Assessment of Rural Solid Waste Dumping in Rural South India

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Abstract—*The objective of the study was to access and analyse per capita rate of solid waste generation, density assessment and physical composition of solid waste in 5 villages of south India. Total solid waste generation was recorded by digital device at last three consecutive days of fourth week of every three months and per capita waste generation was calculated. Density and physical composition was determined by mixing the samples and were provided in duplicate for accuracy. Each sample was transferred to a 0.5 m^3 cylindrical container and its components were measured by digital scale. Maximum and minimum generation rates per capita were 1716±420kg/day and 1375±147kg/day respectively. Maximum and minimum densities were 415±27kg/m^3 and 386±17kg/m^3 respectively. Mean weight percents of putrecible waste, plastics, paper, metal, glass, textiles and others were 77.56%, 6.7%,6.9%,1.1%,0.8%,1.9%, and 4.7%respectively.In our study we observed major proportion of solid waste was composed of putrecible waste (77.5%) for which composting is the best method for waste management. Further the re-cyclable materials should be segregated and re-cycled to promote and balance ecosystem and biodiversity.*

1. INTRODUCTION

One of the basic step in integrated solid waste management is the determination of exact amount and type of solid waste (omrani 2004 mohmoud and et al,2009) rapid change in the life style of rural people and consumption would be more importance and doubled. Thus increased the changes in quality and quantity of solid waste in villages of the country. Generation capita rate is the main key role parameters in determining and measuring the amount of solid waste. This index will express the solid waste generation in terms of grams or kilogram per person per day. (Salvato 2004). Generation waste of solid waste in various communities will be different by geographical climate, social, economic, and also the cultural conditions (Tchobanoglous, and et al., 2003, Essonanawe

Edjabou, and et al., 2012). Each solid waste have different densities depending up on type of waste. For Example, density of household solid waste is different from industrial, hospital, and rural solid wastes (abduli, 2008). Determination of exact weight of percentages of solid waste materials is important subject in rural solid waste management (Tchobanoglous, 2003 and Omrani,2004).

Unemployment, lack of proper facilities for agriculture and health promotionconditions are major cause of villagers migration to the developed cities and places were the all the facilities are available easily (Safa, 2007 and Bemanian, 2007). Considering the important position of villages in creation and preservation of communities, sustainable development, it is necessary to recognize rural development factors and affecting barriers (such as rural migration to cities) (abduli, 2008). It is very important to know the information on the planning of solid wastes management in the rural regions. Secondly, having no knowledge on the unfavourable health outcomes of solid waste highly increasing the occurance of diseases such as, plague, tularermia, cutaneous, ascariasis, eye andrespiratory infections and also cause effect on the environmental issues such as, Air , water is not properly managed especially excreta and other liquid and solid waste from the households and communities. Waste from agricultural industrial issues can cause the health risks. And also the co-disposal of industrial hazardous waste with the municipal wastes can expose people to chemical and radio-active hazards.

2. REQUIRED MATERIALS AND METHODS

This cross-sectional detailed study was performed in the villages of Tamil Nadu state in southern India. This villages under study were selected on such factors as geographical position, availability of environmental health clinic advisor in health centres and mainly easily assessing of our research supervision.

2.1 Assessment of amount of solid waste generation rate:

Here in study all the generated wastes were measured in three consecutive days of each second month of each season by digital devices scales (SOEHNLE, model of 6107 with a 0.1 g precision). An access to the per capita rate of generated waste was made through dividing the total daily generated wastes in the number of rural population.Generated waste was made through dividing the total daily generated wastes in the number of rural population.

2.2Assessingrural solid wastes density:

A complete thorough mixture of solid waste components was determined in first stage to determine the density (or) mixed density of rural solid waste, household waste, agriculture waste in each village in next stage, to bring out most exact date the sampling of solid was carried out by three replications.

By complete mixing in piles of solid wastes each samples was selected in the different desired parts of it (W1) 15o KG and then the selected samples are transferred in to the 0.5 m3 cylinderical plastic container. Then the sample container's weight determined as (W2) along with the solid wastes and was using digital scale.

2.3 Physical analysis of rural solid waste components

To analysis of different components in the rural solid wastes (such as, putrescible materials plastic, paper and glass, metal, textiles, and also the othermiscellaneousmaterials. The sample container with each sample component are transferred to the another plastic container and are measured their weight as (W3) by digital scale. All the data and measurements in this study were analysed by the Excel 2007.

3. OBTAINED RESULTS AND THEIR DISCUSSION FALLOWED:

3.1 Generation rate and Density of rural solid waste:

Table 1 in this study shows the generation rate and Density of solid waste in the selected villages.

