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Resource recovery from urban waste: Options and challenges for community-based composting in sub-Saharan Africa

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Abstract

Municipal authorities in developing countries are facing immense challenges in managing both solid and liquid waste in a sustainable way. Recycling is not yet high on their agenda although they appreciate the potential of composting for waste volume reduction. This offers an entry point to introduce organic waste recycling as a component of sustainable integrated sanitation which has the potential of a win-win situation by reducing waste flows, ensuring environmental health, supporting food production and creating livelihoods. However, due to several constraints recycling attempts have often a short life time. This paper tries to analyse related reasons by drawing from a larger study in Ghana and a survey of compost stations in different parts of Africa. It concludes with a framework for the analysis and the planning of recycling interventions in the context of sustainable sanitation, looking in particular at community-based options for solid waste and human excreta.

Keywords: Urban sanitation; Excreta; Faecal sludge; Solid waste; Agriculture; Recycling

1. Introduction

In Africa, the average population growth rate in urban areas is more than three times as high as in rural areas. The projection is that by 2015 there will be 25 countries in sub-Saharan Africa (SSA) with higher urban than rural populations; by 2030 this will be 41 countries [1]. Policy-makers have started to respond to this demographical shift. Their major challenges are the provision of appropriate water supply and sanitation for millions of urban dwellers. However, despite all efforts so far, by 2015, if the current trends continue, over 900 million people will still be without access to safe drinking water and 2.4 billion people without access to basic sanitation [2]. Current efforts need to be stepped up by almost a third to meet the water Millennium Development Goals (MDG) target and almost doubled to meet the sanitation target.

With increasing attention to the various benefits of ecological sanitation systems and the creation of the

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global "*Sustainable Sanitation Alliance*" there has been a growing interest in resource recovery linking urban environmental sanitation with sustainable food production. Food production, especially in the peri-urban inter-phase, plays a significant role in feeding the cities, especially where transport networks and facilities are not keeping pace with urbanisation. It appears thus appropriate to link the challenges of sanitation and food supply by recycling the nutrients and organic residues from urban consumption back into agriculture [3].

A closely related area of concern in developing countries is human excreta management. Although the public health aspects are of great importance, the options for the recovery of the resources in human excreta should not be overlooked. Few developing countries, to date, have seen investment in human excreta treatment as a priority, due to the paucity of treatment options suited to the economic and institutional conditions prevailing in many of the countries. However, several basic options depending on the goal of treatment, the type of human excreta collected, and economic and climatic conditions may prove suitable [4,5]. The treatment of human excreta, whether singly or in combination with other wastes, requires certain criteria and procedures. Treated human excreta (be it in treatment plants or on-farm) lend themselves well to agricultural use.

Usually, solid waste (SW) and excreta are disposed of or contribute to urban pollution, and there is little or no resource recovery. If well planned, however, the costs of waste management/disposal could be lowered as composting is reducing the waste volume and transport costs while in addition producing a valuable product. Although this appears like a win-win situations for municipalities and farmers, there are seldom any viable compost stations in African cities except project based and usually subsidised pilot stations [6].

This paper discusses these issues in the framework of the constraints hampering waste recycling and the feasibility of recycling strategies and their contribution to ensuring sustainable sanitation in rapidly growing urban and peri-urban environments.

2. Resource potential of municipal wastes

2.1. Solid waste

The waste stream is not a homogenous mass but a collection of different materials that can be handled in different ways to maximise recovery. Very large quantities of SW are generated in urban areas which include household, market, horticultural and agricultural waste. The average SW generation is about 0.4–0.6 kg/person day for low income countries [7,8]. The organic waste fraction remains the largest proportion which can be recovered. The high content of organic matter (50–90%) provides an opportunity for exploitation through composting processes [9,10]. For some selected African cities the percentage of organic matter in municipal SW were recorded as 56% in Ibadan, 75% in Kampala, 85% in Accra, 94% in Kigali and 51% in Nairobi [10]. The per-capita nutrient and carbon contributions from the organic fraction of municipal SW (MSW) indicates that it can be valued on its soil conditioning potential. The organic fraction can be recycled with or without human excreta into compost for urban and peri-urban agriculture.

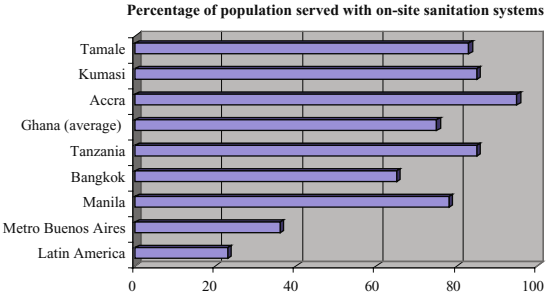

Fig. 1. Proportion of population using on-site facilities in some developing countries (source: modified from [11]).

2.2. Human excreta

In urban areas of low and middle income countries, on-site sanitation systems (OSSs) predominate over water-borne, sewered ones (Fig. 1). OSS comprises non-sewered household latrines, public toilets, aqua privies and septic tanks. In SSA, more than 75% of houses with access to sanitation in large cities and up to 100% in towns are served by on-site sanitation facilities [5,7]. Faecal sludge (FS) is the common term used for all excreta collected from OSSs. Huge quantities of FS are disposed of unrecorded and indiscriminately within the urban settlement area with usually limited proportions collected for treatment in ponds.

However, FS is an important potential source of plant nutrients, energy and humus/organic matter [12].