Kitchen waste management practices in rural household

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COLLEGE OF HOME SCIENCE

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By

Sangeeta Singh
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2017

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CERTIFICATE-I

This is to certify that the thesis entitled **"Kitchen waste management practices in rural household"** submitted in partial fulfilment of the requirements for the award of the degree of **Master of Home Science (Family Resource Management)** to the Orissa University of Agriculture and Technology is faithful record of bonafide and original research work carried out by **Sangeeta Singh** under my guidance and supervision. No part of the thesis has been submitted for any other degree or diploma.

It is further certified that the assistance and help received by her from various sources during the course of investigation has been duly acknowledged.

CHAIRMAN
ADVISORY COMMITTEE

CERTIFICATE-II

This is to certify that the thesis entitled **"Kitchen waste management practices in rural household"** submitted by **Sangeeta Singh** to the Orissa University of Agriculture and Technology, Bhubaneswar in partial fulfilment of the requirements for the degree of **Master of Home Science (Family Resource Management)** has been approved/disapproved by the students' advisory committee and the external examiner.

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Bhubaneswar **(Sangeeeta Singh)**

Date: **Adm. No.0 1FRM/15**

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

%	:	Percentage
=	:	Equal to
&	:	And
et al.	:	And other people
Fig.	:	Figure
etc.	:	Etcetera

ABSTRACT

Waste is any unwanted or unusable materials or any substance which is discarded after primary use or it is worthless, defective and of no use. With the growing population waste accumulation becoming a great threat to the society specially in developing countries. India is now world's third largest garbage generator and Odisha produced around 43 million tonnes of waste in 2014-15. Now a days due to the complex nature of waste it is very difficult to handle it effectively. Hence kitchen waste is a vital constituent of municipality waste, there is a need to examine the knowledge, attitude, practices associated with kitchen waste management as well as the nature and extend of waste generating from kitchen. For this study information was elicited by questionnaire cum interview method from 110 married women of Koraput district, Odisha. The result of the study revealed that bio degradable waste was generating more frequently in comparison to non-biodegradable waste, while waste separation prior to disposal was not so practised mainly due to lack of awareness. Food waste was the main constituent of kitchen waste followed by plastic and paper waste. Waste handling was done by only female members of the house and uncovered dustbin (55.45) was used more readily for this purpose. In most of the cases unhygienic practices such as open dumping and burning was carried out frequently while only food waste (65.4%) and metal (100%) waste was reused as animal feeding, composting and recycling up to some extent. The respondents had an average leisure time of 3.2 hours per day, but due to lack of awareness about various effects of improper waste handling on environment and health they were not utilising it to manage waste in a better way. As per the findings, it seems that due to lack of awareness and unavailability of municipality facility the respondents had poor waste management practices. Through proper education and training programmes the level of knowledge and awareness should be increased as well as efficient community waste disposal facility will help in improving waste management practices.

Key word : Kitchen waste, Biodegradable, Non-biodegradable, Recycling.

CHAPTER-1

INTRODUCTION

Since the beginning, human kind has been generating waste. Any unwanted or unusable materials or any substance which is discarded after primary use or it is worthless, defective and of no use is known as waste (Wikipedia). The problem of waste is a universal one as waste exists in every society. Increasing population level, urbanization, consumerism, industrialization and increasing living standards have enhanced the waste generation in developing countries. Waste management problems only appear more serious in developing economies because of poor management framework. India is now the world's 3rd largest garbage generator. Around 45 million tonnes or 3 million trucks of untreated garbage are disposed in unhygienic manner every day (India spend). According to Union Ministry of State for Environment, Forest and Climate Change, 62 million tonnes of waste is generated annually in the country at present, out of which 5.6 million tonnes is plastic waste, 0.17 million tonnes is biomedical waste, hazardous waste generation is 7.90 million tonnes per annum and 15 lakh tonnes is e-waste. Further added that only about 75-80 per cent of the municipal waste gets collected and only 22-28 per cent of this waste is processed and treated (down to earth). According to forest and environment ministry in Odisha 43 million tonnes waste was generated in 2014-15.

