CHAPTER FOUR

Case Studies

4.1 Balangoda Urban Council

Balangoda Urban Council is the oldest Urban Council in the Ratnapura district and was initiated as a sanitation board. By now it is being n governed by nine governors and a special commissioner. Its current population is 35,855 and the generation of waste per day is about 0.9kg per person. Prior to initiation of a proper solid waste management programme, municipal solid waste collected from the urban council area was disposed to a marshy land which was situated close to the Dorawela Oya flowing across the Balangoda town.

A need of a proper solid waste management was felt strongly in 1999, when an epidemic of diarrhea, typhoid and many other diseases caused basically due to polluted water, mosquitoes and flies were reported. Therefore, major objectives of the project were to create cleaner and nicer environment, groundwater protection and minimizing the chances of spreading vector-borne diseases. Composting project is closely monitored by the Chairman of the Urban Council and a permanent work supervisor has been appointed for the project under the Public Health Inspector (PHI).

4.1.1 Strategies Adopted for Solid Waste Generation Reduction

Large scale public awareness programmes have been conducted to provide information on the 3R concepts (waste Reduction, Reuse, Recycling) included in the National strategy on solid waste management developed by the Ministry of Environment.

a) School 3R Societies

In the Balangoda urban council area, special programmes have been conducted targeting school children to change their attitude regarding waste disposal at household level. Resource centers have been established in 10 schools to include children of all religions and cultures. The school resource center is managed by its 3R society which comprises 50 school children. These societies conduct programmes to popularize the 3R concept in the school system and to create awareness on benefits of waste separation at household level. School children are expected to bring non degradable wastes from home to school's resource center. Members of the 3R societies are expected to buy these non degradable materials and mark the point cards. 3R societies were paid a sum of Rs.1000/= as initial expenses by the urban council. According to the point system, those who earn 1000 points are eligible to receive either Rs.1000/= or school equipment worth that amount or a bank deposit equivalent to the amount. In appreciation of the students committed to the cause, they are awarded an Environmental Friendly badge at the 3000 point

level, an environment lover badge at the 5000 point level, Nation Friendly badge at the 10,000 point level. At the 15000 point level, they will be awarded the badge of Global Lover. If students reach 20000 points they are expected to be awarded a Presidential Green Award.

b) Village 3R Societies

In Balangoda Urban Council area, four village 3R societies function as a pilot project. Each society has 25 households and they are actively involved in 3R concepts. Members of these societies are expected to take measures for reducing generation of waste, separating of non degradable waste at household level and selling those items to the purchasing centers. They are eligible to receive Rs1000/- on the completion of a point card. By considering the points accumulated by each member, loan facilities are expected to be granted to members if they wish to initiate any type of self employment. For members engaging in home gardening, compost is given free on requirement. In addition, members get the opportunity of receiving knowledge and advice on various farming issues from agricultural experts.

c) Recycling Centers

A plastic and polythene recycling center has been established at the Balangoda Composting Plant. The Central Environmental Authority has provided financial and technical assistance for this center.

d) Garbage Tax

Using the power entrusted on local government authorities regarding the disposal of waste from 2008, the Balangoda Urban Council has adopted collecting a garbage tax from commercial establishments such as guest houses, supermarkets, retail and wholesale shops, food cabins and other commercial establishments with more than five employees within the urban council area. However, establishments that practice waste separation were released from paying this tax. Due to continuous awareness programmes which highlight the importance of adopting above 3R concepts, it has been able to reduce the unsorted amount of waste from about 25MT which was generated in the year 2000 into 12MT by year 2012 saving considerable space and labour hours spent on sorting.

4.1.2 Composting Project

Funding

Initially Rs.1.4 million grant has been given by the World Bank through the Environmental Action Project Phase 1 to construct a composting plant. To rehabilitate the access roads to the composting plant situated about 3km away from the Balangoda city, the provincial government granted Rs.1,000,000/=. The Chief Minister of the Provincial Council has granted another Rs.500,000 to build a fence around the compound. Later the Central Environmental Authority has granted Rs.7.4 million for building the night soil plant.

