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Urban organic waste management in Karachi, Pakistan

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INADEQUATE COLLECTION AND disposal of waste poses a serious health risk to the population and is an obvious cause of environmental degradation in most cities of the developing world. Mixed municipal solid waste is dumped either indiscriminately in the neighbourhood or, if collected by a waste collection service, disposed of in uncontrolled dumpsites. The organic fraction of this waste, often contributing to more than 50% of the total waste amount, threatens the health of residents as the indiscriminate waste dumps attract rodents and other disease carrying vectors. Organic waste is also responsible for pollution of soil and water bodies through leachate, and in the process of uncontrolled anaerobic degradation it contributes to global warming by the production of methane. A possible step in mitigating these detrimental effects is enhancing resource-recovering activities of the organic waste fraction. An obvious treatment and recovery option for organic waste is composting. However, before strategies can be developed on how to proceed, it is necessary to understand the existing organic waste management practices and try to assess current and potential markets for the converted organic waste.

Solid waste in Karachi – an overview

Karachi is the largest city of Pakistan, a home to over 10 million people. The main components of urban solid waste management are faced with a major crisis because of the major concerns from the local pressure groups. There is a serious lack of long term plans, which results in a number of disjointed, ad-hoc and often counter productive policies, plans and administrative frameworks.

Responsibilities for the collection, transport and disposal of household, commercial, and institutional waste as well as street sweepings, lie with the municipal authorities (Farhan, 2000). Sanitary workers are employed by Town Municipal Administration to sweep streets and are often hired by residents to provide a primary waste collection service (Ali, S. M. and Cotton, A. 2001). Recently some private entrepreneurs, mostly refugees from Afghanistan have entered into the field of waste collection.

Till 2001, the Karachi Metropolitan Corporation (KMC) was the responsible agency for solid waste management. Since August 2001, the administrative structure has been changed and the city is governed by the City District Government of Karachi which has replaced KMC and various other local authorities. The city of Karachi is now divided into 18 towns. The solid waste management remains the responsibility of city government and town municipal administration.

Focus points of organic waste generation are at the two major markets of Karachi. According to estimates provided by Karachi Metropolitan Cooperation (KMC), approximately 100 tons/day originates from the Vegetable Market and some 70 tones/day from the Empress Market. Most of the waste generated at these markets are biodegradable and should thus constitute an excellent raw material for composting. Food wastes and garden waste are dominant in high-income localities as much of the remaining and half eaten food was disposed off in the refuse while the fresh food material was given to the servants. Here garden waste constitutes nearly 22 percent of the refuse (Farhan, 1998). In low-income settlements where dry leaves and other garden waste was found to be much less (< 9 %).

Current and potential use of organic waste

Scope and methodology

The research project on Current and Potential Use of Urban Organic Waste in Karachi was undertaken as collaboration between the Swiss Federal Institute of Environmental Science and Technology (EAWAG) and Association for Protection of Environment (APE). The objective of the study was to study the current and potential use of urban organic waste in Karachi. Structured surveys were conducted to obtain information from municipal agencies, development bodies, international organisations, research and academic institutions, consultants and professionals as well as NGOs and CBOs. Specific study of cattle colonies, buffalo pens, slaughterhouses, nurseries and plant shops as well as urban farmers was also done. Concise findings and analysis are outlined in this paper.

Past experiences

The only composting plant in the Karachi area, the Farooq Compost Fertiliser Corporation Plant, was established in North Karachi in the early 1980s, and is not in operation anymore. It has never, in fact, operated successfully. The production costs of the end product were prohibitively high, and together with the financial costs, the operation was far from being profitable. The specific reasons for its failure were:

- *Incomplete.* Imported from Scotland, the equipment was not completely delivered (hammer mills were missing).

- *Breakdowns.* The presence of plastic bags and broken glass led to frequent breakdowns in the operation of the plant.
- *Over-designed.* The plant management complained that they could not procure sufficient fresh organic refuse required. The plant capacity (1,000 tons/day) was too high.
- *Cooperation* with the main waste collector (the municipal agency) was not established thus resulting in difficulties with waste delivery to the plants as well as reject collection from the plant.
- The *marketing* plan was to export the compost product to the Middle East markets, a somewhat unrealistic assumption that never materialised.
- *Product quality.* The end products were not of sufficiently good quality,

An NGO, Gul Bahao has initiated a programme in which citizens are encouraged to sell their organic waste in addition to certain other waste items not collected by *Kabaris*. Organic waste is later composted to produce soil-conditioning fertiliser.

Pakistan Environmental Welfare and Waste Recycling Programme Trust (PEWWRPT) is an NGO experimenting to produce plant food (similar to compost according to their interpretation). This NGO collects urban organic waste, presses out the containing liquid (for sale as liquid plant nutrients) and produces waste pellets, which are left to dry in a big pothole for 2-3 days before sales.