Now a day waste is becoming more complex as variety of materials is discarded as waste together. It is very important to understand the wastes, their nature, problems associated with them, and how to dispose them off hygienically. The quantity and type of waste generated depends upon the function which a city performs, its economic status and the level of technological development. Waste can be divided as 3 types i.e. municipal waste, commercial and industrial waste, construction or demolition waste. Kitchen waste forms a significant constituent of municipal waste. It can be biodegradable like food waste, green waste, vegetable peels, paper or non-biodegradable like glass, bottles, cans, metals, certain plastics etc.

The biodegradable waste decomposes easily while the non biodegradable contents can be of serious concern as they stay for long in the environment and hard to decompose.

Present day kitchen wastes are collected in mixed scale and disposed in places, which are environmentally very sensitive. In addition, open dumping is also very common in India. Disorganized and inappropriate kitchen waste disposal has created severe environmental issues such as air pollution, water pollution, reduction of aesthetic value of the environment etc. that have direct impact on the society and the country's development. Also the decaying kitchen waste provides suitable material for harmful insects (mosquitoes and flies) to thrive and rapidly causing diseases. Unprotected waste is the carrier of many kinds of deadly diseases like malaria, diarrhoea, dysentery, typhoid etc.

So waste management is drawing increasing attention, as it can easily be observed that too much garbage is lying uncollected in the streets, causing inconvenience, environmental pollution, and posing a public health risk. Because of this 3 R's are gaining more importance i.e. reduce, reuse and recycle of waste, so that the waste generated is not only minimized but converted into an asset for reuse. Proper waste management practice changes the concept of waste as a material "which has no use" into use it as "a resource" by converting into secondary material with modification. Waste management is the process of collecting, transporting, processing or disposing, managing and monitoring of waste materials in sanitary, aesthetically acceptable and economic manner. Garbage generated in households can be recycled and reused to prevent creation of waste at source. Waste can be managed in better ways by composting, recycling, and can be turned into manure and biogas.

Family is the basic unit of society. Practices and knowledge in grass root level affects the whole community. As kitchen waste is generated from home, kitchen waste management should start right at household level. Therefore, this study attempts to understand the status of kitchen waste management practices at household level in rural area in relation to the extent of waste generated and level of awareness of the people about the environmental and health hazards. To achieve the goal of the study, the following objectives were set.

1.1 Objective of the study

- To study the nature and extent of kitchen waste generated in rural household.
- To investigate the kitchen waste management practices among the rural households.
- To study the general awareness of waste management practices among rural women.

1.2 Limitation of the study

The findings of the present study are subjected to the following limitation.

- The sample size was very small which may not represent the entire rural population.
- The time period given for the study was very limited.
- Only married women were considered as sample of the study.
- The study was confined in rural area so it doesn't reveal the situations in urban area.

CHAPTER-II

REVIEW OF LITERATURE

Review of literature is an essential part of scientific investigation. It provides multi-actuarial information related to the problem done in part and also of different regions. A systematic and thorough review of previous studies related to the problems under study help in analyzing the problem, its historic status and current status. The available review of literature is defined into fallowing sub heads.

2.1 Nature and extent of kitchen waste generated
2.2 Kitchen waste management practices among rural women
2.3 Awareness of waste management practices among rural women

2.1 Nature and extent of kitchen waste generated

A study by Azeez (2006) suggested that the increased of use of plastics is due to changes in life style and industrialization in which plastic packages replace other forms of packaging. It is estimated that over 77.9% of households' generated plastic waste as a component of their domestic waste.

Solid wastes are found everywhere and anywhere In Nigeria, waste is generated at the rate of 0.43 kg/head per day and 60 to 80 per cent of it is organic in nature (Sridhar 2006; Ogwueleka 2009).

Zhang *et al.* (2007) conducted a survey on Characterization of food waste as feedstock for anaerobic digestion. The results of this study indicate that the food waste is a highly desirable substrate for anaerobic digesters with regards to its high biodegradability and methane yield.

Mhaisalkar and Tembhurkar (2007-2008) studied the Hydrolysis and Acidogenesis of Kitchen Waste in Two Phase Anaerobic Digestion. The result indicated that 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.

A study on Effective waste management. A tool for achieving sustainable development in Nigeria was conducted by Jatau (2007) which noted that with the progress of civilization, the waste generated become complex in nature and difficult to manage to the extent that not only did the air get more and more polluted, with the poor management of both biodegradable and non biodegradable solid waste.

A study by Abel (2007) on "An analysis of solid waste generation in a traditional African city" indicated that increased domestic and household activities in urban environments are linked to the generation of high volumes of domestic wastes.