Production of Compost

Municipal and household waste collected from the Balangoda Urban Council area is received at the composting plant. Considering the importance of delivering waste material to composting plants at the early stage of decomposition, waste collection is being practiced on a daily basis. Highly perishable material such as animal waste collected from slaughter houses and fish markets are collected after collecting waste from other places and they are transported in separate containers to avoid mixing with other waste. Average composition of solid wastes generated from the Balangoda Urban Council consists of 65-70% degradable products, 20-25% non degradable, recyclable products and 10-15% of material that has to be used in land filling. Industrial waste is not included in waste collected from this urban council.
At the composting plant manual sorting is done to separate the degradable portions. Open windrow technique is being used and sorted degradable waste is being piled to windrows. Average dimensions of these windrows are 12 x15 feet.

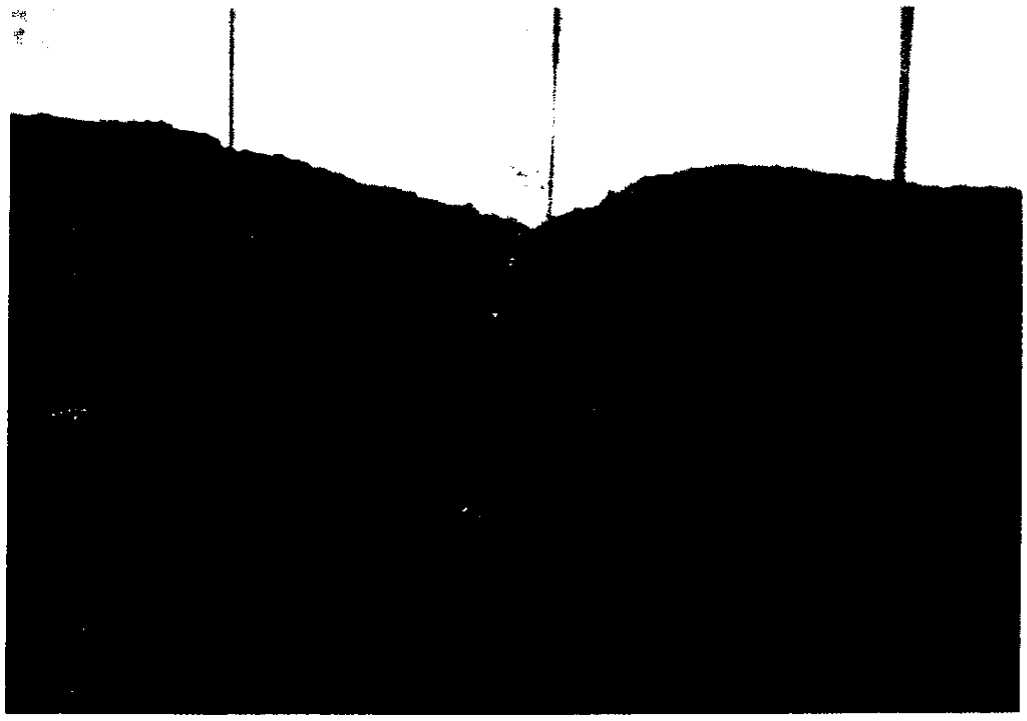

Figure 4.1: Waste Piles at Maturation

These piles are kept for 6 weeks for maturation. After about 6 hours, leachate starts to leak from these piles. Biological oxygen demand as well as acidity is high in this leachate and therefore it has a bad odor and its a source of fly infestation. Leachate is treated after being collected through a lined drain to a concrete tank by adding pure water at a rate of 1:1000 ratio. This treated water is used to moisten the garbage piles. During dry periods, piles are moistened once in every ½ hour. This process creates a favourable environment by maintaining temperature for bacteria growth and their actions.