Awareness on composting as urban organic waste management option

At present very little awareness exists among the stakeholders in Karachi about composting, the product compost, and its characteristics. Even the mainstream users such as nursery/plant shop owners do not have any information about composting or compost. Absence of current and past exposure to compost and allied products is a major hindrance in its utilisation. Most of the actors possess a basic awareness about urban organic waste and its possibility of conversion into compost as a useful plant supplement. The missing link is the non-availability of any existing example or product for demonstration purposes. The only existing examples are very questionable and damage the compost image rather than support the awareness on its benefits. Nutrient supply to crops is currently practised through the application of raw sewerage (on vegetables resulting in high health risks regarding to human consumption) and animal manure.

The municipal agencies responsible for the plantation, management and maintenance of public parks, playgrounds, green belts and open spaces, use mainly animal manure or chemical fertilisers. They are not aware of other nutrients and soil conditioners, which could help with improved growth and survival of their plants. As reported by the District Municipal Council (DMC) West and large-scale nursery owners and operators, the lack of a demonstration

projects further diminishes the possibilities of use of any other form of plant food or manure. Similarly urban professional farmers that grow crops in the outskirts of the city are largely unaware about the existence, nature and characteristics of compost. In Karachi, compost - produced with a scientific knowledge of the process steps - is not available. While the NGO, Gul Bahao claims to have a good demonstration project, scientific experts' do not regard the compost produced as acceptable.

Another important aspect in this respect is the confusion in terminology when talking about compost or manure. Many interviewed people do not distinguish manure or animal faecal matter from raw organic garbage or any other organic product used for soil conditioning and fertilising.

Conclusions

Results from the fact-finding process show that there is a large need for a product such as compost. The number of nurseries is rising and interest of the domestic and commercial sectors in gardening is expanding. The consumption of soil nutrients or similar products is also growing. Thus there is a possibility that if compost were introduced, it may be well received by the increasing potential users.

This study has also shown that the reasons for the failures in the few past pilot cases, was an ineffective marketing strategy and concept. Apart from marketing, the promotion of compost - highlighting its merits and drawbacks - is considered essentially to impart awareness amongst the common people about this product. Amongst the various stakeholders, municipal agencies may be a major client for the use of compost as they are assigned to manage the landscape in the city. In addition, it was found that paucity of funds available for research pertinent to composting is a major issue. Neither government agencies nor any private organisation was able to muster together adequate funds to experiment with composting especially using a scientific approach. The relative failure of the PEWWRPT initiative an important case to learn from as it shows that unless an appropriate series of trials are conducted to demonstrate the viability of compost, little success is likely to emerge.

The few motivated NGOs that have developed some expertise in handling waste as well as producing some form of compost are an important asset in any exercise related to developing composting activities and compost market demand. However their current know-how and performance will have to be improved in order to operate a composting facility which produces a product of high quality. In order to make composting a viable option, it is important that small-scale demonstration projects should be developed and supported. The experiences gained by some local organisations such as Waste Busters, Gul Bahao and Pakistan Environment and Recycling Trust should be carefully and scientifically studied and modified to improve quality and possible scaling up procedures. Some of these examples have enough potential to be converted into demonstration projects.

Commercial and financial viability of composting will require careful estimation and planning. Based on estimates it appears that an initial phase of financial support by an organisation or authority is necessary to initiate and develop composting as a waste management option. Support is especially crucial to overcome the lag phase, which will be necessary in order to develop the market for the compost product. Unfortunately potential supporters such as government authorities or municipal corporations have very little conception about the potential of composting as a waste management option or the possible usage of compost. As responsible actors for municipal solid waste management and as caretakers of parks, landscape and green belts of the city, they will require appropriate and intensive orientation. It may prove convenient to let pilot scale plants be owned and operated by a Joint Venture between Karachi City Government and a private partner. City Government would in such a case provide the raw material and the private company guarantee that the operation is conducted following established business standards. Such a solution will also be in line with the privatisation plans currently under consideration in Pakistan (KMC, 1992).

Appropriate feedstock is not a problem as it is easily available in abundance. The various studies reviewed for this project have shown, that as much as 50 of the waste is biodegradable and currently is being dumped or burnt in an uncontrolled manner. On the dump the organic fraction is proportionally even higher due to recycling of inorganic materials by waste pickers. Animal scavenging by stray cattle and sheep, to some extent reduces the volume of organic wastes such as food waste. This amount is considered to be negligible for Karachi, and will also decrease over time as the practice of letting animals roam around in the city freely is being abolished. Cattle colonies and buffalo pens in the urban fringe areas and the generated animal faecal matter is a large but still minimally used source of organic waste which could be used as a feedstock for

composting. Most of this waste can be acquired at very low cost as the generators of this waste are concerned about removal of the waste from their sites. Thus they are willing to even give any quantity of the said waste free of cost.

High ambient temperatures normally above 20°C in Karachi, would enhance fast decomposition. However high temperatures will also significantly reduce waste moisture thus provision of water for watering compost heaps will be necessary. As water is a scarce commodity, this may pose a significant challenge to composting operations.

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