GENERATION AND COLLECTION PRACTICES OF ORGANIC KITCHEN WASTE IN HOUSEHOLDS OF MANIPAL

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Abstract:

The present study was conducted to understand the organic kitchen waste management practices in households of Manipal. The general steps in waste management are 1. Generation 2. Collection 3. Sorting 4. Separation 5. Transfer 6. Transport and 7. Disposal. This study was aimed at understanding the management practices at the first two steps only ie. Generation and Collection. Data was collected by interviewing the household members, with the help of a structured questionnaire. The study brought out the various types of wastes generated, the constituents and their quantum in organic kitchen wastes as well as the activities which happen at the generation and at the two waste collection points.

Key Words: Organic kitchen waste, generation, collection

Introduction

Disposal of household waste is one of the biggest challenges that towns and cities all over the world is facing. Multifold are the problems associated with the disposal of waste from all three streams of waste i.e. municipal waste, commercial and industrial waste and construction or demolition waste. Kitchen waste forms a significant constituent of municipal waste. The composition of municipal waste varies greatly from country to country and changes significantly with time. Municipal waste is generally categorized as (i)Biodegradable waste: food and kitchen waste, green waste, paper (ii) Recyclable material: paper, glass, bottles, cans, metals, certain plastics, fabrics, clothes, batteries (iii) Inert waste: construction and demolition waste, dirt, rocks, debris (iv) Electrical and electronic waste (WEEE) - electrical appliances, TVs, computers (v) Composite wastes: clothing, tetra packs, waste plastic such as toys. (vi) Hazardous waste including paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and containers(vii) Toxic waste: pesticides, herbicides, fungicides and (viii) Medical waste[1]. These wastes have different characteristics and can be divided into those which are bio-degradable and not, as well those which can be re-cycled or not. The ability to manage them further, comes from the understanding of wastes.

Municipal waste management is a challenging task.It consists of various stages such as recycling, composting, land filling and waste-to-energy via incineration. The primary steps are generation, collection, sorting and separation, transfer and transport, and disposal[2].Collection includes the gathering of the generated waste which will either be disposed in a landfill disposal site or taken to a further processing facility. There are two collection points; one at the individual house and the other at common points of waste collection in a locality. The third step is the sorting and separation. Separation and sorting of waste at both the household and common collection points are usually done. One usual categorization of household waste is by segregating the waste into biodegradable and non -biodegradable as well as recyclable and non-recyclable. The fourth step is the transfer and transport. This element involves two main steps. First, the waste is transferred from a smaller collection point to a to larger transport point. This waste is then transported, usually over longer distances, to a processing or disposal site. The final step is the disposal. The further processing depends on the philosophy of the municipality, concern for environment, and the sensitivity of the

residents and possibility of commercial viabilities. This study focuses on the nature of organic kitchen waste and the generation and collection of it at different households.

This study focused on the organic waste from households [5].Kitchen waste contains lots of rich nutrients which include carbohydrates, lipids and protein compounds that are not harmful. A more detailed analysis of kitchen waste shows that it can be further divided into two categories i.e. waste of vegetarian food items and waste of non-vegetarian food items. A study done in an urban community in a state of North India, is shown in Table-2[6].

Table 1: Constituents of organic kitchen waste.

Constituents	% composition*
1. Cooked rice	23.00-59.50
2. Cereals	8.76-18.93
3. Cooked vegetables	5.68-16.27
4. Chappatti	18.67- 41.90
5. Vegetable waste residue	1.37-2.59
6. Salad	17.40-29.50
7. Misc/ non vegetarian items	0.79-2.16

*the average, based on a study conducted on a few households observed over a few days.

Kitchen waste has chemical characteristics which are beneficial as well as non- beneficial for the natural environment. Kitchen waste is usually acidic.Since there is a wide variation in food content, there can be a wide variation in Chemical Oxygen Demand (COD) content.COD indicates its decomposing nature and thus its bio degradable characteristics. Some of the chemical characteristics of kitchen waste are shown in (Table-2) [6].

Table 2: Chemical characteristics of organic kitchen waste

Parameter	Median value
Density, kg/m^3	797 ± 51.33
pH	5.9 ± 0.49
Alkalinity, mg/l	44 ± 20.11
COD, gm/l	396.82 ± 265.95
TS, %	23.16 ± 4.01
VS, % of TS.	97.64 ± 3.19
Moisture content %	76.85 ± 4.01
Carbon %	38.68 ± 1.34
Nitrogen %	1.5 ± 0.26
C/N	24.7 ± 4.83
Phosphorus %	0.3255 ± 0.006
Potassium %	0.225 ± 0.035

Objectives

To understand the generation and collection practices, of organic kitchen waste, in households of Manipal.

Methodology

This study was aimed to find out the kitchen waste generation and collection practices of households. The study was limited to the first two steps in the waste management cycle i.e. kitchen waste generation and collection. The study is limited to knowing the nature and type of generation and collection of only organic kitchen waste.

