means of transforming waste into a beneficial soil conditioner and nutrient.

Acknowledgements

The research team would like to thank the numerous individuals, organisations, enterprises, and municipalities who have been involved in this project. They have committed their valuable time to describe their activities and openly share with us all the information available, their experiences, as well as their financial data. For this we are very grateful. Without them this document would not have been possible.

We would also like to thank all the participants who gave us the benefit of their observations and insights on this work at the workshop on decentralised composting options, which took place in Bangalore in June 2002.

Finally, we wish to thank the Swiss Agency for Development and Co-operation (SDC) and the Swiss Federal Institute for Environmental Science and Technology (EAWAG) for their financial support.

References

Committee Constituted by the Hon. Supreme Court of India, (1999). Solid waste management in Class I cities of India. Hon. Supreme Court of India, India.

Dulac, N., (2001). The organic waste flow in integrated sustainable waste management. in A. Scheinberg, editor. Tools for Decision-makers -- Experiences from the Urban Waste Expertise Programme (1995-2001). WASTE, Nieuwehaven.

Furedy, C., Initiatives for Source Separation and Urban Organic Waste Reuse. www.gdrc.ord/uem/waste.

Ghosh, A., (1998). Management of Urban Environment -A Study on Post-Plague Initiatives of Surat Municipal Corporation. Urban Studies Department, Institute of Social Sciences, Delhi.

Ministry of Environment and Forests, (2000). Municipal Solid Wastes (Management and Handling) Rules 2000. The Gazette of India, New Delhi.

Rajagopal, K., India's Environment Pollution and Protection. Report No. 97ED57, Submitted to Central Research Institute of Electric Power Industry (CRIEPI, Japan). Tata Energy Research Institute (TERI), New Delhi, http://www.teriin.org/reports/rep01/rep01.htm.

UNDP/WB RWSG-SA, (1991). Indian experience on composting as means of resource recovery. UNDP/WB Water Supply and Sanitation Program South Asia, Workshop on Waste Management Policies, Singapore 1-5 July 1991, India.