Geoscience Research

Geoscience Research
ISSN: 0976–9846 & E-ISSN: 0976–9854, Vol. 2, Issue 2, 2011, pp-61-69
Available online at http://www.bioinfo.in/contents.php?id=90

DISPOSAL OF MUNICIPAL SOLID WASTE AND IT'S IMPACT ON THE AGRICULTURE SOIL PROPERTY IN SHELGI VILLAGE OF SOLAPUR DISTRICT

DHAYAGODE N.I.*[1], SHINDE N.G.[2] AND PARDESHI R.S.[3]

[1]Department of Geography, Walchand College of Arts and Science, Soalpur, MS, nagnathdhayagode@yahoo.com
[2]Head, Department of Geography, Dayanand College of Arts and Science, Solapur MS,
[3]Department of Geography, Solapur University, Solapur MS
*Corresponding author. E-mail: rahul.pardesi@yahoo.com

Received: September 07, 2011; Accepted: September 29, 2011

Abstract- Since the beginning, humankind has been generating waste, be it the bones and other parts of animals they slaughter for their food or the wood they cut to make their carts. With the progress of civilization, the waste generated became of a more complex nature. At the end of the 19th century the industrial revolution saw the rise of the world of consumers. Not only did the air get more and more polluted but the earth itself became more polluted with the generation of non biodegradable solid waste. The increase in population and urbanization was also largely responsible for the increase in solid waste. The present study will be mainly based on the both primary and secondary sources of data. The primary data will be collected from conducting filed survey in Solapur Municipal Corporation Solid waste location. Observation Methods actually view respondents, personal survey on site. Analyses soil pH measurement, Plastic Content other factor to impact of agriculture system.

Key words: municipal waste, waste composition, agricultural soil, soil Property, soil property analysis

INTRODUCTION

During the flourishing of civilizations from 300-1000 D.C. solid waste in capitol and large cities were placed in large pits with layer of soil cover. The municipal refuge referred as any waste generated by the domestic and industrial sectors in municipality. The municipal solid waste is heterogeneous in nature and it contains papers, plastics, rags, metals, glass pieces, ashes and compatible matters. In addition other substances like scrap materials, waste papers, dead animals, discarded chemicals, paints, hazardous hospital waste and agricultural residue is also categorized in municipal solid waste. Till date, the biomedical waste generated from clinics, hospitals, nursing homes, pathological laboratories, blood banks and veterinary centers have also been disposed along with municipal solid waste at dumpsite.

Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. With rising urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been increasing rapidly and its composition changing. In 1947 cities and towns in India generated an estimated 6 million tonnes of solid waste; in 1997 it was about 48 million tonnes. More than 25% of the municipal solid waste is not collected at all; 70% of the Indian cities lack adequate capacity to transport it and there are no sanitary landfills to dispose of the waste. The existing landfills are neither well equipped nor well managed and are not lined properly to protect against contamination of soil and groundwater.

In Indian cities solid waste generation rate is increased. The average per capita solid waste generation in India has increase from 0.32kg/day in 1971-73 to 0.48kg/day in 1994. Daily per capita generation of municipal solid waste in India ranges from about 100gm in small towns to 500gm in large towns. The EPRIT in 1995 showed that 23 big Indian cities generate 11 million tones of solid waste every year. But now urban centers of India produce 1, 20,000 tones of solid waste each day; it is expected that it will reach 300 million tones per annum by the end of 2047. NEERI in 1996 carried out study over charactisation of Indian municipal solid waste which contains large organic fraction (30-40 per cent), ash and fine earth (30-40per cent), paper (3-6per cent) along with that plastics glass and metal (each less than1per cent).