The study was limited to Manipal in the Udupi district of Karnataka. According to the Census of India 2011 Udupi district has a population of 2,35,000 households. Manipal is a semi urban township in Udupi district and is about 6 km in diameter and has a population of about 26000 households. Manipal has both municipality and panchayat areas. Most of the households are in the middle and upper class category and it is on this household sample, that the study was carried out.

Sampling

The sample of households selected was limited to 100 in number, as there was a lot of homogeneity in characteristics of most of the households in Manipal. The population was divided into 3 strata 1. Households with an income, Rs. 1.0 lakh and above per month 2. income of households between Rs. 50,000 and Rs. 1.0 lakh and 3. income of households below Rs. 50,000 per month.

Stratified proportionate random sampling was used for sampling. The sample size consisted of 20 households form the first, 60 from the second and 20 from the third strata. But care was taken to choose households in the municipality and panchayat areas and also from vegetarian and non-vegetarian households, graduates and non- graduates, as well as those who own a house or living in rented house.

Table 3: Characteristics of the sample studied

Strata of households	Vegetarian %	Non Vegetarian %	Graduate and above %	Below graduation %	Own house %	Rented house %
Rs. 1.0 lakh and above	45	55	75	25	62	38
between Rs. 50,000 and Rs. 1.0 lakh	40	60	65	35	52	48
Below Rs, 50,000 per month.	55	45	50	50	44	56

Data collection and analysis

Data was collected through the interview method , using a structured questionnaire. A 7-point Likert scale was used to measure satisfaction of households towards waste collection.

Data was quantitatively as well as qualitatively analyzed. Mean, percentages and rating scores were calculated .

Findings

Every household was concerned about the proper management of kitchen waste. At an average, about 820 gms of waste per day is generated from each house.

Composition of kitchen waste

House hold waste consisted of kitchen cooking waste, plastic, paper, glass, metallic items, clothes, house cleaning wastes etc (Table-4) .

Table 4: Composition of Household waste.

Constituents	**% of composition**
Kitchen cooking waste	36
Plastic	20
Paper	15
Glass,	6
Metallic items	8
Clothes	6
House cleaning wastes	3
Misc.	6

The most frequently generated wastes are kitchen wastes, plastic and paper. A major component of plastic is milk cover and the plastic carry bags from shops. About 20% of the households separately keep milk plastic covers to be sold to scrap merchants' over a period of time. Paper wastes are the result of writing paper and other paper stationery items used by students and elders in the house. Newspapers are generally separately kept and sold as scrap to scrap merchants by most houses. Kitchen waste which is the major constituent of house hold waste is generated and collected almost daily.

Composition of Organic kitchen waste

The major constituent of Kitchen waste are those associated with cooking. Most households prepare food two times a day; once in the morning and once in the evening. The cooking in the morning is usually more elaborate. Breakfast cooking includes preparing dosa, idly, poori, chappathi, upma, sandwich etc. Lunch is both vegetarian and non- vegetarian. Since the study was done in a coastal region, fish is a more popular non vegetarian item cooked and consumed.

Kitchen waste consisted of vegetable peels, spoiled fruits, food remains after consumption, spoiled food and other eatable items, meat waste, fish waste etc.(Table- 5). Vegetable peels, cereal remains, cooked food remains and spoilt food are the most regularly generated kitchen waste.

Table -5: Constituents of organic kitchen waste

Constituents	**% of composition**
Vegetable peels & cereals	25
Spoiled fruits	7
Cooked food remains after consumption	28
Spoiled food and other eatable items	14
Meat waste	8
Fish waste	12
Others	6

Waste collection at first point

Most of the households keep all the wastes in a single dustbin. Only 10% do any kind of separation of the household wastes. A large % of the households keep the waste of the day, tied in plastic bag in the dust bin. 60% of the household keep these tied bags or dust bins in front of their house, to be taken by the waste collecting agency. The remaining put it in the public dustbin kept in the public place. In most of the cases, this is done in the mornings. Only a very few percent casually throw the waste in the nearby open area.

Usually the collection at the first point is done by the maid or the lady of the house. In most of the cases, transferring to the second collection point is done by the lady of the house. While a large percentage of households transfer waste to the second collection point only once in a day, about 20% of the households do it two times a day.

Waste collection at second point

Most of the household complained of the irregularity in picking waste from the second collection point. One of the biggest fall out of this, is pollution and other side effects in the local area. These solid wastes, when improperly and irregularly collected can be an environmental hazard. It can be a major cause of water pollution. If these wastes get into drinking water, it can cause diseases like cholera, dysentery etc. These wastes when eaten by domestic animals can also lead to their death due to diseases as well as choking. These wastes are good breeding ground for mosquitoes and flies. This improper dumping can pollute nearby water bodies and cause water pollutions leading to death of fish. When solid wastes are not removed properly, it can clog drainage channels and gutters and block the flow of the sewage. This may cause flooding and other difficulties. Irregular lifting of waste from the second point can produce bad odor in the locality, which pollutes the air quality of that place. It spoils the natural beauty of the place too.