To maintain a desirable C: N ratio which is 25 : 1 external application of animal waste is required. Animal waste collected from fish market, farms and slaughter houses is being added to the center of garbage piles on the second day of maturation. In the Balangoda composting plant, about 1500kg of animal waste is added to 14000kg of garbage. After 6 weeks, garbage piles are turned using a bobcat machine to provide aeration to accelerate the decomposing process. Pelicans are

indicators of aerobic condition and fly control. In the absence of pelicans, larvae of flies are removed manually by collecting and discarding them to the leachate dump. Temperature inside the garbage pile during the 1st week should be about 700C to prevent the growth of harmful fungi such as Aspagillus. If fungi growth was not managed properly, users of final compost would develop skin irritations. Garbage piles are turned again in the 8th week (2 weeks after 1st turning). After 2nd turning, degraded compost is dried to reduce its moisture content to about 8%. When the moisture content is reduced to 8%, degraded waste is sieved through 4mm sieve to separate non-degradable part from compost.

Biochar produced from four mills in the area is being mixed with the sieved compost to remove the 'Se' content to a certain extent. To provide the Phosphorous requirement, 15% of rock Phosphate is added while night soil is added according to wish of the bulk users at a rate of 30%. Required C and N elements are added through addition of animal waste to the decomposing waste. To maintain the quality of the final product, samples are tested for basic nutrients at the soil testing centers of the Department of Agriculture in Gannoruwa and Makadura. Once in every six months compost samples are sent to the Industrial Technological Institute (ITI) to detect heavy metal contamination. The capacity of the composting plant is to produce 50MT per month, but the current production per month is around 30MT.

Staff turnover at the plant is very low and to enhance their social recognition National Vocational Qualifications (NVQ) have been prescribed for the municipal solid waste operation assistants. Workers employed in the project are on casual or contract basis. Most of the employees are residents of the neighbouring households and there had been only few households around the plant before initiating this composting plant. Villagers have benefited by getting employment, developed infrastructure facilities etc. Due to these benefits, so far the project has not received any social objection from the villagers. Workers were given necessary items for their safety during their work at the composting plant. No incidence of sicknesses linked to their work at the composting plant has been reported..

Sales and Marketing

Main consumers of compost produced in the Balangoda Urban Council are the Urban Development Authority of the Western Province, Urban Council of Balangoda, tea estates, vegetable farmers, CIC company and farmers from the eastern part of the country. Wholesale marketing is done via fertilizer dealers while retail marketing is done at the sales center located at Balangoda city and at the composting plant. Marketing avenues are being sought by the project managers and they have to take up the challenge of constantly searching for new customers since there are no regular MSW compost users who purchase in large quantities.

Constraints Experienced during the Project

a) Leachate should be treated properly before releasing to the environment. If not it can pollute water resources. At the initial stage of the project, when leachate was released to a canal without treating, farmers who cultivated

paddy lands along that canal had developed burning sensations on the skin and experienced bad odor.

b) Human hair and batteries disposed from households and commercial dwellings have been identified as a major obstacle in the composting process. As a result of vigorous public awareness programmes by now, almost all the barber shops and other shops in the Balangoda urban council area dispose items containing heavy metals in separately.

4.2 Weligama Urban Council

The Weligama Urban Council initiated its composting plant in 2006 with the aim of minimizing the adverse impacts of open dumping. About 18 MT of waste is collected daily from the Weligama Urban Council area. The composting plant is located at Kapparatota which is a very populated area close to the Weligama city. Composting plant and the home garden occupy about 8 acres while the rest of the 18 acre land is used as an open dump.

4.2.1 Strategies Adopted for Solid Waste Management

Public awareness programs have been conducted to encourage waste separation at household level. Special programmes have been conducted at school level and the council has provided a bag to dispose things that cannot be used in compost making and these items are being collected once a month. High decomposing material such as food items and animal waste is collected in the morning. In addition to encourage source separation of waste, the council charges a tax on unsorted garbage collected from commercial dwellings.