A study named "Vermicomposting: A Better Option for Organic Solid Waste Management" was conducted by Aalok *et al.* (2008) estimated that the per capita waste generated in India is about 0.4 kg/day with the compostable matter approximately 50-60%. Most common practices of waste processing are uncontrolled dumping which causes mainly water and soil pollution.

A research on the Potential Impacts of Climate Change on Solid Waste Management in Nigerian revealed that waste management relates to materials produced by human activity and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste includes all items that people no longer have any use for, which they either intend to get rid of or have already discarded and these include: packing items garden waste, old paints containers, vegetables, metals etc. (Enete, 2010).

Business for Social Responsibility (BSR) (2010) carried out study on "The New Frontier in Sustainability" concluded most businesses define waste as "anything that does not create value".

Khatib *et al.* (2010) presents the case study of SWM in the Nablus district–Palestine. Per capita waste generation rates varied between different localities although trends were similar. Overall, the majority of waste was organic (65.1% by weight), suggesting a strong resource recovery potential in terms of animal feed or compost. Recyclable waste (plastic, paper and card) made up 16.7% by weight the waste composition suggesting an incentive to introduce source separation.

Findings of Public Health Implication of Household Solid Waste Management in Awka South East Nigerian by Modebe and Ezeama (2011) showed that the commonest type of waste generated was garbage (100%), followed by cellophane bags (99%).

A case study on An abattoir waste water management through composting was carried out by Hammed *et al.* (2011) which revealed that The household wastes contain other materials such as paper, glass, metal, plastic, and other non biodegradable materials and some of them are excellent raw materials for various industries in the country. People litter the roads with no civic concern. All these wastes contain a lot of valuable resources in the form of nitrogen, phosphorus, potassium and other chemicals which are useful.

A survey conducted by Premakumara (2011) on Household Solid Waste Generation and Public Awareness on waste separation and composting practices in Cebu City. He stated biodegradation is the chemical dissolution of material by bacteria or other biological means. Biodegradable matter is generally organic material such as plant and animal matter and other substances originally from living organism, or artificial materials that are similar to plant and animal matter to be put to use by microorganisms.

Upadhyay *et al.* (2012) conducted a study entitled "Solid Waste Collection and Segregation: A Case Study of MNIT Campus, Jaipur" revealed discarded products and waste materials potentially still have some economic value if reused or returned to the technological cycle. However, source segregation is one of the prerequisites for successful and economically feasible recycling activities. Rather than considering MSW simply as residue to be thrown away, it should be recognized as resource materials for the production of energy, compost and fuel depending upon the economically viability, local condition and sustainability of the project on long term which can be made effective by source segregation.

Afolayan *et al* (2012) stated that increasing population, urbanization, industrialization and changing consumption patterns are resulting in the generation of increasing amount of solid waste and diversification of the type of the solid waste generated.

Owusu *et al.* (2012) carried out a stud on Conflicts and governance of landfills in a developing country city, Accra. In the study it is stated that The high rate of urbanization in African countries implies a rapid accumulation of refuse. Social and economic changes that most African countries have witnessed since the 1960s have also contributed to an increase in the waste generated per capita.

Simon *et al*. (2013) conducted a study on "Generation and collection practices of organic kitchen waste in household of Manipal". The study result revealed that about 820 gms of waste is generated per day from each household. In kitchen waste, the bigger contribution is cooked food remains after consumption, followed by waste of vegetable peels and cereals fallowed by spoiled food. Very few made effort for separation of waste items at the source into either biodegradable or non-biodegradable or even those which can be recycled. Most of the house hold felt that the public dustbins (2^{nd} collection point) as well as the area around it is maintained poorly making the place highly unhygienic and sizable number of households showed interest in trying out further processing of the organic waste.

Study on Bio-Degradable (Organic) Kitchen Waste Management Practices in the Selected Households was conducted by Agamacharyya and Manimozhi (2013) revealed that vegetable waste and food waste are available regularly. Compare to small and medium families large families were generating more quantities of household waste.

Guerrero *et al.* (2013) carried out a study about Solid waste management for cities in developing countries which says that increasing population level, urbanization and increasing living standards have enhanced the solid waste generation in developing countries.