Large quantities of untreated industrial municipal and agricultural wastes are dumped into the soil. Heavy metals like mercury, lead, cadmium, nickel and arsenic cause serious land pollution problems. For example wastes from mines and factories located in agricultural areas have been found to have contaminated the soil with heavy metals. In some cases, land disposal of degradable hazardous organic wastes is practiced as a means of disposal and degradation. In soil a pesticide may be transported into various sectors of the environment by different physical processes, such as adsorption by the soil, leaching by rain water or be taken

up by plants and animals or carried away by wind. But the processes that actually play important roles in reducing their total amount of residues, are those mediated by microorganisms, animals, plants and sunlight. Other factors are pH and heat. Catalytic agents in the soil and soil enzymes also play important roles in degrading relatively unstable pesticides. The major group of soil microorganisms such as acitnomycetes, fungi and bacteria, degrade pesticides through oxidation, ether cleavage, ester and acid hydrolysis, oxidation, oxidation etc. The notable characteristics of degradation systems in microorganisms are the reductive systems. Combustion of sulfur-containing fuels emits SO2 and finally leaves sulphate in the soil. Atmospheric nitrogen oxides are converted into nitrates in the atmosphere and the nitrates eventually are deposited on the soil. Particulate lead from automobile exhausts also settles on soil along with rides of highway with heavy automobile traffic. High levels of Pb, Zn etc, are absorbed on soils near lead and zinc mines, etc. All these result in deterioration of soil quality, due to effects on the micro fauna, bacteria, fungi, etc. Biological degradation is also associated with lowering or depletion of soil organic matter.

POLLUTION ISSUES CONCERNING WITH MUNICIPAL SOLID WASTE DISPOSAL

The municipal solid creates many problems during solid waste collection till disposal. Even after disposal of solid waste, it creates various problems. Solid waste disposal creates air, ground water and land pollution problem. Presently most of the municipal solid waste in India is being disposed unscientifically.

Generally municipal solid waste is collected and deposited in sanitary land fills. Such unscientific disposal practices attract birds, rodents and fleas to the waste dumping site and it creates unhygienic condition. The anaerobic decomposition by microorganism brings degradation of most of the solid waste and this result emission of carbon dioxide (CO_2), methane (CH_4) and other trace gases. Methane gas constitutes about 60 per cent generated in a solid waste landfill. Municipal solid waste burns due to emission of methane gas also create air pollution. Along with methane gas there are many toxic, volatile air pollutant emitted such as chlorinate hydrocarbon compounds like vinyl chloride and tetra chloro ethylene from solid waste landfill. It is found that these air pollutants have caused a plethora health problem among residents nearby. During land filling of solid waste due to continuous pressure it results quizzing of contaminated liquid called as leachate[8]. Leachate is liquid emanating from a land disposal cell that contains dissolved, suspended and microbial contaminants from the solid waste. Leachate has high organic contents, soluble salts and other constituents capable of polluting ground water. It is proved that this polluted ground water is unfit for drinking and causes health complaints like jaundice, nausea, asthma, miscarriage and infertility. Now a day it realized that unscientific solid waste disposal practices is one of the reasons of global warming.

National highways viz. NH-9 and MSH3. Solid waste pollution in Shelgi village Solapur Municipal Corporation disposes solid waste at site near Shelgi village. The Solapur City is headquartered of the district Solapur in Maharashtra. It is a railway junction on the broad-gauge railway line Mumbai to Channai. In the 19th century the British rule was experienced by the city. The Municipal of Solapur was established in 1852.

STUDY AREA

Shelgi village located at North Solapur district in Maharashtra State. The near about national highways viz. NH-9 and MSH3. Solid waste pollution in *Shelgi* village Solapur Municipal Corporation disposes solid waste at site near *Shelgi* village. The Solapur City is headquartered of the district Solapur in Maharashtra. It is a railway junction on the broad-gauge railway line Mumbai to Channai. In the 19th century the British rule was experienced by the city. The Municipal of Solapur was established in 1852.

SOIL STRUCTURE

The soil of Solapur is of three kinds, *kali* or black, or coarse grey, and tambdi or *reddish*. In North Sholapur taluka, the soil is generally light and of moderate depth. On an average 300-450MT per day solid waste is generated from Solapur Municipal area. This unsegregated solid waste is disposed at landfill site near *Shelgi* village. The 55ha of land allocated for solid waste disposal, from which 18ha area is already land filled and sealed off permanently. The EM culture is applied over solid waste for decomposing of organic matter. But due to the unsegregated waste, decomposition of all waste is not successful. While the remaining parts of solid waste are left as it is for land filling. This solid waste disposal and management practices cause various environmental problems in *Shelgi* village. The burning of solid waste creates heavy smoke and dust pollution in local village. This smoke after inhalation results various respiratory illness among habitants. Therefore various issues are arising out of solid waste disposal practices of Solapur Municipal authority. This subject attracts attention of researchers for carrying scientific inquiry in disturbed environmental settings in *Shelgi* village.

