STUDY ON THE TRADITIONAL PRACTICES FOR SOLID WASTE RECYCLING IN RURAL HOMES

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ABSTRACT

Solid wastes are important components for recycling biomass to return the nutrients to their origin. Traditionally, the people of the Ganges and the Brahmaputra basins have been recycling solid wastes for centuries. The practices which are followed here have scientific merit but in most of the cases, the people are ignorant about those facts. The present study was conducted in 90 rural homes of Ishwarganj and Nandail Upazillas under the district of Mymensingh. The objectives of the work were to find out the scientific explanations of the recycling practices. The study showed that the traditional procedures which are being applied on trial-and-error basis got the effective result of supplementing organic materials to the soil. Although these effective practices have been used generation after generation, in-depth studies were not carried out. This study has uncovered the scientific reasons behind many of the traditional practices of solid waste management. Chemical analyses revealed that most of the macro-nutrients, namely potassium, phosphorus, nitrogen, calcium, sulphur, magnesium, iron and total organic matter contents were not depleted; rather, the total organic matter contents increased significantly after the recycling. This kind of rural home-based and short-cycled solid waste management ensures zero depletion of organic soil content.

INTRODUCTION

Civilization began when nomads first took shelter in permanent homes and started cultivating the earth. Home became their centre of all activities. They used to collect their livelihoods from the surroundings, learnt to process and store them for their use in their homes. During the processing and utilization, the un-utilized remaining, called the 'wastes' were left, thrown away or stored for degradation and recycling. From the experience, people acquired knowledge for easy and safe recycling methods for better utilization of wastes in favor of natural environment. Home is a microenvironment and fulfils an ecosystem.

Traditionally, the inhabitants of the Ganges and Brahmaputra Plains were more conscious about hygiene, natural resources and agricultural practices and they were used to practice simple methods in their homesteads knowingly on unknowingly, which are really important and scientifically rich even during this advanced technological era.

However, with the advancement of mechanization and industrialization and the influences of western culture many of the traditional cultural practices have lost their importance and are not in use by the common people. Therefore, it is essential to collect the age-old practices used by the common people for waste management and biomass recycling. These should be studied to investigate their scientific merit and re-establish their positive roles in the present complicated situation aroused by the modern cultures, specially, by the chemicals and shortcut cultures. With this aim, Centre for Global Environmental Culture (CGEC) of IUBAT—International University of Business Agriculture and Technology along with Homestead Cropping and Ecoagriculture Research Center for Sustainable Rural Development (HCERCSRD) conducted the present study in a few villages of Mymensingh in the Brahmaputra Basin.

MATERIALS AND METHODS

During the study, the sources of waste, previous and present practices of waste and residue management were investigated; relevant information and data were collected from the fields and villagers. Fact-finding works were done through physical observation, analysing data and comparison with present practices. Traditional practices are supported by figures and question-answer methods with the villagers. Chemical analysis of soil was done in the laboratory of the Bangladesh Tea Research Institute, Srimangal. The present study carried out in-depth analysis of the major crops and activities are focused.

OBSERVATION

The following major sources of wastes in the rural homes are found, in most cases the biological products come from the fields, homestead forests, ponds, rivers, Haors, Bheels, and the markets, are utilized and processed and the residues are recycled through some traditional practices.

The main sources of solid wastes are:

1. Agricultural crops
2. Foods
3. Pets and domestics
4. Litter and sweepings
5. Fuels
6. Clothing
7. Building materials
8. Utensils
9. Corpses, faeces and excreta

Agricultural Crops

Major crops

1. Food crops: Rice, wheat, millets, sugarcane, lentil, pulses, potato, vegetables, onion, garlic, ginger, turmeric and chilies etc.
2. Fruits and nuts: Mango, jackfruit, litchi, banana, carambola, papaya, pineapple, lemons and oranges, black berry, Bullock's heart, coconut, betel nut, Palmyra palm and dates etc.
3. Meats and Fishes: Beef, mutton, chicken and fresh water fishes and prawn etc.
4. Fibres: Jute, hemp, silk cotton, coir and silk etc.
5. Oilseeds: Mustard, linseed, peanuts, sesame and castor oil etc.
6. Corms and tubers: Arums (*Colocasia spp.*), Elephant foot yam, Kham-aloo (*Dioscorea atata*)