Yoada *et al.* (2014) carried out a study named Domestic waste disposal practice and perceptions of private sector waste management in urban Accra the study found that the majority of the solid waste generated at home was largely food debris and plastics, which were mainly stored in uncovered plastic containers and disposed without separation.

Indhira *et al.* (2015) conducted a study on Awareness and attitudes of people perception towards to household solid waste disposal: Kumbakonam Town,

Tamilnadu, India concluded that they were disposing three and six kilograms of bio degradable and non biodegradable waste /week. The type of household solid waste disposal items were food items, vegetables, dry leaves, plastics, garden waste, batteries, electronic goods, cloths, rubbers and glasses.

2.2 Kitchen waste management practices among rural women

A study was conducted on waste generated and adoption of waste management practices among rural household in Haryana by Kumari and Grover (2007) and revealed that different waste were used for different purposes like vegetable peels and fruit peels are mainly used for animal feed, decorative and utility items are prepared from cut pieces, plastic bags, and bottles, old clothes and used in durries weaving ,straw is used in animal feed, mushroom production and animal bedding, cotton stalk and animal dung are used as fuel. In rural household substantial amount of waste generated at household , farm and from animals gets reused in various forms depending on the nature of the waste while the rural families besides practicing traditional methods of waste management are also adopting recommendations of scientists and govt. departments and practicing vermicomposting, mushroom production, biogas.

In Pakistan, Al-khatib *et al.* (2007) found out that although municipal solid waste collection service was available for 98% of the residents, no proper treatment or landfill procedure was adopted for the collected waste in most of the area. Instead, waste burning in open dumpsites was the most common practice due to the inefficient collection of waste disposal fees from residents. Municipalities often suspended the collection service due to reduction in its labour force.

According to ALCO/World Bank (2007) Incineration, a capital and energy intensive op ion is 5-10 times more costly than sanitary landfill, and composting is 2-3 times more costly. However, incineration is a choice for the disposal of healthcare wastes which contain infectious or hazardous components.

Damghani *et al.* (2007) conducted a study about Municipal solid waste management in Tehran: Current practices, opportunities and challenges. They concluded the use of colour coded containers to store different types of solid waste, which has been in practice in developed countries for over four decades, is reported to

offer a more cost effective waste management service, since it improves household waste separation and reduces the amount of waste in landfills.

A study on Evaluation of solid waste generation categories and disposal was conducted by Babayemi and Dauda (2009) which described the complete lack of efficient and modern technology for the management of waste.

A study on People's perception on household solid waste management in Ojo local Government area in Nigeria revealed that most of the respondents did not separate their waste; out of the 364 households, only 63 (17.3%) separated their waste when storing it, while the remaining 301 (82.7%) did not do any kind of solid waste separation, which is a reflection of what happens in most African cities by Longe et.al. (2009).

A research on Solid waste generation and disposal in a Nigerian City was carried out by Nwachukwu (2009) which recommended the privatization of solid waste management systems and adequate funding of agencies responsible for refuse collection and disposal in the Nigerian city of Onitsha.

Ogwueleka (2009) observed that solid waste management in Nigeria is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal in his study on Municipal solid waste characteristics and management in Nigeria.

Norley (2009) carried out a study entitled "Poor disposal of liquid waste a Menace for city dwellers" concluded that local governments are responsible for the collection and disposal of the wastes generated within their jurisdiction, as well as for the operation and maintenance of their equipment. However, local governments usually lack the authority and resources to provide a satisfactory and economically viable service. Effective and efficient solid waste management depends upon an equitable distribution of responsibilities, authority, and revenue between the national government and all the local governments.

A study conducted in Nigeria by Banjo *et al.* (2009) showed that the perception of domestic waste disposal indicates that people's attitudes about and perceptions of sanitation issues contribute to the waste management problem.

A study on Men's Engagement in Shared Care and Domestic Work in Australia was conducted by Hewitt *et al.* (2010). The preponderance of female respondents in this study is a reflection of higher level of interest expressed by the female gender as reported in a qualitative study of preference for house hold tasks. Men commonly reported how they enjoyed being outside in the garden, or alternatively, how they did not expect their partners to be able to look after the grounds as well as them. However, women commonly reported performing the jobs of mowing the lawn or taking out the rubbish better than their partners, and as a result, assumed the responsibility of completing these tasks themselves.