Plastic Pollution

Every year in the world 10 corer tone plastic get produced. People use 500 million plastic bags. It takes 250-300 years to dispose a single plastic polythin. From available recorded it is found that India has imported 7,800 tone plastic from America in 1994 in first six months. For India is ranked at 4th position importing plastic in the world. In the world 18 kg plastic is used per human being. Plastic waste is significant portion of total Municipal Solid Waste (MSW). It is estimated that approximately 120 MT per day of plastic waste is generated. The plastic waste constitutes two major categories of plastic

i. Thermoplastics
ii. Thermoset Plastics

Thermoplastic constitutes 80 per cent and thermoset constitutes 20 per cent of total post-consumer plastic waste generated in India. Thermoplastics are recyclable plastics which include Polyethylene Terepthalate (PET), Low Density Polyethylene (LDPE), Polyvinyl chloride (PDC),High Density Polyethylene (HDPE), Polypropylene (PP), Polysterene (PS).Thermoset plastics contains Alkyd, Epoxy, Ester, Melamine Formaldehyde, Phenolic Formaldehyde, Silicon, Urea Formaldehyde, Polyurethane, Metalised and multilayer plastics. The environmental hazards are due to mismanagement of plastic waste.

Solid waste management in Solapur is commonly undertaken using improper methods that are commonly associated with much risk to human health and environment. Problems that are more common to solid waste management in Solapur are inefficient waste collection, transportation and absence of sanitary means of land disposal. This is particularly evident in medium and small cities where availability of investment in solid waste management is limited. Low-efficiency collection of solid waste from its generators led to waste accumulation in many parts of the city causing serious risk to the city inhabitants improved after initiation and the surrounding environment.

OBJECTIVES

1. To analyze the impact of municipal solid waste disposal on agriculture soil on Shelgi Village, Solapur District
2. To find out the aggregation and impact of plastics by municipal solid waste disposal practices on farm.
3. To interpret the impact of solid waste disposal on agricultural production.

RESEARCH METHODOLOGY

A. Data collection regarding agricultural out-put:

i. Primary sources: - Primary data will be collected from the Communication Methods with Interacting of respondents and Asking for their opinions, attitudes, motivations, and characteristics Observation Methods actually view respondents, personal survey on site. Self reported interview case study technique with 5 sample size i.e. farmers are selected as respondents were conducted.

ii. Secondary sources: - The study is based on secondary data from the respective Solapur District Pollution Control Board, Solapur Municipal Corporation, Agricultural Department of Solapur District From books, journals, magazines and report based resources of municipal solid waste disposal and its problem has been referred.

B. Soil Parameter Analysis

1. pH Measurement

pH of natural water varies around 7, generally over 7pH (i.e. alkaline) due to presence of sufficient quantities of carbohydrates. It increases during the day time mainly due to photosynthetic activity (consumption of carbon-die-oxide) and decreases at night due to respiratory activity. Factors like exposure to air, temperature and disposal of industrial waters etc. Also brings about the change in pH.

Procedure

1. Use of an inexpensive pH testing kit based on barium sulphate in powdered form, where in a small sample of soil is mixed with water which change colour according to the acidity/alkalinity.
2. Use of litmus paper. A small sample of soil is mixed with distilled water, into which a strip of litmus paper is inserted. If the soil is acidic the paper turns red, if alkaline, blue.
3. Use of a commercially available electronic pH meter, in which a rod is inserted into moistened soil and measures the concentration of hydrogen ions.

2. Conductivity Measurements

Procedure

1) Clean the COND cell with distilled water, dry it and connect at COND input.
2) Put function switch at COND. Position.
3) Dip the COND Cell in solution under test and determine its value in ms/cm (m Mhos/cm).

3. SAR (Sodium Absorption Ratio)

More than fifty year of research have been conducted to determine the relationship between Salinity (EC) and Sodicity (SAR) of irrigation water and its effects on soil physical property (Krista E. etal,2003). This relationship is now understood well enough to make accurate predictions of specific soil will behave when irrigated water containing different levels of salt and sodium. The combination of Salinity and Sodicity of soil is measured by swelling factor, which is the amount a soil is likely to swell with different combinations of salinity and Sodicity.