Awareness of biodegradation and composting of kitchen waste

Bio degradation or composting is possible after the first collection point in the case of organic kitchen waste. About 80% of the households studied, know that the organic kitchen wastes are bio degradable. Nevertheless only 40% of the households showed interest in making compost out of the organic kitchen waste. It has not been done because of lack of specific knowledge of how to do it or lack of time or shortage of space. However, most of them said that, they would like to manure their plants using this compost manure.

Biodegradation is the chemical dissolution of materials by bacteria or other biological means[7]. Biodegradable matter is generally organic material such as plant and animal matter and other substances originating from living organisms, or artificial materials that are similar to plant and animal matter to be put to use by microorganisms. In nature, all the materials have the capability to be broken down into their raw material. The process of biodegradation may be different for different substances but in general, biodegradable substances will be decomposed into carbon dioxide, methane, and water as the final products.

Composting can be more amateurally done by either using a bin or using a pit in the garden[8]. If one, uses a bin, one can add a shovel or two of garden soil because this will contain the microorganisms that will break down the organic matter. If one uses a pit in the ground, those organisms are already present in the soil, to 'act' on the waste. The organic matter is continually added in layers. Weeds can also be a good component of the compost pile, along with food scraps and even fireplace ash and coffee filters added sparingly. Water can be added if the waste mixture is dry. It may take a couple of months to turn the waste into compost manure. Of the 60% of household who

were not keen on composting, some (20%) are willing to attempt, if sufficient knowledge on the process is imparted by an expert and if the process is not cumbersome.

Satisfaction towards waste collection

Households expressed overall dissatisfaction (Table-6) at the waste collection at the second point, by the waste collecting agency. But, most of them would like the waste collecting agency to regularly lift the waste from the first collection point as well as second collection point. Majority of the households (70%) are paying about Rs.30 per month for the waste disposal and most of them would not mind if they have to pay double the amount, if the collection is regularly done.

Table-6: *Satisfaction of households at the second waste collection point

Factors	Satisfaction score
Regularity of collection.	4.5
Maintenance of the dust bin	3.0
Cleanliness around the dust bin	3.5
Method of collection	5.5
Sensitivity of people who collect	5.0
Quality of mode of transport	6.0
Fee charged	7.0

*Score on a scale of 1-10. 1- being low satisfaction and 10- being high satisfaction.

Usage of technology in waste collection

Udupi does not use any technology in waste collection or disposal. But the adjacent district of Mangalore, decided to adopt a technology to monitor on-line whether its waste collecting contractors have cleared solid waste from bins and containers in the city daily. The contractors would be given away cell phones from the corporation which they should use for taking the photographs of the bins and containers daily. Immediately after clearing a bin the contractor should click its photograph and press an option in the pre-loaded software in the cell phone. The picture would get uploaded in a website (which could be linked to the city corporation's website) within 10 seconds with the date, time and location of the bin or container. On the other hand, the website would have a map of the city with the locations (which are called geo reference stations) of bins and containers and black spots (places minus bins and containers where people daily dump solid waste).A green icon would appear on the location where a bin or the container had been cleared. If not there would a red icon indicating that it had not been cleared. It would be mandatory for the contractor to upload the photograph of bins which had not been cleared daily. Photographs of such bins would be recorded in red icons.The households of Manipal are willing to pay extra for waste collection, if such technology is implemented in Udupi district too, and if it can increase the effectiveness of waste collection.

Conclusion

The primary steps in waste management are: generation, collection, sorting and separation, transfer and transport, and disposal. The study was intended to understand the organic kitchen waste generation and collections practices and was limited to kitchen waste collection at the first and second collection points. The study was done on middle and upper class households in the Manipal area of the Udupi district of Karnataka.

Each household generated about 820 gms of waste per day. Out of that, the biggest constituent was organic kitchen waste followed by plastic and paper. These three are the most regularly generated wastes too. In kitchen waste, the biggest contributor is cooked food remains after consumption, followed by waste of vegetable peels and cereals followed by spoiled food. Fish waste came fourth. Cooked food waste, vegetable waste and spoiled food are the three most regularly disposed kitchen waste items. Surprisingly, very few made efforts for separation of waste items at the source into either biodegradable or non-biodegradable or even those which can be recycled.

The second collection point, for many households. Since it is not done regularly and scientifically, it has led to dissatisfaction of the local area residents. Another negative impact which the households perceive of this is the problems due to pollution. Most of the households felt that the public dustbins (2nd collection point) as well as the area around it, is maintained poorly making the place highly unhygenic.A positive aspect was that a sizable number of households showed interest in trying out further processing of the organic waste .

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