4.2.2 Composting Project

Funding

Initial funds for the construction of the composting plant have been granted by the Ministry of Provincial Councils. In addition, few NGOs had also provided financial assistance for this purpose.

Production of Compost

Municipal solid wastes collected from the area consist of 80% of decomposable material and 10% recyclable material. Only 10% of waste goes to the open dump. Hospital waste and factory waste are not collected by the urban council. Technology used for composting is the open windrow system. The leachate of the decomposing piles are collected through ditches and used to moisten the piled waste.

To increase the 'N' content in the final compost, fish and meat residues are added to the center of piles. In addition, poultry manure and cow dung received from the home garden of the composting plant is also added at the 1st turning of the decomposing waste.

Availability of labour for this project is very satisfactory but the staff turnover is very low. To protect the health of the workers they were directed to medical clinics once a month and they were provided protective items such as gloves, boots, sanitary masks and welfare facilities such as safe sources of drinking and bathing water and resting facilities etc. There were no records of its workers being contracted of any disease or illnesse related to their nature of work.

Sales and Marketing

Most of the users are vegetable growers in the area and growers of plant nurseries and landscaping. Marketing of compost is done by the sales center at the composting plant. Packets of compost are available and 2kg, 5kg and 25kg bags are priced at Rs. 20, 40 and 225. So far they have not received any complaints regarding the quality of the compost produced by them. Average retail sale is about 30,000kg per month.

Constraints Experienced during the Project

Residents of the area complained about the bad odor and various impacts of water pollution caused by the leachate of open dump. Further, neighbouring land owners complained that their value of land had fallen due to this composting plant situated in an urban setting. However, it was informed that the Urban Council is planning to plant fast growing trees such as bamboo in the boundaries of the land to reduce the odor issue.

4.3 Bandaragama Pradesheeya Sabha

Bandaragama Pradesheeya Sabha in the Kalutara district consists of 103 *Grama Niladhari* divisions and it covers the two Divisional Secretariats; Bandaragama and Milleniya. The total extent of the Pradesheeya Sabha is 93.2km^2. Open dumping was adopted by the Pradesheeya Sabha until the Deldorawatta Waste Management Center came into operation in 2007 as a sustainable solution for the serious issue of disposing municipal solid wastes collected from the area. Currently the composting plant receives 10 to 12 tons of waste on a daily basis from households, street sweeps and waste collected from weekly fairs and commercial enterprises. About 10 tons of waste is mixed waste while about 2 tons are received after source separation.

4.3.1 Strategies Adopted in Solid Waste Management

To manage solid waste generated in the area, the Pradesheeya Sabha has conducted many programmes. To promote home composting, composting barrels have been distributed among more than 200 households with the financial assistance of the Ministry of Provincial Councils. In addition, garbage bins have been distributed to promote waste separation at household level. Further, public awareness programmes have been conducted covering the whole Pradesheeya Sabha area. Special programmes for pre-school children and school children have been conducted to train them to separate waste at household level.

4.3.2 Composting Project

Funding

Financial assistance has been provided by the Pradesheeya Sabha, the Ministry of Provincial Councils and the Pilisaru project of the Central Environmental Authority (CEA). Since its inception, the total cost spent on the composting project to the end of year 2012 is estimated about Rs.6,816,819.00.

Production of Compost

Compost plant and the bio gas plant are located at the Deldorawatta Waste Management Centre which is located in the interior of Bandaragama. Mixed waste is sorted manually at the plant and technology used for composting is the open window technique. Leachate is treated by collecting it to tanks via lined drains and by mixing with water at a ratio of 1:1000. This treated leachate is used to moisten the piled waste kept at maturation.

Upto now the plant has not practiced external incorporation of nutrients. However, it has obtained analytical test reports from the Horticultural Crop Research and Development Center, Gannoruwa and the Industrial Technological Institute (ITI) of Sri Lanka to perform necessary quality improvement.