Some amount of salt is always present in water and soil. Salt up to certain limit is essential for soil fertility. On the other hand excess of salts it soil hinder the crop growth. It is the primary minerals, but saline soil usually accumulates the excess salts by drainage and seepage from the areas.

C. Quadrant Method for Plastics Measurement

The quadrant method is used to measure the quantity of plastics (in grams) scattered in agricultural land on *Shelgi* village. The one square meter quadrate is used to analyses the amount of plastics. The four quadrant samples are taking on to different lands. The plastics are collected in the quadrants are measured at digital weighting in lab.

Plastic causes serious damage to environment both during its production and disposal. The major chemicals that go into making of plastics are highly toxic and cause serious threat to living beings of all species on earth. Some of the constituents of plastic such as Benzene and vinyl chloride are known to cause cancer, while many others are gases and liquid hydrocarbons. Plastic impart a several toxic chemicals on soil and through food chain it can accumulate in human body.

Plastics contain poly-vinyl chloride and other Chemicals. The Decomposition of plastic is uneven and unequal. There are many studies reveals that, plastics remain in soil and with photo-voltaic reaction it can deteriorate and disturbed the soil property especially the teaching chemicals plastics to the soil kill the several beneficial micro-organisms.

We tested four quadrants for measuring the amount of plastics in soil. From the table number, it is found that the average 85.63 gm of plastics are accumulated per square meter. The 150.5 gm per square meter is highest plastic found at in sample number 2 where as in sample are accumulated. The amount of plastic accumulated in agricultural land has been posing a serious kind of constraint soil health.

From the table it is confirmed that the pH of the samples are different. Sample number 1 show acidic pH i.e. 6.05 Sample numbers 2 shows moderately alkaline pH (8.05) Fourteen of the seventeen essential plant nutrients are obtained from the soil. Phosphorus is never readily soluble in the soil but most available in soil with a pH range centered on 8. In moderately alkaline soil causes problem with the availability of iron and creates physiological problems with plant growth. In alkaline soil condition the symptoms of nutrient deficiency may result including thin plant stems, yellowing (chlorosis) or mottling of leaves and slow growth. Therefore, in context with pH condition of the soil at Shelgi village is towards the alkaline or acidic and lead to reduce the crop production.

From conductivity it is found that amount of electrical current pass from solution. This is equivalent to accumulation of salts in solution. Here it is found that salinity of samples ranges 0.37 mohm/cm^2. Especially in sample number 2 the conductivity is much higher than sample number one. One of the reasons for increase in conductivity is use of well water for irrigation. This well water is already polluted and contaminated with higher salt content. Therefore the salts are accumulated in soil and responsible for salinity problem. From the figures of soil salinity it ascertain the problem of increase in salinity in soil and solid waste disposal is responsible for that the same.

Discussion with Farmers revealed more information about the situation. Shri. Nagnath Shety 49 year old farmer revealed pains of solid waste disposal practices. 'I am doing farming since long time. Due to solid waste, lots of plastic bags always come in my farm, which I need to remove by engaging some worker, but again after 5to 10 days same situation takes place, due to this, farming is becoming very difficult task for us. The Past 10 years production of crops become very less**'.** When team enquiry about the agricultural impact, Shri. Nagnath responded that 15 years back they used to take crops through out the year but at present only one crop is possible in a year. He reported that average yield of the crop is decreasing and more money is spending for removing the plastics from Farms.

Sadanand Shinde 55 year's old farmer was harvesting the bean when team visited the farm. 'I take sugarcane as a main product in my field due to which, I get better money but in every year there is decrease in production. Since, last 5 to 10 year I take make sugarcane as a main product in both seasons but every year soil polluted'. He felt problems with solid waste disposal. From the above case studies it is crystal clear that disposal practices of Municipal Solid Waste near Shelgi are not only responsible for health problem as well as land problem. It creates a serious question about livelihood of farmers and villagers of Shelgi, Solapur District.

CONCLUSION

From the previous studies and reports it is already confirmed that, the air pollution, water pollution and soil pollution are serious threats because of solid waste disposal practices by Solapur Municipal Corporation.

