Planning of Composting Programme: A Decision Maker’s Guide

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Planning the Composting Programme

• Cities that are considering to incorporate composting into their solid waste management (SWM) strategies need to conduct thorough planning to decide what type of programme best fits the needs and characteristics of their local conditions.
• Because each city possesses its own financial, socio-economic, demographic and land use characteristics, there is no fixed formula.
• A well planned compost programme poses less operational difficulties, follow budget, produce a good quality compost and market all of it and get community support to the programme.
1. Identify Composting as a Component of Integrated Solid Waste Management
2. Identify Goals of the Composting Programme

Determine what you want the programme to achieve.

- Reducing the flow of materials into landfills or incinerators.
- Diverting certain types of materials from the MSW stream, such as yard trimming, food waste, restaurant waste etc.
- Complying with national or local regulations or mandated waste reduction or material recovery targets.
- Producing marketable products and recovering revenues by selling the compost (business opportunity and income generation)
- An income and employment generation opportunity for the poor (poverty reduction)
- Improved soil and nutrient management, reduced environmental pollution
- Clean and green neighbourhood
3. Identify the Scope of the Composting Programme

- Decentralized
  - Backyard or Household Composting
  - Community/Neighbourhood Composting

- Centralized
  - Yard trimming/green waste Composting
  - MSW Composting
Decentralized Vs Centralized Composting

**Decentralized**
- Low and simple technology
- Labour intensive
- Low capital
- Low O & M
- Low transportation
- Interacts with neighborhood
- Provides no. of jobs
- Awareness generation
- Organic neighborhood farming

**Centralized**
- Highly technical
- Less labour
- High capital
- High O & M
- High transportation
- Low interaction
- Highly mechanised
- Individual awareness
- Mostly sale purpose

4. Identify the Composting Technologies

- Vermin Composting
- Takakura Composting
- Bokashi Composting
- Windrow Composting
- Aerated static pile Composting
- Aerated static pile Composting
- In-vessel Composting
- In-vessel Composting
5. Identifying Supportive Technology

- Separation belt (sorting)
- Screener (sorting)
- Shredder (size reduction)
- Front-end loaders
- Screening of compost
- Packaging (Photo: Waste Concern)
6. Identify the Potential Environmental Concerns

• Odor Control:
  – Effective control and monitoring of the composting process minimizes the ordors
  – Engineering methods to collect and treat the ordors

• Leachate Control:
  – Diverting leachate from composting area to leachate control area
  – Collect and treat leachate

• Safety Concern of Workers
  – Providing worker training
  – Safety equipments
## Criteria for Selection of Appropriate Technology

<table>
<thead>
<tr>
<th>Technical Criteria</th>
<th>Financial Criteria</th>
<th>Management Criteria</th>
<th>Environment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience with technology under the local condition</td>
<td>Investment cost</td>
<td>Labour requirement</td>
<td>Gas/ energy emission</td>
</tr>
<tr>
<td>Scale of operation</td>
<td>Operational cost</td>
<td>Skills for operation and maintenance</td>
<td>Pollution potential</td>
</tr>
<tr>
<td>Required land, water and power</td>
<td>Financing mechanisms</td>
<td>Sills for monitoring and management</td>
<td></td>
</tr>
<tr>
<td>Locally available spare parts</td>
<td>Market for end products (demand, price)</td>
<td></td>
<td></td>
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<tr>
<td>Process aesthetics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Environmental impacts</td>
<td></td>
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<td></td>
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</tbody>
</table>

7. Identify Ownership and Management Style

<table>
<thead>
<tr>
<th>Facility type</th>
<th>Owner</th>
<th>Operator</th>
<th>Arrangement</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal</td>
<td>Municipality</td>
<td>Municipality</td>
<td>Municipality provides its own equipment and labour</td>
<td>Municipality has full control of operations</td>
<td>Municipality shoulders all financial and performance risks associated with starting and operating the facility. If problems occur with the facility (e.g. traffic, Odor etc.) the municipality might have to address political issues as well.</td>
</tr>
<tr>
<td>Privatized</td>
<td>Private vendor/NGO/CBO</td>
<td>Private vendor/NGO/CBO</td>
<td>Vendor works with or without long-term service agreement with municipality to compost feedstock. Vendor design and construct the facility on the basis of private capital attracted by the predictable revenue stream created by the long term contract</td>
<td>Municipality uses franchises and operating licenses to minimize competition far the vendor and thereby minimize investment risk for the vendor</td>
<td>Municipality does not have full control over operations</td>
</tr>
</tbody>
</table>
## 7. Identify Ownership and Management Style