Staff turnover is very low though employees of the composting plant work on contract basis. All of them undergo individual health check-ups to identify diseases. They were given treatment as well as advice on preventing measures. The Pradhesheeya Sabha is providing rain coats, gloves, masks, boots etc. for their safety. To motivate the workers, letters of appreciation have been given to those who have higher attendance.

Sales and Marketing

Retail marketing is done at both Pradesheeya Sabha and the composting plant. A compost packet of 2kg is priced at Rs.25/= and 5kg Rs.60/=. Wholesale price for 1kg of compost is Rs.10/= and has to be purchased at the composting plant itself. During the year 2011, income received from compost marketing is Rs.213,840/= and Rs.20,300/= from selling the recyclable items. However, they produce compost only for the existing demand though they have a potential of producing more compost.

Constraints experienced during the Project

Since the composting plant is located in a remote area away from the residential area, no serious complaints have been received so far. However, people of the area reported that by evening and on rainy days they had to suffer from the bad odor.

4.4 Kaduwela Municipal Council

Kaduwela is located close to the capital city of Sri Lanka, Sri Jayawardenapura Kotte. The total population of the Kaduwela Municipal Council is about 290,000 and

generation of waste per person is about 0.8kg per day. The composting plant was initiated in 2006 with the objective of reducing the quantity of waste that goes to open dump sites, which created many social and environmental issues. Financial assistance for this project was provided by the Central Environmental Authority and the Waste Management Authority of the Western Province. Initial capacity of the composting plant was 5 tons of waste per day and currently it uses 25 tons of waste per day.

4.4.1 Strategies adopted in Solid Waste Management

Daily collection of waste is about 45-50 tons and about 50% and 10% of it consists of short term degradable material and long term degradable material. Recyclable component accounts for about 15% and the remaining portion goes to the dumping sites for final disposal. Waste collected by the Kaduwela Municipal Council does not include hospital waste. During transport, fish and meat waste is collected in separate containers. Public awareness programmes have been conducted by organizing pocket meetings and distributing handbills.

4.4.2 Composting Project

Funding

Funds for the composting project have been provided by the Waste Management Authority of the Western Province, Pilisaru project of the Central Environmental Authority and the Kaduwela Municipal Council.

Production of Compost

Composting plant is located in a 3 ½ acre land and open dumping is done by the side of the compost plant. From the total waste reaching at the waste management center, only the waste separated at household level is composted currently. Open windrow technique is used for compost making and 5' piles are made by the workers manually. To reduce the odor and protect the moisture within the piles, paddy husk and saw dust are mixed with decomposing waste. Animal waste is added at the center of piles.

Quality of the compost is tested at the Horticultural Crop Research and Development Institute once in 3 months.

Workers employed in compost manufacturing have been recently absorbed to the permanent carder. They were given basic necessities for their safety and other facilities such as drinking water and sanitary facilities. To motivate the workers 25% of the revenue received from the compost business is shared among them at the Sinhala/Hindu New Year considering their attendance at work.

Sales and Marketing

Vegetable growers of the area and tea plantations are the main customers. Marketing is done at the composting site as well as at the fertilizer shop at the

Kaduwela market. Current prices of compost is Rs.11.50 per kilogram and the wholesale price is Rs.9/= per kilo of compost.

Constraints Experienced during the Project

Neighbouring wells have been polluted due to leachate and residents who were affected due to leachate of the open dump have been provided pipe-borne water facilities by the municipal council.

4.5 Waste Management Authority (WMA) of the Western Province-Kalutara

The Waste Management Authority of Sri Lanka came into operation in 2004 with the prime objective of finding a permanent and immediate solution to the waste problem in the province. Since then, the Authority has initiated short term, mid-term and long term projects on waste management by providing financial and technical assistance. The Authority had received financial grants worth Rs. 5 million from the Provincial Specific Development Grant for this purpose. To enhance the legal structure in waste management in the province the Waste Management Authority had received short term technical assistance from USAID/USAEP. Further, the Authority has formed clusters of Local Authorities to facilitate participatory projects in the Province. The composing plant at Kalutara is operational since early 2011.