The local corporations have adapted different methods for the disposal of waste – open dumps, landfills, sanitary landfills, and incineration plants. One of the important methods of waste treatment is composting.

Composting is a biological process in which micro-organisms, mainly fungi and bacteria, convert degradable organic waste into humus like substance. This finished product, which looks like soil, is high in carbon and nitrogen and is an excellent medium for growing plants.

Waste recycling has some significant advantages. It leads to less utilization of raw materials, reduces environmental impacts arising from waste treatment and disposal, makes the surroundings cleaner and healthier, saves on landfill space, saves money, reduces the amount of energy required to manufacture new products.

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The crop production is badly affected because of plastics and irrigating polluted water. Plastics are accumulated in the agriculture and alter the soil's physic-chemical property. The salinity in soil it's towards high and it has been impacting on the agriculture production. The farming system is discontinued and only seasonal practices are adopted. Therefore this study leads to the conclusions that, Solapur Municipal Corporation will need to stop the further disposal of solid waste at *Shelgi* further growing any ecological problems.

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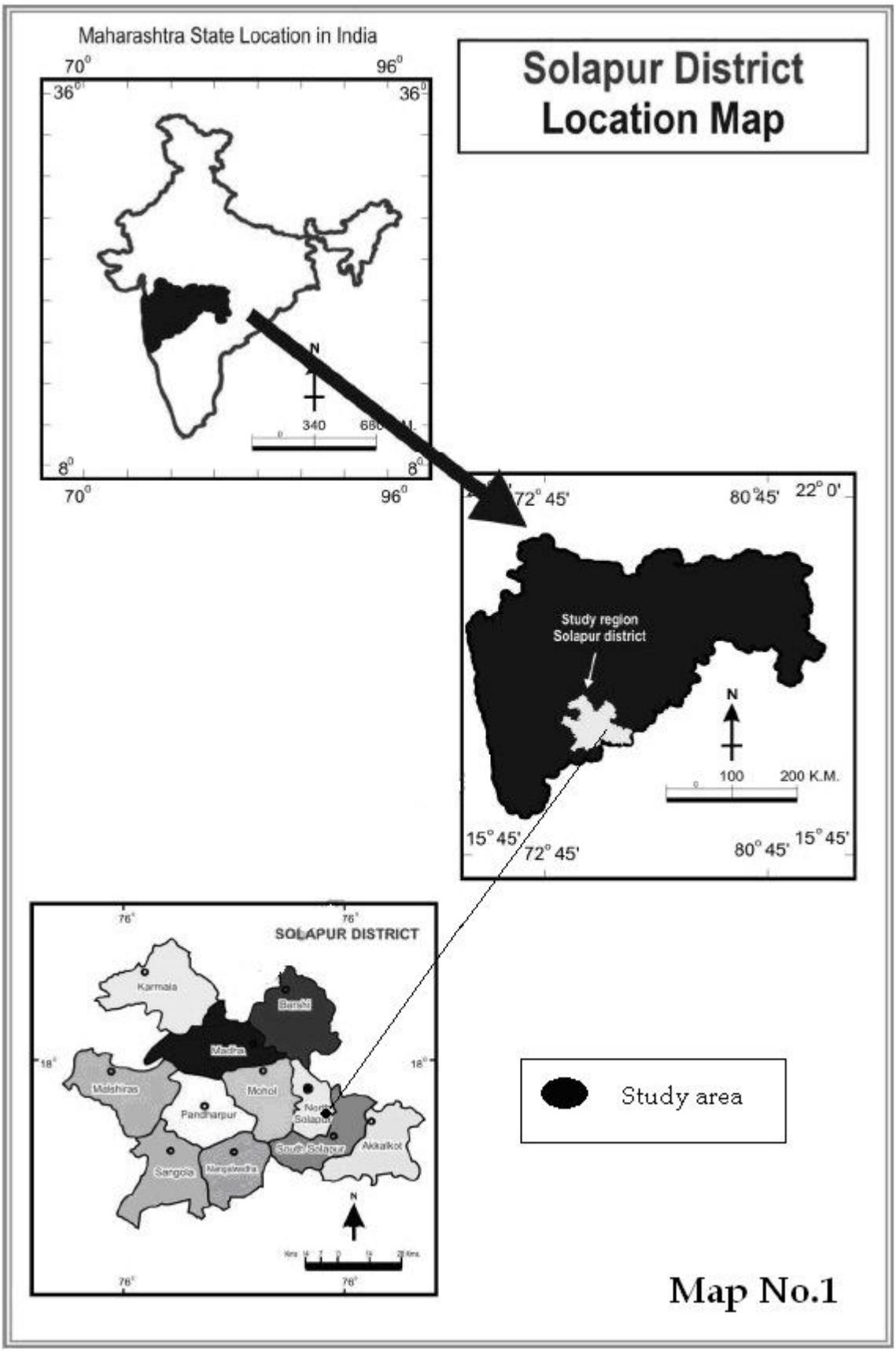
Maharashtra State Location in India
Solapur District
Location Map
70°
96°
36°
8°
N
340
Study region
Solapur district
72° 45'
80° 45'
22° 0'
15° 45'
100
200 K.M.
SOLAPUR DISTRICT
Karmala
Barshi
Madha
Malshiras
Mohol
Pandharpur
North Solapur
South Solapur
Akkalkot
Sangola
Mangalwedha
Study area
Map No.1

