

Technology for Waste Management and Infrastructure – Madhyapur Thimi Municipality

1. Existing Waste Management Systems

The following paragraphs describe the existing practices in the management system relating to WAB. The management system has been described based on generation based waste management system and stakeholder based waste management system as given below:

2. Generation-based Waste Management

The generation based waste management system consists of three major sectors. They are the farms; the agro processing units or the agro-industries; and the commercial facilities or the vegetable markets. The existing management systems for the sectors are presented below:

2.1 Agricultural Farms

The main crops being planted in the MTM are the paddy, wheat, maize and vegetables. Once the agricultural products are ready and in the right time of the season depending on the crop, the farmers harvest the crops.

Paddy and wheat crops are harvested by cutting the plants leaving around 3 inches of straw and roots in the field. The paddy or the wheat grains are thrashed out from the plant manually or using the thrashing machine and the rice straw or the wheat straw is piled and left in the field for drying. The dried straw is bunched in a size of around one kilogram. The farmers are found to use themselves some of these bunched rice straw and wheat straw for tying of vegetables, knitting of mats, roofing of huts, cattle feeding etc. For this the farmers transport the necessary amount of straw bunches from the field to their house manually or on bicycle or power tillers. Any remaining amount of such waste is sold to other users mainly from the farm itself. Some of such wastes especially short fibers and dust are also being burnt openly in the field.

In case of the maize crop, the cobs are only harvested leaving the stalks in the field for drying until the field is to be prepared for the next crop. Some farmers, who also have

cattle farming, use the green stalks for cattle feeding. For the preparation of the next crop, the maize stalks are cut and piled or subjected to open burning. Some farmers are found to carry these dried stalks to their home for using as cooking fuel. The leaves covering the cobs and the stem of the cob after removing the maize grain are also used as cooking fuel.

In case of Vegetables, the crops are plucked leaving the non-sellable portion in the field itself. The waste vegetable portion is heap dumped to leave it for decaying and used as fertilizer for the next crop. Some farmers even remove the waste vegetables from the field to dump them in the land near to the river especially when the land is to be used immediately for next crop. Dry and not decayed plants are openly burnt in the field before preparing plantation of next crop.

Level at Madhyapur Thimi Municipality

The survey has shown that out of the 300 households, only three persons have received training on environmental aspects and waste management. Out of them 3 persons have been trained from local club, 2 from local club, 3 from NGOs and one has received training from government as well as NGO. Only five of them are found to use the knowledge from the training.

2.2 Agro Industries

Agro- industries producing WAB operating in MTM are only rice mills and beaten rice or Chiura mills. Paddy is used as raw material to produce rice and rice husk results as byproduct or waste product. As the rice mills in MTM is small Sheller mills, the rice husk produced is not consumed or used internally. The rice husk produced is first heap dumped and then packed in jute sacks of around 20 kilograms. These sacked husks are piled in the store area and they are sold to be used as fuel.

The chiura mills also use paddy as the raw material to produce beaten rice or chiura. Rice husk gets produced as byproduct or waste product. Most of such rice husk produced is used in the industrial cook-stove in the process of roasting the paddy. Remaining rice husk is heap dumped and then packed in sacks. These sacks are piled in the store to sell them to poultry farms.

2.3 Commercial

MTM has one wholesale vegetable market in Naghdesh and two organized retail markets one at Gatthaghar and another one at Kaushaltar. The wholesale market operates from 3 am to 6 am in the morning and the waste vegetables generated in the

area is collected by the Municipality. The collection is done using hand cart and it is carried to Municipal waste bin. Municipality Solid Waste (MSW) Tipper comes to collect such wastes from the bean to carry and dispose openly to the riverside. Similarly, the vegetable wastes generated in the retail markets are collected and disposed to open area near to the rivers using tricycle carriers by private operators.

3. Technology and Infrastructure

The prevailing technology and infrastructure for the Waste Management in MTM have been described below:

- *Primary Collection and Transfer stations:* The collection is done manually and there is no transfer station for WAB
- *Transportation:* The transportation means for the transportation of WAB are manual on shoulder using Kharpan, bi-cycle, tricycle rickshaw and in a small number on power tillers or tractors.
- *Pre-treatment:* Open and direct Sun drying is the only pre-treatment used on WAB.
- *Recycling and Recovery:* WAB is only used as fuel. Vegetable wastes are used for composting.
- *Final Disposal:* Final disposal is just dumping openly along the river.