A study named as Municipal solid waste management in Kolkata India was conducted by Chattopadhyaya *et al.* (2011) which reported a complete absence of segregation of waste at source, limited house-to-house collection and the use of very old vehicles in waste collections.

NSWMA, National Solid Waste Management Association (2011) revealed that In spite of the recycling and composting of greater amounts of municipal solid waste in the United States in the last couple of years, the majority of waste generated still end up in landfills. While wastes are deposited in open dumps in developing nations; these have become obsolete in the developed countries. Sanitary landfills which are well engineered facilities (with liners, leachate collection/ treatment system, and gas collection system) are now used to ensure the protection of human health and the environment. These modern landfills are often under strict federal and state regulations and are therefore specially sited, designed and operationalized to ensure environmental performance.

Management of Municipal Solid Wastes: A Case Study in Limpopo Province, South Africa was carried out by Ogola *et al.* (2011) recorded that waste collected is not sorted into recyclables or non-recyclables and is all disposed of at the final dumpsite with no sorting.

Findings of Public Health Implication of Household Solid Waste Management in Awka South East Nigerian by Modebe and Ezeama (2011) showed that majority of the respondents in Awka (73%) disposed their waste through government waste management agency and only 27% dumped theirs in unauthorized area. This is an

indication that the residents of Awka enjoy the benefit of existing strong and functional government waste management agency.

A Ghanaian study about attitude towards recycling and waste management conducted by Asuamah *et al.* (2012) showed no significant effect of gender, employment and educational statuses, on willingness to recycle.

Maliky *et al.* (2012) carried out a study on Kitchen Food Waste Inventory for Residential Areas in Baghdad City and reported that composting can be more amateurally done by either using a bin or using a pit in the garden. 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 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 fire place ask 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 export and if the process is not cumbersome.

Aderemi and Falade (2012) noted that the most popular methods of waste disposal known to the respondents were open dumping (27.9) (98.94%) followed by burning 267 (94.68) while the least known method was incineration. This scenario is not very different from findings in other studies. Open dumping remains the simplest and the most commonly used method for disposing municipal solid waste.

A combined study was carried out by Abeyewickreme *et al.* (2012) which evident that some of this waste is dumped on the streets, gutters, holes and in nearby bushes. This has the potential of serving as breeding grounds for rodents and insects that could increase the risk of the spread of parasitic and zoonotic diseases.

Study on Bio-Degradable (Organic) Kitchen Waste Management Practices in the Selected Households carried out by Agamacharyya and Manimozhi (2013) concentrated only in organic household waste generated by the households per day and waste recovery as home composting and vermin composting. Compare to small

and medium families large families were generating more quantities of house hold waste. 7 percent households selected home composting and 5 percent household selected vermin composting as method of disposing waste.

The attitude of people towards waste management can be affected by their level of knowledge and awareness of waste management and it has been reported by Adeyemo and Gboyesola (2013) that homes with waste bins engage more in proper way of storing waste than homes without waste bins.

In Nigeria, liquid wastes are managed in an indiscriminate manner. There are no sewage treatment plants. Sullage gets into drains and flows into rivers and streams. Human excreta are managed separately through ventilated improved toilets, pit toilets or septic tanks (Hammed 2013).

A study was carried out in Owerri Municipal and considered the waste management practices among the residents by Adogu *et al.* (2015). The study found that large numbers of the residents were aware of waste management and also knowledgeable about various methods of waste disposal. Majority of the residents had a positive attitude towards proper waste management, even though there was evidence to the contrary considering the discovery that the most prevalent methods of disposal were open dumping and burning.

Warunasinghe and Yapa (2016) studied a survey on household solid waste management with special reference to a peri-urban area (Kottawa) in Colombo and found that their knowledge on environment and health issues related with inappropriate waste management are satisfactory. The rate of waste generation from more than 70% of the household exceeds 2 k.g per day. 94% of the total waste collection was from the kitchen. Nearly 50% used waste pits. Other methods of kitchen waste disposal were garbage truck collection (44%), burning (44%), composting (16%) and incineration (10%). Awareness about the environmental hazard caused by improper waste management was 100%. The result also showed that 26% of the households were not aware of waste recycling, reuse and reduction. However 96% of the respondents agreed to co-operate and to participate for a proper waste management programme.