Table 1- The type of litter we generate and the approximate time it takes to degenerate

Sr.No	Type of litter	Approximate time it takes to degenerate the litter
1	Organic waste such as vegetable and fruit peels, leftover foodstuff, etc.	a week or two.
2	Paper	10–30 days
3	Cotton cloth	2–5 months
4	Wood	10–15 years
5	Woolen items	1 year
6	Tin, aluminum, and other metal items such as cans	100–500 years
7	Plastic bags	one million years?
8	Glass bottles	undetermined

Table 2- Indian some Cities Solid Waste generation rate (kg/capita/day)

City	Year		
	1971-73	1986-87	1994
Bangalore	0.32	-	0.48
Chennai	0.32	-	0.66
Delhi	0.21	-	0.48
Mumbai	0.32	-	0.66
Nagpur	0.22	-	0.27
Pune	0.24	0.28	0.31
Solapur	0.15	0.20	0.35

Source- TEEDY, 2001-2002

Table 3- Indian some cities solid waste disposal facilities

City	Solid Waste collection (tone/day)	Mode of disposal (per cent)		
		Dumping	Compositing	Other
Bangalore	2,000	90	10	-
Chennai	3124	100	-	-
Delhi	4000	93	7	-
Calcutta	3692	100	-	-
Mumbai	5355	91	9	-
Pune	700	93	-	7
Solapur	500	100	--	--

Source- CPCB, New-Delhi 1999.

Table 4- Test Soil parameters

Sr. No	Denomination	pH range
1	Ultra acid	<3.5
2	Extremely acid	3.5-4.4
3	Very strongly acid	4.5-5.0
4	Strongly acid	5.14-5.5
5	Moderately acid	5.6-6.0
6	Slightly acid	6.1-6.5
7	Neutral	6.6-7.3
8	Slightly alkaline	7.4-7.8
9	Moderately alkaline	7.9-8.4
10	Strongly alkaline	8.5-9.0
11	Very strongly alkaline	>9.0

Table 3- Amount of plastic observe in farms near solid disposal site at Shelgi Village, District Solapur

Sample	1	2
Weight (gms)	85.63	150.5

Source: complied by researcher

Table 4- Analysis of soil samples

Sample	1	2
pH	6.05	8.05
Conductivity (mS/cm2)	0.37	1.22
Salinity Mg/lit	384	369
SAR	15	14