Rice

Rice is the major crop produced by the farmers of the villages. After harvesting this field crop, the grains are separated from the panicles, are cleaned by sieving or blowing out the debris, Chittas etc. Husks and bran are also removed manually by traditional Dheki and or power operated husking machine. Residues viz. straws, Chittas, husks and bran have the secondary uses and then undergo decomposition or burnt to ashes. The common practices are:

Table No. 1 Traditional uses and recycling of rice residues

Residues	Primary Use	Secondary Use	Dispersal, decomposition and recycling
Straws	Fodder, Thatch, Packing materials, Fuel	Mulch	Cow-dung, Ash, Compost
Chittas	Fuel	Mulch	Ash, Compost
Husks	Fuel, Smoking, Mud-wall cladding	Mulch	Ash, Compost
Bran	Fodder, Poultry feed		Excreta, Compost

Jute

Jute is the second most important crop produced by the farmers of the selected villages. After maturity, jute is harvested from the field, rotten in water; fibres are separated from the sticks, dried and bundled for sale. Fiber is the primary product used for weaving, ropes and threads etc. Sticks are also dried and used as fuel, thatch, wall cladding and also for making pulp.

The common practices are:

Table No. 2 Traditional uses and recycling of jute residues

Residues	Primary Use	Secondary Use	Dispersal, decomposition and recycling
Sticks	Fuel, Fence, Cladding, Thatch, Chips, Paper pulp, Support for creepers and climbers	Mulch	Ash, Compost
Leaves	Vegetable, Fuel, Fodder,	Mulch	Ash, Compost
Pods/Capsules	Fuel	Ticca (carbon), Mulch	Ash, Compost
Roots	Fuel	Ticca (carbon)	Ash, Compost

Sugarcane

Sugarcane is another important crop produces in this area. After maturity, the canes are harvested and sent to the mills or brought to the homes for traditional roller driven juice squeezer. The bagassee, leaves, leaf sheaths and twigs are the major residues which are utilized and recycled

The common practices are:

Table No. 3 Traditional uses and recycling of sugarcane residues

Residues	Primary Use	Secondary Use	Dispersal, decomposition and recycling
Bagassee	Fuel, Paper pulp, Packing materials	Mulch	Ash, Compost
Leaves and leaf sheaths	Fuel, Fodder, Cladding, Thatch	Mulch	Ash, Compost
Twigs	Propagation	Fodder and fuel	Ash, Compost
Roots	Fuel		Ash, Compost

Vegetables

Vegetables are also important crops produced in this area. The common vegetables are egg plants, tomatoes, amaranths (Danta, Lalsak), arums, beans, cucumbers, pumpkin, gourds, Pui, cinopodium, radish, cauliflower, cabbage and drumsticks etc.

The common practices are:

Table No. 4 Traditional uses and recycling of vegetables residues

Residues	Primary Use	Secondary Use	Dispersal, decomposition and recycling
Whole plant	Fodder		Ash, Compost
Leaves and leaf sheaths	Fodder		Ash, Compost
Twigs	Propagation		Ash, Compost
Roots/bulbs	Fodder, propagation		Ash, Compost

Disposal of Solid Wastes

Solid wastes are disposed and recycled traditionally for hundreds of years. The people of the experimental area informed that they did not know when these systems were started. They also do not know the reasons for such accumulation of the refuses separately with distinct groups. They might have used trial and error method to establish best process for recycling. One thing is clear from the interrogation that, they know the need and benefits of the wastes for their crop production. During the study, it was also found that people followed some specific methods for specific purpose of conducting the simplest ways of decomposition and recycling. A utilization and decomposition chart of household refuses is shown below.