2.3 Awareness of waste management practices among rural women

Virk *et al.* (2004) conducted a study on 75 households of Barnala and Ludhiana of Punjab indicated that 56.6% respondent in both the cities were satisfied with existing waste disposal practices inside home. Only 4% in Barnala and 52% in Ludhiana were satisfied with existing waste disposal practices outside home. In Barnala 33.3% and in Ludhiana 5.6% of respondent think that municipal committee bins are hygienic way of disposing bins. Most respondents were aware of adverse effects of waste material on environment and think that waste should be put into polythene bags. 86% respondent thinks that waste disposal is a problem. In Barnala 86.6% and in Ludhiana 74.6% of respondent had knowledge about composting.

Solid waste management is the discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principle of public health, economics, engineering, conservation, aesthetics, and other environmental considerations. It is also responsive to public attitudes (Sridhar 2006).

Damghani *et al.* (2007) Municipal solid waste management in Tehran: Current practices, opportunities and challenges. They concluded that indiscriminate open dumping of wastes poses significant threats to public health and the environment if they are not stored, collected and disposed of properly.

Schiopu *et al.* (2007) had agreed that there is the need to develop, master and implement a simple but reliable tool that will help decision markers in the analysis process in his study on Solid waste in Romania: Management, treatment and pollution prevention practices.

Obionu (2007) concluded in his study on Primary Health Care for Developing Countries that poor waste management and disposal could lead to various diseases, infections and infestation and these include fly transmitted diseases like myiasis, diarrhoea, typhoid, cholera; rodent transmitted disease likelassa fever plague, leptospirosis, murine typhus; mosquito borne diseases such as malaria, yellow fever, filariasis, and dengue hemorrhagic fever.

Zia and Devadas (2008) Urban solid waste management in Kanpur: opportunity and perspectives. In the study it is stated that globally, millions of tons of municipal solid waste are generated every day. Urban waste management is drawing increasing attention, as it can easily be observed that too much garbage is lying uncollected in the streets, causing inconvenience, environmental pollution, and posing a public health risk.

GHS (2008), Ghana (2010), Osei and Duker (2008) revealed the same conclusion in their study that poor waste management situation in recent years has led to a high incidence of sanitation related illness, such as cholera, intestinal worms and typhoid. These are among the top ten diseases that have been recorded, which raises the alarm of a public health crisis.

A study on Vermicomposting of domestic waste by using two epigeic earthworms (Perionyx excavatus and Perionyx sansibaricus) done by Suthar and Singh (2008) concluded that Solid waste can be converted to a potential plant nutrient enriched resource and it can be utilized for maintaining fertility of land.

Lazcano (2008) stated that Composting means it is biological process in which recycling of organic matter take place. It is suitable and best technique for the management of solid waste. We can find out appropriate composting method with the use of agricultural solid waste and cow dung. Processing of organic solid waste material through controlled bio-oxidation processes, such as composting, reduces the environmental risk by converting the waste into a safer and stable product suitable for application to soil.

A study on Comparison of vermicompost with pit compost prepared from Municipal solid waste indicated that P and K content was high in vermicomposting than NADEP and pit composting. The level of moisture was more in vermicompost and then followed by pit and NADEP compost. The pH value was high in NADEP compost while it decreases in vermicompost and pit composting. (Chavan and Ustad (2010).

A study conducted by Ukpong and Udofia (2011) revealed that greater investment should be made in the area of refuse storage, sorting, collection and

disposal. Greater awareness of the need for cleaner environment is needed among the urban population since it will reduce indiscriminate disposal. It is believed that the involvement of both government and private agencies and even individuals in waste sorting at the source will go a long way in helping the recovery of reusable materials from domestic waste.

Management of Municipal Solid Wastes: A Case Study in Limpopo Province, South Africa was carried out by Ogola *et al.* (2011) resulted that In Lagos, Nigeria, some of these open pits are located near residential housing and therefore represent a threat to human health and the environment. Also a South African study has found that out of the 5 million tons of waste produced every year, only 5% is disposed of in designated sites, which implies that most of the waste in that country is deposited in environmentally unsafe sites.

Ayodeji (2012) studied the waste management awareness knowledge and practices of secondary school teachers in Ogun state and it showed that teachers were aware and knowledgeable about waste management even though they possessed negative waste management practices. There seems to be appreciable awareness and knowledge about waste disposal among people in Nigeria but most of them are only aware of the crude and traditional methods and are oblivious of the modern methods such as incineration and recycling.