Source: complied by researcher

Photo 1-polluted agricultural Soil for Municipal Solid Waste and Plastics

Photo 2-Location of Solapur Municipal Waste near agricultural area

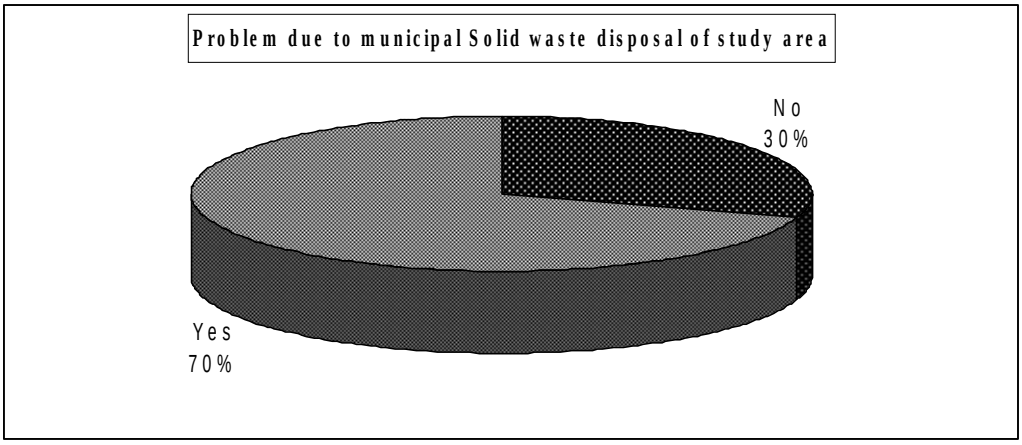

Fig. 1-Problems due to municipal solid waste disposal.

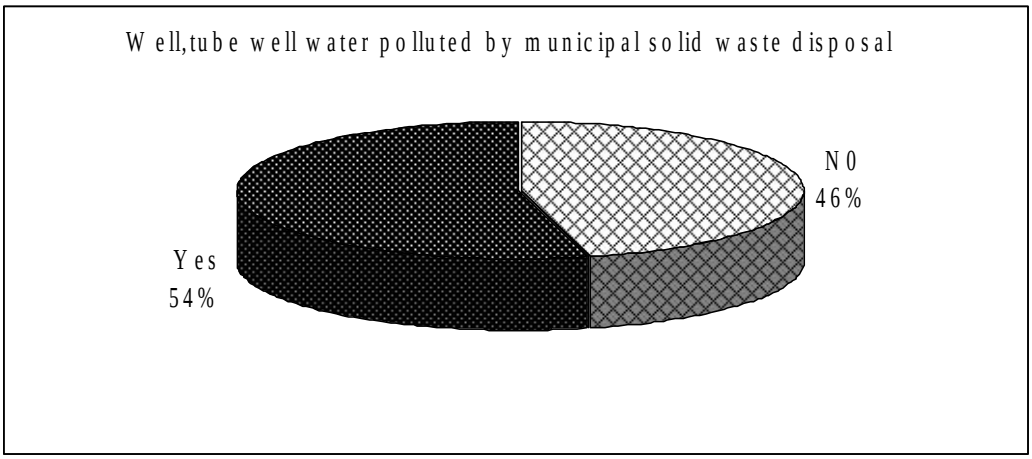

Fig. 2-Well, tube well water polluted by municipal solid waste disposal.

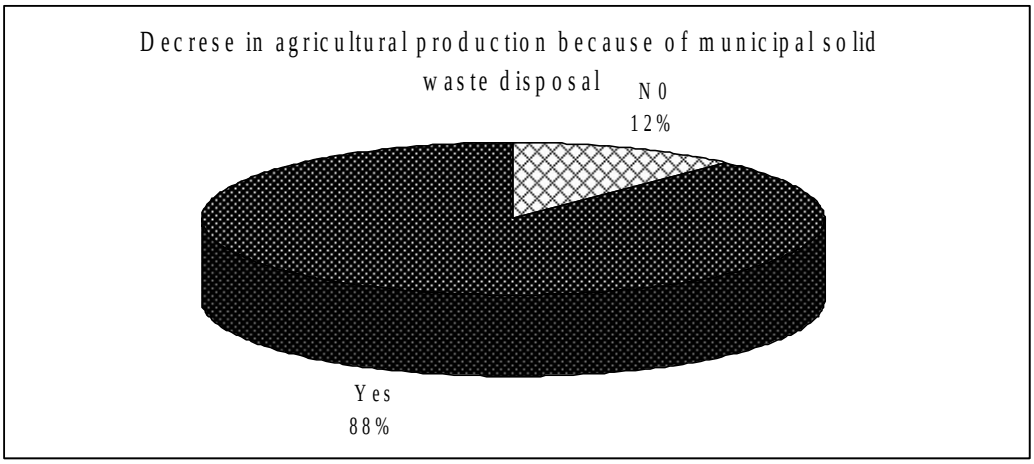

Fig. 3-Decrease in Agriculture production because of municipal solid waste disposal.