Usually the green garbage and dungs of cow and horse are disposed in a pit of 2-3 meter

1. Compost Pit: Cow-dung, goat droppings, fodder residues, waste green vegetables,
2. Sweepings: Fallen dry leaves, chicken and duck droppings,
3. Ash Heap: Fuel wood ash from the kitchen, burnt dry leaves and straws, etc.
4. Human faeces: Latrine

Fig. 1. Heap and rice straw

Fig. 2. Cows eating straw

Fig. 3 Cow-dung

Fig. 4. Drinking water

Fig. 5. Compost heap

Fig. No 6. Compost

Fig. 7. Compost in the field

Fig. 8. Fuel wood

Fig. 9. Withered thatch

Fig. 10. Sugarcane Bagassee.

Fig. 11. Ash collection

Fig. 12. Cow-dung sticks

Fig. 13. Kitchen

Fig. 14 .Large stove

Fig.. 15. Ash application

Fig. 16. Ash application

Fig. 17. Cleaning utensil with ash

Fig. 18. Jute hanger

Fig. 19. Bamboo crafts

Fig. 20. Bamboo cladding

Fig. 21 .Floor cladding with Dung & Husk

Fig. 22. Pitcher/Coconut shell

Fig. 23. Goats eating banana sheath

Fig. 24 Goat droppings

Fig. 25. Chili

Fig. 26. Chicken room

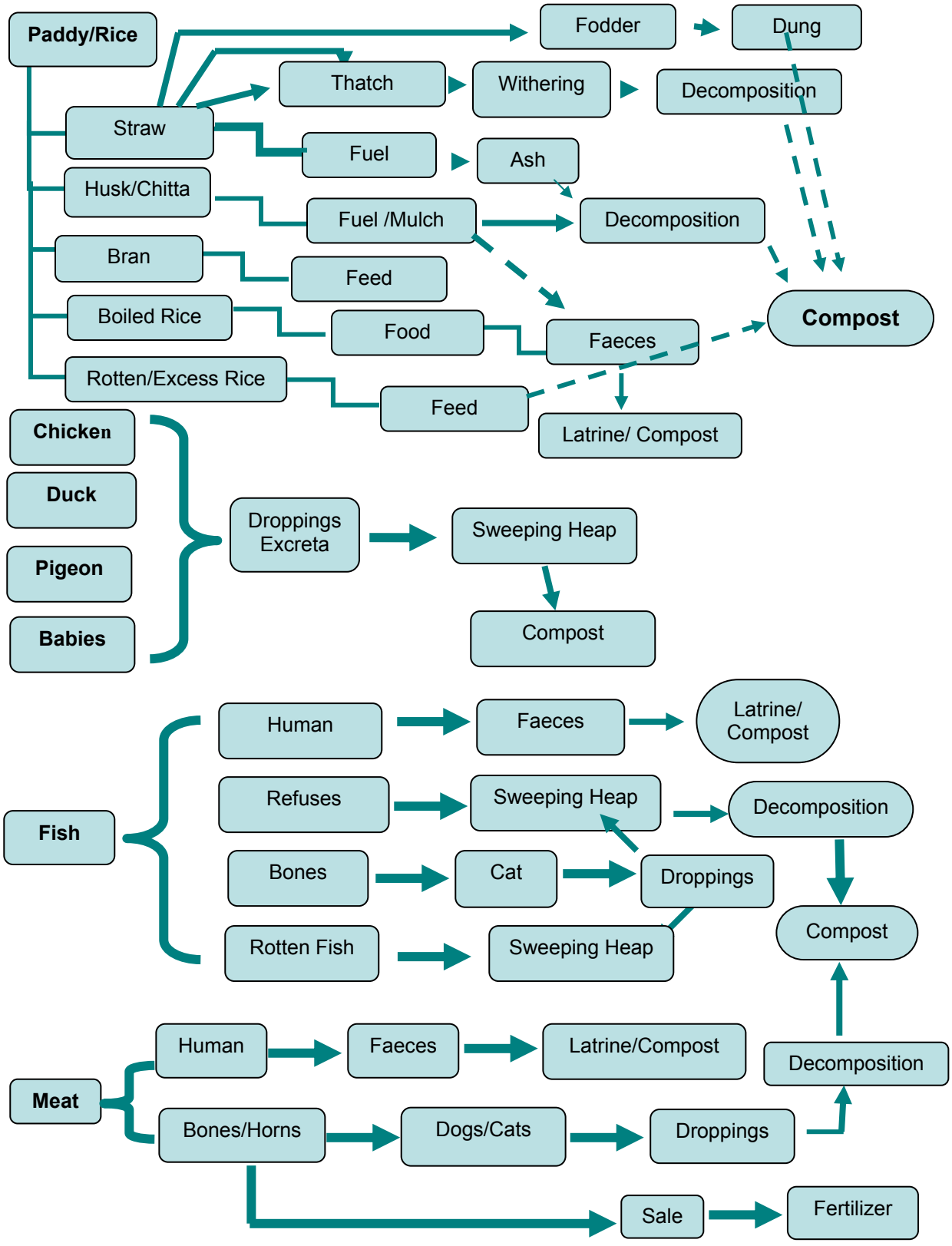
Fig. 27. Mulched Bamboo

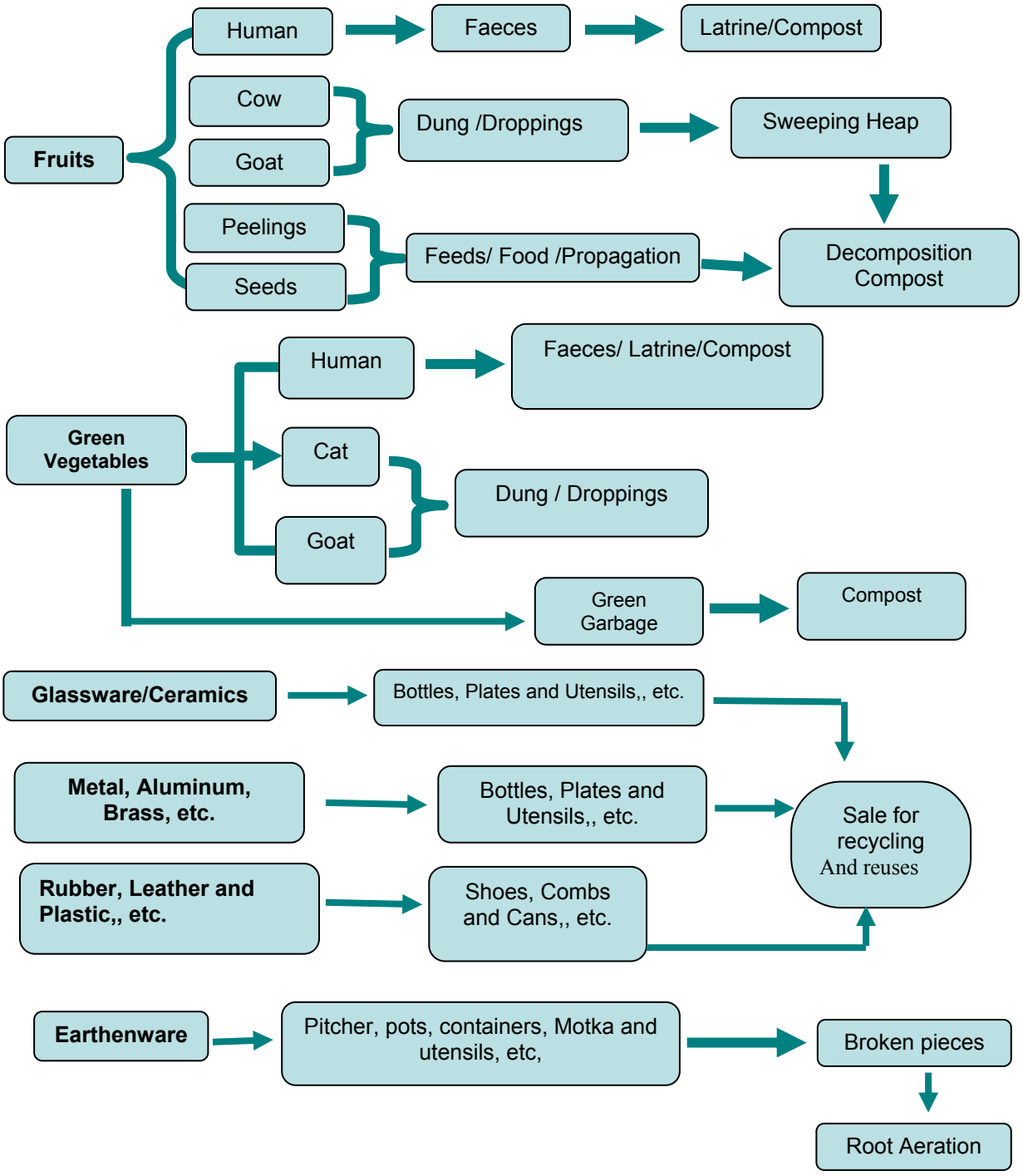
Fig. 28. Bamboo beams &thatched roof

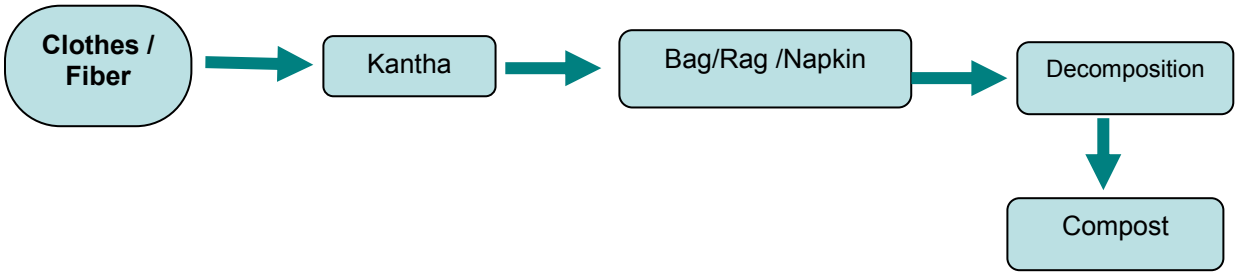
Fig. 29. Betel nut leaf fence

Fig 30.Luxariant growth of homestead plants

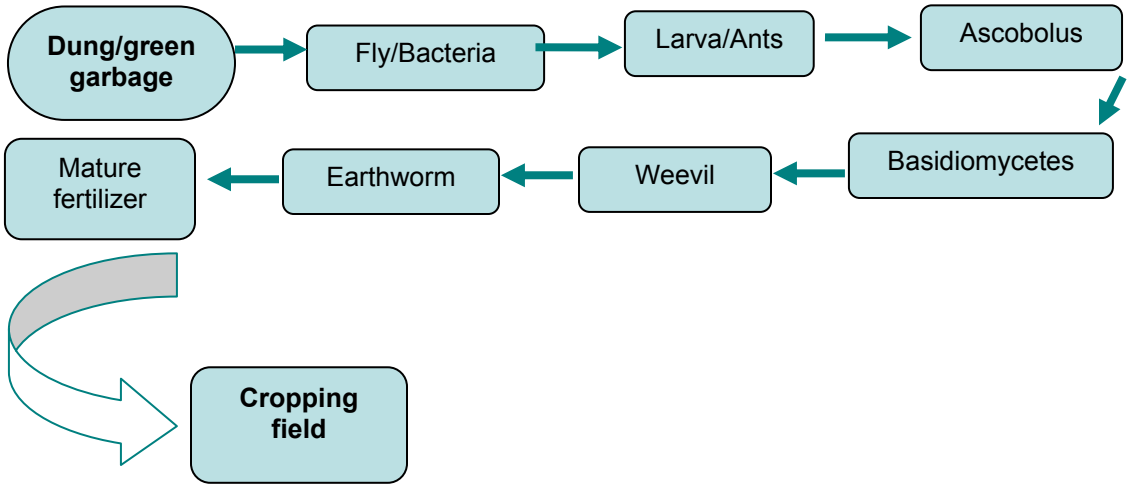
Utilization and decomposition chart of household refuses




