CHAPTER SIX

Findings, Conclusions and Recommendations

6.1 Findings

1. In all composting plants surveyed, the composting projects continue to function with sufficient encouragement from the respective politicians as well as personal commitment of the officials attached to the project. Continuous political backing is essential for the success in all activities such as finding funds for initial investment, getting a land for the composting plant and marketing the final product.

2. Collaboration of managers of the MSW composting plants with the agricultural officers regarding the quality and the nutrient content of the produced compost is very limited. Promising developments can be observed currently in Bangladesh where local government authorities as well as the Ministry of Agriculture are supporting and promoting composting and the use of compost in agriculture (Zurbrügg, 2002).

3. Though government has invested huge amounts of money on thes composting projects, making it compulsory to produce compost fro MSW in all local authorities, government intervention in improving i quality for agricultural use and making a suitable marketing arrangemen is still not adequate. Currently the burden of marketing the product also has to be borne by the respective local authority. Many large and small composting schemes have failed due to inadequate attention paid to marketing and the quality of the product (ibid).

4. Majority of the composting plants do not fully utilize their MSW for composting due to limited marketability. This situation sends larger proportions of waste to open dumping sites.

5. Social objections were less when these composting plants are located on same lands which were earlier used as open dump sites. It was observed that when the land is selected in a less populated area within the area of waste collection and when the project has contributed to develop infrastructure facilities and create employment for the neighbouring families it was able to get the support of the society. In the event when open dump sites located adjacent to the composting sites are not maintained in a sanitized way, social objection is directed towards the waste composting process as well.

6. Waste separation is still at a poor level in most of the composting plants, and little effort has been taken to avoid heavy metal contamination in the final compost. However, with higher level of public awareness, volume of waste generated as MSW could be reduced and it has reduced the time taken for sorting of waste.

7. Lack of quality assurance for MSW compost is a barrier in promoting its use in agriculture. If a quality assurance could be given by the government at least about the status of heavy metal content, marketability of the product is much higher.

6.2 Proposed Channels of Marketing

It was learnt during the key informant discussions and focus group discussions that the main constraint for marketing of compost is the consumers' doubts regarding the quality parameters such as soluble salts, heavy metals and toxic microbes. Since testing regular batches of compost by individual producers is not practical due to high cost of testing facilities for heavy metals etc, it is proposed to establish packaging centers at central locations. Local authorities can be paid for the carbon content in each batch of compost, because carbon is the most cost effective element to analyze. At those centers, necessary quality should be tested and suitable enrichment also could be done according to the most popular type of crop in that area. Responsibility of proposing the most suitable composition for each crop type could be handed in to research institutes that are currently working on that particular crop. After doing so, compost could be marketed under one brand with government's quality assurance. This will build trust among the users. Marketing facilities could be arranged through Agrarian Service Centers at village level with subsidized chemical fertilizer.

6.3 Conclusions

1. The success of MSW composting projects is largely observed with high level of political and managerial commitment towards project activities.
2. Functioning MSW composting plants do not produce compost to their full capacity as marketing avenues are currently limited for compost produced from MSW.
3. Community participation in source separation of waste is at a lower level in many areas and it could increase considerably through frequent public awareness programmes.
4. Government involvement in composting MSW is limited in assuring its quality for agricultural use. However, government assistance is necessary to monitor the quality of MSW compost regularly and to create an assurance among the users regarding its suitability in using agricultural purposes.

6.4 Recommendations

1. Composting plants should preferably be located in previous garbage dumping sites and indirect benefits to the residents such as employment opportunities at the project, developed infrastructure facilities should be considered.

2. The Government should make necessary policy changes to make composting MSW operate as a complete package that assures systematic collection of sorted wastes, purchasing of recyclable wastes, and implementation of legislations to reduce waste generation.

3. Public awareness programmes regarding the importance of separating degradable and non degradable items at household level should be strengthened. It should adopt suitable legislations that will be beneficial towards this task.

4. Current composting programmes should strengthen in getting the contribution of all stakeholders including compost producers, agricultural experts and users to improve the quality of MSW compost as a soil amendment as well as a nutrient supplement.

5. Government intervention is needed in assuring suitability of MSW compost for different purposes such as in cultivation of horticultural crops, plantation crops, floriculture and etc.