In this study, females were found to be more aware and knowledgeable about waste management than males. A Togolese study on the intersection of gender, education and health, recognizes the pivotal role of women in household cleanliness and sanitation. It is therefore not surprising that the female respondents knew so much about basic waste management principles. (Mattos, 2012).

Katre (2012) carried out a study on Use of vegetable waste through aerobic composting of village Bamhani, District: Gondia (Maharashtra state), India revealed that NADEP method is a simple method to process and operate which is nuisance free, environmental friendly and socially acceptable as the end product has good fertilizer value.

According to UNICEF and Ministry of rural development (2012) compost plays very important role in plant growth and nutrition. The final product of compost was rich in nutrients and beneficial to growth promoting substances. It was easily available nutrient from the complex material to the plant.

Study on Bio-Degradable (Organic) Kitchen Waste Management Practices in the Selected Households carried out by Agamacharyya and Manimozhi, (2013) and found that more than 90 percent households complained insects, mosquitoes, flies and rodents in breeding place as major problem. Up to 80 percent households explained health problems, polluted water supply, unpleasant odour and street dogs were the problems faced due to accumulation of waste. Overflow of drainage was the other problem expressed by more than 75 percent of households.

Awareness and knowledge of waste disposal is influenced by many factors as pointed out in a work done by Banga (2013) on household knowledge, attitudes and practices in solid waste segregation and recycling in urban Kampala. It indicated that the participation in solid waste separation activities depended on the level of awareness of recycling activities in the area, household income, educational level and gender.

Jatau, (2013) knowledge, Attitude and Practices associated with Waste management in Jos South Metropolis, plateau State revealed that level of education had statistical significant influence on knowledge associated with waste management as well as on practices associated with waste management. Age has no statistical significant influence on attitudes associated with waste management.

According to the study of Turning Waste into Wealth in Nigeria: An Overview by Sridhar MKC and Hammed, (2014) to achieve specific waste management goals in Nigeria, Sustainable Integrated Waste Management which is the selection and application of suitable technologies and management programmes needs to be considered.

Sandhya, (2015) carried out a study on Nirmala Nagaram Nirmala Bhavanam-A Model for Decentralized and Community based Solid Waste Management System which states that Kerela is a rapidly growing economy with highest per capital consumption in the country. This will definitely increase the state's waste load unless

it s managed scientifically. Or it could adversely impact the quality of life. Nirmala Nagaram Nirmala Bhavanam throws a ray of hope in which the waste is converted to wealth by generating fuel and manure from it.

Chavan (2015) studied effect of organic and inorganic fertilizers on Cluster bean (*Cyamopsis tetragonolobus).* Vermicompost which can be prepared from agricultural solid materials can be recommended for better growth and yield of Cluster bean (*Cyamopsis tetragonolobus*) in agricultural practices as compared to NADEP and pit organic fertilizers treatments. The resulting vermicompost has been shown to have several positive impacts on plant growth and health.

CHAPTER-III

MATERIALS AND METHODS

A systematic methodology is an important step to a research because it directly influences the validity of the research findings. Therefore in order to achieve the objective of the present study entitled "Kitchen waste management practices in rural household", a detailed plan of work and sequential procedure was adopted. The study was conducted during 2015-2017. The methodology adopted to conduct the investigation is detailed under following subheads to explain the plan of work and sequential procedure.

3.1 Research design

"A research design is the arrangement of conditions for collecting and analysing of data in a manner that aims to combine relevance to the research purpose with economy in procedure" (Kothari, 2005).

Research design is to provide for the relevance with minimum of efforts, time and money. It is the specification of methods and procedures used for acquiring the information needed for the study. Exploratory research design was planned in order to achieve the objectives of the study. Exploratory research type helps to determine the best research design, data collection method and selection of subject. The objective of Exploratory research is to gather preliminary information that will help to define problems and suggest hypothesis (Kotler and Armstrong, 2006) (Shields and Rangarajan, 2013). This research design was adopted to gain familiarities and to acquire a new insight into the existing aspects of various issues related to waste management practices, nature of waste generated, general awareness regarding waste management.

3.2 Selection of study area

Location of study area should be appropriate to achieve the objectives of the research. The locale for this present study was Similiguda and Nandapur block of Koraput district, in the state of Odisha. The location was selected purposively as per the convenience of the researcher.