Prevailing technologies for Waste Management (WM) have been presented in the table below:

Table 1: Data Sheet on Prevailing Technologies for WM

Area of Application	Technology		
	Type	Number	Important Features
1. Collection	Hand tools	As no of farmers	Manual
2. Transportation	Kharpan, bicycle, tricycle, Power tillers	Varying	Traditional
3. Pre-Treatment	-	-	Only sun drying
4. Recycling /Recovery	Burning	-	Traditional
5. Disposal	open	-	Adverse impact to environment

The table below presents the analysis of limitations of prevailing technology for WM:

Table 2: Analysis of Limitations of the Prevailing Technologies for WM

Area of Application	Technology	Limitations			
		Technical	Economic	Environmental	Social
1. Collection	A: manual	slow	- (Low cost)	- (No adverse impact)	- (accepted)
2. Transportation	A: Kharpan	Human effort based	- (Low cost)	No adverse impact, but health impact is there	-
	B: bicycle/tricycle	slow	Medium cost	- (No adverse impact)	-
	C: tractor	Not accessible	High cost	Polluting	Only rich farmers can afford
3. Pre-Treatment	A: sun drying	Seasonal slow	- (Low cost)	-	-
4. Recycling /Recovery	A: used as fuel	Traditional	Low benefit	Polluting	Complained by neighbour
	B: Used in poultry	Traditional	Comparatively low benefit	Odour problem	-
	C: composting	Traditional	Low benefit	GHG emitting	Complained by neighbour
5. Disposal	A: open dumping along river	-	-	polluting	Aesthetic, religious problems

Any new technology to be introduced should have the essential and desirable performance criteria as given in the table below:

Table 3: Expected Performance Criteria of Technologies for WM

Area of Application	Expected Performance Criteria							
	Technical		Economic		Environmental		Social	
	Essential	Desirable	Essential	Desirable	Essential	Desirable	Essential	Desirable
1. Collection	simple	manual	Beneficial to generator	Low cost	Without health hazard	Non-polluting	Not disturbing traditional practice	Local Employment generating
2. Transportation	Appropriate for land condition	Efficient	Low Cost	Cost on volume basis	Meeting std.	Eco-friendly	-	No noise disturbance
3. Pre-Treatment	-	simple	-	Low cost	Meeting	Eco-	As per IEE	Beneficial

					std.	friendly	report	to society
4. Recycling /Recovery	-	efficient	Within budget	Low cost	Meeting std.	Eco-friendly	As per IEE report	Beneficial to society
5. Disposal	Proper site	Scientific land fill	Within budget	Low cost	As per IEE report	Eco-friendly	As per IEE report	Beneficial to society

The roles of stakeholders, gap analysis and suggested improvement measures are presented in the table below:

Table 4: Role of Stakeholders, Gap Analysis and Suggested Improvement measures

Area of Application	Major Stakeholders	Role of Stakeholder	Gaps and Weaknesses	Suggested improvement measures
1. Collection	Waste Generator (Farmer, industry)	Collection, segregate, pre-treat	Inefficient collection	Improvement in the collecting practices
	Govt. / MTM	Develop Code of Practice, Collection, Formulation of rules, monitoring	Weak enforcement, Impractical rules	Rules and regulations should be practical and strict enforcement
	Service Provider	Collection	Inefficient collection	Improvement in the collecting practices
	Private / NGO	Awareness, Collection	Insufficient awareness, Inefficient collection	Improvement in the collecting practices
2. Transportation	Waste Generator (Farmer, industry)	Transportation to storage point	Inefficient and inappropriate transportation	Improvement in transportation system
	Govt. / MTM	Develop Code of Practice, Formulation of rules, monitoring, transportation	Weak enforcement, Impractical rules	Rules and regulations should be practical and strict enforcement

Area of Application	Major Stakeholders	Role of Stakeholder	Gaps and Weaknesses	Suggested improvement measures
	Service Provider	Transportation	Inefficient transportation	Improvement in the transportation system
	Private / NGO	Transportation and awareness	Insufficient awareness, Inefficient transportation	Improvement in the transportation system
	Waste Generator (Farmer, industry)	Pre-treat (drying only)		
	Govt. / MTM	Develop Code of Practice, Formulation	No rules and	Develop Code of Practice,

3. Pre-Treatment		of rules, monitoring	regulation	Formulation of rules, monitoring
	Service Provider	-	-	May introduce pre-treatment
	Private / NGO	-	-	May introduce pre-treatment
4. Recycling /Recovery	Waste Generator (Farmer, industry)	-	-	Better if the generators introduce recycling / recovery unit
	Govt. / MTM	Motivation and incentives, Formulate rules and regulation of rules, monitoring	No motivation, No incentives, No formulation of rules and regulation	Motivate other stakeholders, Formulate rules and regulation
	Service Provider	-	-	Better if the service providers introduce recycling / recovery unit
	Private / NGO	Recycling / recovery	Inefficient and incomplete recycling / recovery	Improve and efficiently operating recycling / recovery unit
5. Disposal	Waste Generator (Farmer, industry)	Disposal	Partial and improper disposal	Either complete and proper disposal or subcontract disposal
	Govt. / MTM	Awareness, dumping site arrangement, Formulate rules and regulation of rules, monitoring, dumping	No dumping site, No formulation of rules and regulation	Arrangement of proper dumping site, formulation of rules and regulation
Area of Application	Major Stakeholders	Role of Stakeholder	Gaps and Weaknesses	Suggested improvement measures
			improper disposal	dumping site
	Private / NGO	Awareness, disposal	Insufficient awareness, improper and incomplete disposal	Massive awareness, Proper and complete disposal

Reference

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