Human
Faeces
Latrine/Compost
Cow
Goat
Dung /Droppings
Sweeping Heap
Fruits
Peelings
Seeds
Feeds/ Food /Propagation
Decomposition
Compost
Human
Faeces/ Latrine/Compost
Green
Vegetables
Cat
Goat
Dung / Droppings
Green
Garbage
Compost
Glassware/Ceramics
Bottles, Plates and Utensils,, etc.
Metal, Aluminum,
Brass, etc.
Bottles, Plates and
Utensils,, etc.
Sale for
recycling
And reuses
Rubber, Leather and
Plastic,, etc.
Shoes, Combs
and Cans,, etc.
Earthenware
Pitcher, pots, containers, Motka and
utensils, etc,
Broken pieces
Root Aeration



Succession of decomposition flora and fauna during green garbage and cow-dung compost



RESULTS AND DISCUSSION

Chemical analyses revealed that the total organic matter and the ingredients viz. nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, iron are not depleted after intense cropping. Analysis was done by taking samples from the fields which were not applied with any chemical fertilizers other than compost and mulching and no significant change was observed after intense cropping. The result is shown in the table 5:

Table 5 : Soil analysis report

Soil ingredients	Ingredient in April 2007 (ppm)	Ingredient in April 2008 (ppm)
Nitrogen	1230	1410
Potassium	85	95
Phosphorus	40	40
Magnesium	55	55
Calcium	100	110
Iron	125	120
Sulphur	45	40
Total Organic Matter (%)	1.57	1.61

Green garbage and cow-dung are decomposed in a 3m X 3m X 1.5m open pit, usually 20-30 meter from the houses. The major wastes are cow-dung, vegetables refuses, wet straws, green grasses, urine-mixed straws and sweepings from the cowshed. It takes about 7 to 8 months to complete decomposition starting

from the month of February and March. The villagers do not mix ashes and dry leaves with the green garbage and cow-dung. Since ash does not contain nitrogen and dry leaves contain very low nitrogen, decomposition of green garbage delays significantly.

However, all fallen leaves and sweepings are gathered in a separate place and chicken, pigeon and duck droppings etc. are kept together for quick decomposition. As the dry leaves have very high carbon and low nitrogen (Rahman 2004 and 2005), the villagers are used to add fish remains, chicken droppings and baby stool etc. which contain high nitrogen (Talukder *et.al.* 1993) with sweeping leaves for quick decomposition. However, in the wet season: June to August the sweepings decompose readily but in the dry season especially from October to April they use the sweepings mostly for mulching and some people burn them to make ashes.

The villagers are found to store ashes in a separate place or container. The ashes are mainly from wood, rice husk, jute sticks, rice straws, burnt leaves, dry cow-dung (Ghote) and cow-dung sticks, rejected or withered building materials. Leaves of coconut, betel nut and Palmyra palm etc. are usually used for making brooms, household utensils, handicrafts, fencing and also for mulching of coconut, areca nut, bamboos etc. However, after withering they are often used as fuel. These mulches are readily decomposed and the ashes are used as fertilizer and also to control insects.

After decomposition of the refuse, the villagers obtain manure and use this according to the needs of the crops. They use ashes for enrichment of soil fertility and to control pests and diseases. Thus, they ensure recycling of biomass to the cropping land which keeps the soil at zero depletion of nutrients through their traditional practices.

However, with the advancement of modern technology, mechanization and urbanization have been hampering rural home-based short-cycled biomass recycling and the countryside is suffering a great nutrient depletion. Therefore, we need in-depth study to incorporate traditional knowledge for improving the fertility of the soil of Bangladesh.

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