Table 1: Comparison of physical characteristics of solid waste in the selected villages.

village	Population	Generation Rate (Kg/d)	Generation rate per capita (kg/d-person)	Density (Kg/m3)
1	2374	1716±420	0.72±0.16	386±17
2	1842	1587±278	0.86±0.22	405±22
3	1865	1609±302	0.86±0.22	415±27
4	1662	1375±147	0.82±0.20	409±25
5	1977	1685±346	0.85±0.21	412±26
MEAN	1944	1594.4±133.6	0.82±0.06	405.4±11.5

In this subject the study shows the total average of solid wastes i.e., per capita generation rate in the selected villages was 0.82±0.06kg/day-person. The maximum and minimum generation rate of solid wastes in the selected villages were 1716±420kg/day and 1375±147kg/day respectively. According to a study in Oklahoma State in USA. The generation rate of rural solid waste was 2250gm/person/day which is much higher than the generation rate of solid waste in these villages (Abduli 2008). The density of rural solid waste of population in each village is recorded in the Table 1. Generation rate per capita (kg/day-person) in each village were recorded as 0.72±0.16 in 1st village 0.86±0.22, 0.86±0.22, 0.82±0.20 and 0.82±0.06 as fallows per village. The average generation rate per capita is subjected villages is 0.82±0.06. And densities ae as fallows in each village 386±17kg/m3, 405±22kg/m3, 415±27kg/m3, 409±25kg/m3, 412±26kg/m3 and the total mean of densities in villages is 405±11.5kg/m3.

A rapid increased rain fall and also increased air humidity are reasons behind the increased waste density in rural areas of southern India. Directly (or) indirectly large percentages of animal waste in the solid composition in three rural areas are the other reasons of waste densities. On consideration of these animal wastes in the solid composition of subjected villages, composting utilization and fertilizer production from putrescible wastes such as Animal wastes, food wastes, agricultural wastes and post harvested agricultural wastes is useful for the safe management of rural solid wastes, increasing of environmental and human health levels and developing of agriculture in these subjected rural villages.

Table 2: Percentage weight components rural solid wastes in the selected villages

Village	Putrescible waste(%)	Plastic(%)	Paper(%)	Metal(%)	Glass(%)	Textiles(%)	Other(%)
1	72.4	5.7	6.3	0.8	1.7	2.1	3.9
2	83.9	6.1	6.8	1.4	0.6	1.9	4.6
3	76.3	5.4	7.1	0.7	1.1	1.8	5.1
4	74.5	7.0	5.9	0.9	0.2	2.4	4.8
5	80.7	9.4	8.4	1.7	0.6	1.7	5.3
MEAN	77.56±4.18	6.72±1.44	6.9±0.85	1.1±0.38	0.84±0.51	1.98±0.24	4.74±0.4

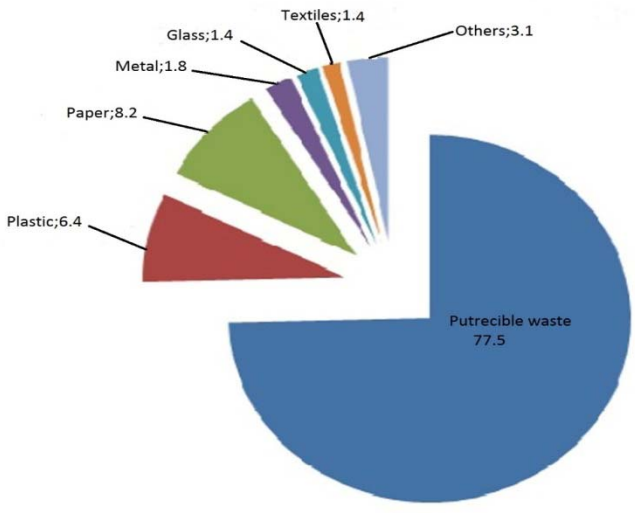

Fig. 1: Mean weight components of municipal solid waste in the selected village.

Average percentage of putrescible wastes materials, plastic, paper, metals, textiles, glass and others in the selected villages were 77±4.8%, plastic 6.72±1.44%, paper 6.9±0.85% metal 1.1±0.38, glass 0.84±0.51%, textiles 1.98±0.24% and the mean percentages of the other rural areas is 4.74±0.4% respectively. According to a study on physical composition of solid wastes in rural areas of Bangladesh the amount of putrescible materials, paper, plastic, and the trash were 67.75%, 9.7%, 5.1%, and 8.8% respectively (Enayetullah, 2005). In the investigation the distribution of waste materials in Oklahoma rural areas the solid wastes as paper, plastic, metals, glass, yard wastes and others 38.8%, 8.6%, 8.3%, 6.1%, 20.6%, and 17.6% respectively.

Considering the amount of bio-degradable component of solid wastes in this study (77.56±4.18), more than the three quarters of solid wastes generated in the villages of southern India in Tamil Nadu could be changed to bio-fertilizer by household consumption of this organic fertilizers reduce the immethodical use of chemical fertilizers which are having adverse effect on the human animal and the environmental issues, improved the quality of soil and quantity of produced agricultural income. Also having non-degradable solid waste such as plastic and paper. Considering to weight percentage of non-degradable components such as paper, plastic, metals, glass, textiles as solid wastes in southern India villages and comparing them with municipal solid wastes of these areas (Table 2 and Fig. 2).

Change in lifestyle of rural villagers is the main factor of occurring of this phenomenon. A proper sustainable consideration is necessary on the building and construction of solid wastes disposal and the use of some disposable plastic equipment (good quality) by segregation of solid wastes and this recycling for reduction of waste generated in these villages.

4. CONCLUSION

Use of household fertilizers such as an organic fertilizers, natural, bio-degradable and healthy alternative to chemical fertilizers would be much appropriate as the high increase in the putrescible wastes in this study. Other most important factor of construction and recycling of non-degradable solid wastes such as plastic, papers, metals, glass are to be recycled and further used in such rural areas.

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