<table>
<thead>
<tr>
<th>Facility type</th>
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<th>Arrangement</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merchant facility</td>
<td>Private vendor/NGO/CBO</td>
<td>Private vendor/NGO/CBO</td>
<td>Private vendor designs, finances, construct and operate facility on expectation of sufficient revenues from tipping fees and service charges. No contract between vendor and municipality exits.</td>
<td>Municipality carries no financial or operational risks</td>
<td>High risks to vendor because of absence of contract guaranteeing feedstock and tipping fees. The public risks is tied to the possibility of the vendor failing and leaving the community with reduced waste management capacity. Also community has no input on the level of services and no control of costs.</td>
</tr>
<tr>
<td>Contract services</td>
<td>Municipality</td>
<td>Private vendor/NGO/CBO</td>
<td>Long-term contract with community for operation and maintenance of facility. Private vendor receives tipping fees. Municipality might staff the site or the private company might brings its own labour resources.</td>
<td>Municipality retains significant cord since it can change service company upon expiration of the contract</td>
<td>Municipality shoulders funding of facility</td>
</tr>
</tbody>
</table>

# 8. Identify Potential End Users

<table>
<thead>
<tr>
<th>User Group</th>
<th>Primary Uses for Compost Products</th>
<th>Compost Products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agricultural and residential</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forge and field crop growers</td>
<td>Soil amendment, fertiliser supplement, top dressing for pasture and hay crop maintenance</td>
<td>Unscreened and screened compost</td>
</tr>
<tr>
<td>Fruit and vegetable farmers</td>
<td>Soil amendment, fertiliser supplement, mulch for fruit trees</td>
<td>Unscreened and screened compost</td>
</tr>
<tr>
<td>Homeowners</td>
<td>Soil amendment, fertilizer supplement, mulch and fertiliser replacement for home gardens and lawns</td>
<td>Screened compost, high-nutrient compost, mulch</td>
</tr>
<tr>
<td>Organic farmers</td>
<td>Soil amendment, fertiliser supplement</td>
<td>Unscreened and screened compost, high-nutrient compost</td>
</tr>
<tr>
<td>Turf growers</td>
<td>Soil amendment for turf establishment, top dressing</td>
<td>Screened compost, top soil blend</td>
</tr>
<tr>
<td><strong>Commercial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discount stores, supermarkets</td>
<td>Resale to homeowners</td>
<td>Screened compost</td>
</tr>
<tr>
<td>Garden centres</td>
<td>Resale to homeowners and small volume users</td>
<td>General screened compost products</td>
</tr>
<tr>
<td>Golf courses</td>
<td>Top dressing for turf, soil amendment for greens and tree construction, landscape planting</td>
<td>Screened compost and top soil blend</td>
</tr>
<tr>
<td>Land-reclamation contractors</td>
<td>Topsoil and soil amendment for disturbed landscapes (mines, urban renovation)</td>
<td>Unscreened compost, top soil bland</td>
</tr>
<tr>
<td>Landscape and land developers</td>
<td>Top soil substitute, mulch, soil amendment, fertiliser supplement</td>
<td>Screened compost, top soil bland, mulch</td>
</tr>
<tr>
<td>Nurseries</td>
<td>Soil amendment, soil replacement for field-grown stick, mulch, container mix component, resale to retail and landscape clients</td>
<td>Unscreened and screened compost, composted bark, mulch</td>
</tr>
<tr>
<td><strong>Municipal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landfills</td>
<td>Landfill cover materials, primarily final cover</td>
<td>Unscreened, low-quality compost</td>
</tr>
<tr>
<td>Public works departments</td>
<td>Top soil for road and construction work, soil amendment and mulch for landscape planting</td>
<td>Unscreened and screened compost, top soil bland</td>
</tr>
<tr>
<td>School, parks and recreational departments</td>
<td>Topsoil, top dressing for turf and ball fields, soil amendment and mulch for landscape planting</td>
<td>Screened compost, top soil blend, mulch</td>
</tr>
</tbody>
</table>

9. Identify the Potential Marketing Strategy

<table>
<thead>
<tr>
<th>4 Ps of the Marketing Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
</tr>
<tr>
<td><strong>Price</strong></td>
</tr>
<tr>
<td><strong>Place</strong></td>
</tr>
<tr>
<td><strong>Promotion</strong></td>
</tr>
</tbody>
</table>
10. Identify Most Suitable Programme after Evaluating Alternative Options