4.5.1 Composting Project

Funding

Funds for this project have been granted by the Solid Waste Management Authority of the Western Province and by now they have invested about Rs. 70 million for buildings and Rs.90 million for equipment.

Production of Compost

About 60 percent of the waste collected from the Kalutara Urban Council is compostable and only about 40% is compostable from the Kalutara Pradesheeya Sabha. The composting plant is equipped with four conveyer belts to facilitate waste separation (Figure 4.3). It takes about 4 man hours to sort 1MT of waste with the conveyer belts. However, 100 percent sorting could not be expected and only recyclable items are separated from the mixed waste received at the composting plant.

Composting plant is established at the same site which was used as a dumping site for more than 50 years. Due to this, people had not resided in the vicinity. Therefore, the composting plant has been not subject to much public criticism.

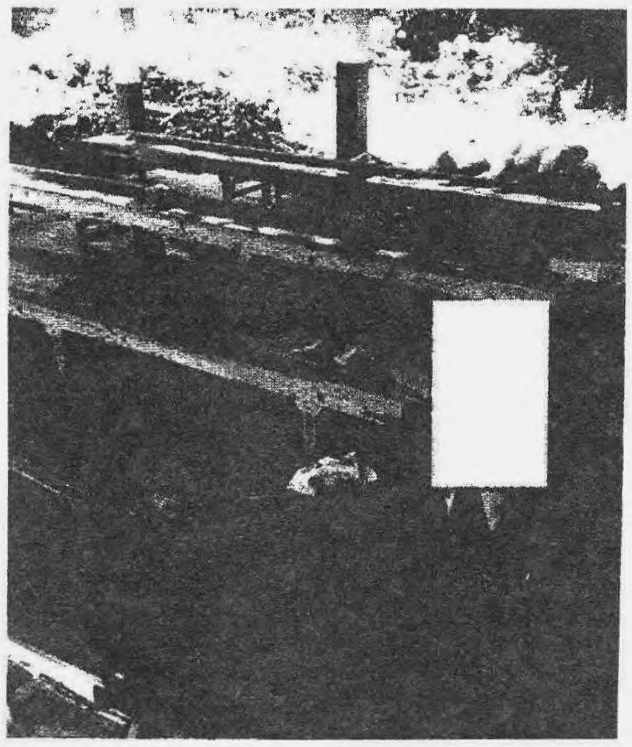

Figure 4.2: Conveyor Belts used for Waste Separation

The composting plant has the capacity of handling 60 tons of waste per day though currently it process only about 30 tons of waste collected from both Pradesheeya Sabha and the Urban Council of Kalutara. Average composition of waste collected from the Pradesheeya Sabha is significantly different than the waste collected from urban council areas.

Every three months, quality of the final compost is tested at the Horticultural Crop Research and Development Institute. The Atomic Energy Authority performs the heavy metal analysis. However, estimation capacity is limited to 100 tons per month. Up to now quality improvement is not practiced.

Cost of salaries and welfare expenses are borne by the Waste Management Authority. It provides an annual medical scheme worth Rs.200,000 which covers the entire family of the workers. In addition, workers were given protective gear such as gloves, masks, and boots twice a year. Overall health of the workers is screened by the health camps conducted by Public Health Inspectors every 6 months. Other financial incentives they receive include an year-end bonus payment and encashment of unutilized leave.

Sales and Marketing

Main users are tea growers and marketing is done by the fertilizer dealers. Current price of a 50kg compost bag is Rs.510/= at the composting site and Rs.530/= at the market.

Farmers mainly depend on the technical expertise and agricultural officers' of the Department of Agriculture as well as officers attached to Agrarian Service Centers in their respective areas. Since, MSW composting projects function separately, farmers are concerned over the suitability of this MSW compost for cultivation purposes.