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Annex 1

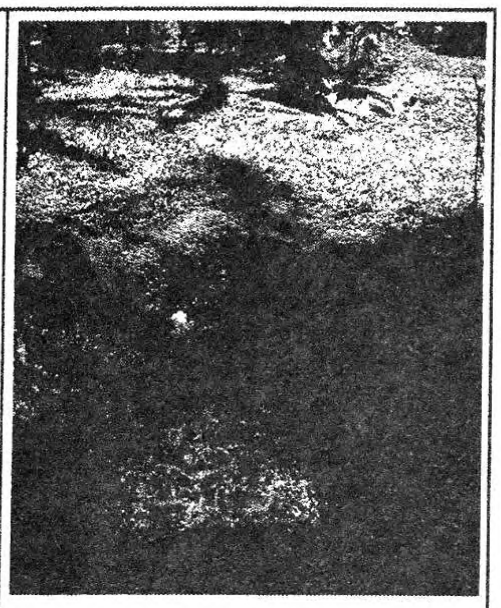
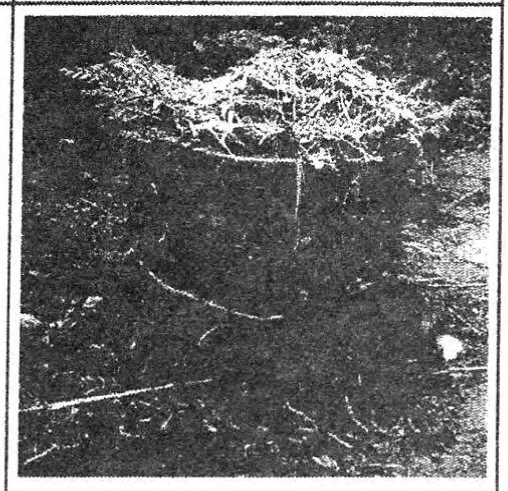
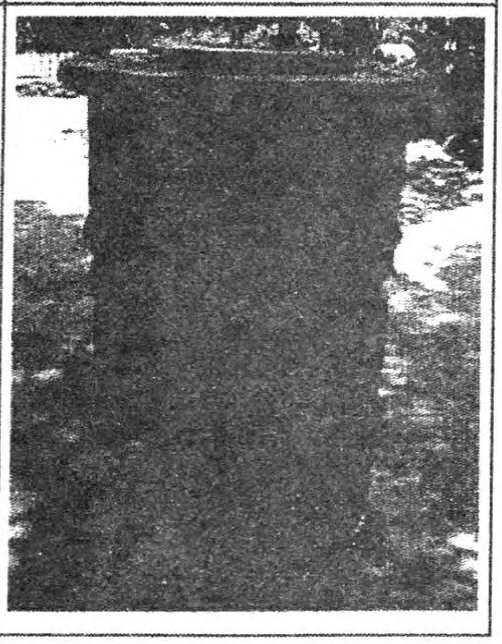
On-site Composting of Household Organic Waste

In Sri Lanka, the pit method is the most common and traditional way of composting of degradable waste in-house. Solid waste originates from kitchen and food wastes are co-disposed with garden sweepings/trimming in a pit at the backyard of the dwelling. The decomposition in the pit method resembles the natural decomposition except the fact that the feedstock is mixed and turned a few times a year. The decomposed material at the bottom of the pit is traditionally used in home gardens. The pit composting system is among the best alternatives to reduce the waste generation at the source, especially in rural or semi-urban areas in Sri Lanka. The heap method is a popular method used for composting garden waste and yard trimming, but has limited application for MSW of Sri Lanka.

Jeewakotu is another popular on-site composting method where waste is packed in an above ground structure made out from live sticks (e.g. *Gliricidia sepium*). Opposite to the pit method, *Jeewakotu* can diffuse more oxygen to the feedstock thus create a more favorable condition for rapid decomposition, but required regular watering in dry weather, especially in the dry areas of the country. Although *Jeewakotuwa* was originally introduced to make organic manure with yard trimmings at home gardens, now it has become a popular method to manage food waste in schools and model farms.

Pit method and *Jeewakotu* are not popular on-site composting methods in urban and semi-urban areas in the country due to inadequate space in small backyards in urban dwellings. Instead, home composters are becoming popular among urban households. Over the last few years, Sri Lankan government and NGOs are promoting home composters to reduce the recyclable organic waste in MSW stream. There are different types of home composters available in the market as well as supplied through local authorities at a subsidized price. However, due to faults in design and inadequate knowledge on compost making among households, the success of home composters remains low. The following figure summarizes the technical features and a brief analysis on on-site composting methods follows.

Annex Figure 1: Common Methods of On-site Composting of Organic Waste in Sri Lanka

Pit composting	Advantages; ✓ Easy to construct and minimum operation & maintenance requirement ✓ No or minimum cost of construction Disadvantages: ✓ Requires a relatively large area ✓ Use of meat & fish waste is not recommended ✓ Requires a relatively long time to decompose	
Jeewakotuwa	Advantages; ✓ Easy to construct and minimum operation & maintenance requirement ✓ Relatively low cost of construction Disadvantages: ✓ Requires a relatively large area ✓ Use of meat & fish waste is not recommended	
Home composters	Advantages; ✓ Composters are available at subsidized price & in markets ✓ Small land area requirement Disadvantages: ✓ Purchasing and transport cost ✓ Requires basic skills to operate ✓ Difficult to fabricate in-house	

In-situ composting reduces the amount of waste flow into the MSW stream and recycle the valuable materials in organic waste back into the garden. However, there are some common problems associated with in-situ composting; lack of knowledge on composting process that leads to use of inappropriate feedstock such as non-degradable and fibrous organics, difficulty in managing leachate, fly and worms , and irregular feeding/unloading of compost (Lekammudiyanse and Gunatilake, 2009). Thus, some local authorities are reluctant to promote in-situ composting as a segment of integrated solid waste management.

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