• Analysis of *Material Flows and Process Costs*:
  – The method should be adopted combines material flow analysis and cost accounting in order to determine the consequences of composting for municipal waste management.
  – The aim is to model waste flows and municipal waste disposal processes as well as to show the influence of the waste flows on the costs of these process.
Case 1: Cost/Benefit Analysis of Different Scale of Composting (Source: Andante, 2012)

Assumptions made:

- Operation and maintenance cost and benefit values are in any given year of the plant lifetime.
- Utilized Indonesian Rupiah conversion rate is 1 USD = 9,433 IDR. Utilized Chinese Yuan conversion rate is 1 USD = 6.366 USD
- Sources: KITA, 2007 (for Rungkut Lor and Matale), Zurbruegg et al., 2012 for Temesi, PT. Godang Tua Jaya, 2012 (for Bantar Gebang), and Zhang, 2012 (for Nangong)

<table>
<thead>
<tr>
<th>Scale</th>
<th>Investment Costs (USD)</th>
<th>Operational and Maintenance Costs (USD/Annum)</th>
<th>Income (USD/Annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6 TPD Rungkut Lor</td>
<td>19,400</td>
<td>2,220</td>
<td>2,735</td>
</tr>
<tr>
<td>1 TPD Matale</td>
<td>33,900</td>
<td>21,300</td>
<td>24,300</td>
</tr>
<tr>
<td>51 TPD Temesi</td>
<td>380,000</td>
<td>190,183</td>
<td>260,760</td>
</tr>
<tr>
<td>200 TPD Bantar Gebang</td>
<td>5,618,043</td>
<td>937,134</td>
<td>1,404,155</td>
</tr>
<tr>
<td>638 TPD Nangong</td>
<td>77,600,000</td>
<td>3,679,820</td>
<td>3,680,366</td>
</tr>
</tbody>
</table>
Assumptions made:
Figures are per ton per day at any given time of the year. Interest rate and inflation rate is not incorporated anywhere within the calculation. Neither increase of fertilizer price and tipping fee. Machinery investment is only once throughout the entire assumed 15 years lifetime and having no reselling value. 100% of the product is assumed to be sold.
Case 2: Handling of Household Waste in Jakarta City (Source: Aretha and others (No Date))
### Case 2: Comparison of Revenue/Cost Analysis

<table>
<thead>
<tr>
<th>Description</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quantity of waste (tonnes/day)</strong></td>
<td>6,000</td>
<td>200</td>
<td>250</td>
<td>1,000</td>
<td>298</td>
</tr>
<tr>
<td><strong>Investment and Operational Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land acquisition</td>
<td>1,852,941</td>
<td>2,575</td>
<td>2,670,692</td>
<td>5,150,882</td>
<td>1,291,787</td>
</tr>
<tr>
<td>Equipment</td>
<td>300,176</td>
<td>1,765</td>
<td>12,861,040</td>
<td>9,266,182</td>
<td>1,342,071</td>
</tr>
<tr>
<td>Planning and designing</td>
<td>9,069,641</td>
<td>88</td>
<td>8,435,609</td>
<td>3,319,321</td>
<td>95,275</td>
</tr>
<tr>
<td><strong>Total investment costs</strong></td>
<td>74,113,124</td>
<td>27,958</td>
<td>38,770,978</td>
<td>24,918,028</td>
<td>2,757,488</td>
</tr>
<tr>
<td>Operation and maintenance</td>
<td>317,698</td>
<td>12,395</td>
<td>6,767,334</td>
<td>6,557,486</td>
<td>356,560</td>
</tr>
<tr>
<td>Transportation</td>
<td>1,919,680</td>
<td>655,046</td>
<td>1,919,680</td>
<td>696,141</td>
<td>1,919,680</td>
</tr>
<tr>
<td><strong>Total Costs</strong></td>
<td>76,350,503</td>
<td>695,399</td>
<td>47,457,992</td>
<td>32,171,655</td>
<td>5,033,728</td>
</tr>
<tr>
<td>Compost production (tonnes/annual)</td>
<td>706</td>
<td></td>
<td>46,976</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling price (per tonne)</td>
<td>118</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity production (kWh per annual)</td>
<td></td>
<td>20,070,912</td>
<td></td>
<td>17,849,000</td>
<td></td>
</tr>
<tr>
<td>Electricity selling price (US$/kWh)</td>
<td>0.11</td>
<td></td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Revenue + tipping fee savings</strong></td>
<td>0</td>
<td>959,045</td>
<td>2,303,275</td>
<td>1,872,553</td>
<td>2,048,296</td>
</tr>
<tr>
<td>Revenue/Cost Ratio</td>
<td>0</td>
<td>1.4</td>
<td>0.05</td>
<td>0.1</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Case 3: Process Cost Analysis in Asmara City
(Source: Silke, 2007)

Current situation: total waste collected and landfilled
Scenario 1 (Centralized Composting): 180 tonnes/day waste treated at one larger compost plant at the landfill site.
Scenario 2 (Decentralized): 60 community composting plants (180 tonnes/day)
Scenario 3 (Decentralized): 36 community composting plants (180 tonnes/day)
11. Obtaining Political Support for Implementing a New Waste Management System

- Political Consensus and support is critical for sustainable application of composting.
- The composting programmes requires some legislative and incentives.
- To obtain political support, consult them at the early-stage of planning (setting goals), arrange site visits for successful programmes, and provide first-hand information and cost/benefits analysis for facilitating decisions.

<table>
<thead>
<tr>
<th>Legislations</th>
<th>Incentives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permitting and sitting of composting facilities</td>
<td>Encourage private, NGO and CBOs to start composting programmes</td>
</tr>
<tr>
<td>Compost facility design and operation</td>
<td>Provide financial subsidies and tipping fees for their services</td>
</tr>
<tr>
<td>Compost product quality</td>
<td>Market development for compost products</td>
</tr>
<tr>
<td>Banning of landfilling or incineration of organic materials</td>
<td>Developing education and public awareness programmes.</td>
</tr>
<tr>
<td>Setting up waste reduction and recycling goals</td>
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<tr>
<td>Separated waste collection policies</td>
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</tbody>
</table>
12. Initiating Public Education and Information Programmes

- A successful waste management program requires widespread public participation in planning, sitting, operation and monitoring.

- Such participation can best be obtained through early and effective public education programs, which must continue even after the program is in full swing.

- The six stages of a successful education program include the following:
  - \textit{Awareness}: At this stage, people are learning about something new.
  - \textit{Interest}: After people have been made aware of waste management issues, they seek more information. Need a variety of methods to inform people.
  - \textit{Evaluation}: At this stage, individuals decide whether to participate or not. For even well-promoted programs, initial participation is about 50%.
  - \textit{Trial}: Individuals try the program at this stage. If they encounter difficulty, they may opt not to continue participating.
  - \textit{Adoption}: Participation should continue to grow. On-going education programs solicit constructive feedback and provide new program information when necessary.
  - \textit{Maintenance}: On-going incentives and education keep participation rates high.
13. Identifying Necessary Financing

- Obtaining necessary financing is an integral part of planning a composting programme.
- A variety of financing methods may be available:
  - Municipal budget allocation
  - National government subsidies (loan) under the special programme
  - Municipal bond or bank loans
  - Private sector investment
  - Community contribution
  - Donor funding
  - Carbon credits (CDM)
DISCUSSION WITH THE PARTICIPANTS
Objective of the composting

- Economic Benefits
- Promote 3Rs
- Reduced waste to be land filled
- Environmental Benefits
- Promote agricultural resources
- Environmental education
- Reduce waste at source
Oyama-town

- Palm wine
- Farmers
- Eco-tourism
- Community development – long history
- Cooperate
Oki-town

- 25 waste reduction
- Bi-gas, liquid fertilizer
- Women make soap
- 2016 zero waste incineration
- Community collection points
- Integrated SWM
- Subsidy for farmers
- High investment costs
- Good order control system
- Famous for some special products
- Community awareness/involvement high
Sasebo

- Bokashi composting
- H/H composting
- Low-cost
- Marketing seed compost
- Oil make different quality
- Training of trainers
- Anaerobic H/H bins
- Bamboo powder for seed compost
- Organic farming
- High nutrient value
- Children awareness
Hachigame

- Smell
- 40 days process, 2 months for maturing
- No shredder
- Mechanical/labour methods
- High production
- Partnership with university professor good for technology, monitoring quality and awareness raising
- Subsidies from government
- Very good PR and marketing strategy
- Partnership with community
- Sawdust
- Problem in collection centers (people are not willing to keep baskets in front of their houses)
- Political issue with the city office