Table 3.2.1 Conceptual frame work of the study

Research type	Exploratory research
Sampling method	Multi stage purposive random and proportionate sampling
Sample unit	Married women of rural household
Sample size	110
Tools for data collection	Questions consist of 5sections with 51 questions. Information collected through questionnaire cum interview method.
Tools for data analysis	The data was analysed with the help of statistical package.

3.3 Sample selection

3.3.1 Sampling design

A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt in selecting items for the sample. Sample design may as well lay down the number of items to be included in the sample i.e. the size of the sample. Sample design is determined before data are collected (Kothari, 2005).

Multistage purposive sampling design was used to select the district, block, gram panchayat and villages keeping the operational feasibility in view. Out of the four villages 110 rural married women were selected by proportionate random sampling techniques as respondents of this study. Care was taken to choose respondents who were ready to cooperate the investigation.

Table 3.3.2 Representation of sampling design

Particular	Number	Name	Sampling Method
State	1	Odisha	Purposive
District	1	Koraput	Purposive
Block	2	Nandapur Similiguda	Purposive
G. P.	2	Khurji Subai	Purposive
Village	4	Muliaput Khatalaput Dalaiguda Luhaba	Random
Respondents	9 21 41 39	Muliaput Khatalaput Dalaiguda Luhaba	Proportionate
Total Respondents	110		Purposive

Out of the blocks Nandapur and Simliguda blocks were selected purposively. Further, from a total of 37 Gram panchayat from the above two blocks, Khurji and Subai Gram panchayat were selected purposively as the researcher could easily reach the respondent. Two villages from each gram panchayat such as Muliaput, Khatalaput, Dalaiguda, Luhaba were selected randomly. Data was elicited from the respondents at their residence by observation and interview method.

3.4. Tools used for data collection

The tool selected for collecting the data was an interview schedule cum observation sheet. Direct interview cum observation method authenticates the information as it involves direct interaction with the respondents and observation of phenomena is the most effective and easiest way of gathering on site data for any social research. Interview schedule consisted of data collection technique in which the interviewer physically met the interviewee and asked questions related to the research topic. It facilitates direct access and contact for exploring information on research questions and noting down the responses in their natural settings (Mathiyazhagan *et al.*, 2013).

Keeping in mind the objectives of the study an interview schedule cum observation sheet was developed and pre-tested in 10 houses to validate the information. Finalised schedule was used for collecting information. The interview schedule tool included questions on general information and specific information (Appendix).

In the questionnaire, general information regarding respondents age, education, caste, income, type of family, occupation of respondent, type of house, facilities in house were included.

Specific information regarding amount and frequency of waste generated and their disposal facility, kitchen waste disposal practices, waste management programmes, awareness of various diseases due to improper waste management, environmental problems due to waste accumulation, respondents view on the criteria for proper waste management were gathered from the respondents.

3.4.1 Method of data collection

For gathering the relevant data interview and observation method was adopted. The required data was collected from 110 houses, covering 4 villages. Reliable information was collected by asking the respondent the questions framed in the interview schedule covering the general profile to the specific information of kitchen waste management practices.

The observation made for the present study included observing the degradable and non degradable kitchen waste separation and management. The researcher visited each respondent for three conjugative days. The respondents were provided packets to keep the waste product. To quantify the waste, a digital weighing machine was used. The average of degradable and non degradable waste generated in these three days was calculated separately and recorded.

3.5 Variable

Variable can be defined as a numerical value or a characteristic that can differ from individual to individual (Stark, 2014). It is called as variable because the value may vary between data units in a population and may change in value over time

(Australian Bureau of statistics, 2013). The present study includes dependent and independent variable.

Independent variable is the variable that is manipulated by the experimenter to determine its relationship with an observed phenomenon, called the dependent variable. More generally, the independent variable is the "cause", while dependent variable is the "effect" of the independent variable.

An independent variable, a term used in mathematics and statistics, is a variable which can be manipulated but it is not dependent on the changes in other variables. The independent variables in the study were:-

a) Age
b) Education
c) Income group
d) Types of family

A dependent variable is also known as a "response variable", "regression and measured variable", "responding variable", "explained variable", "outcome variable", "experimental variable", and "output variable" (Dodge, 2003). The dependent variables for the present research study were:-

a) Nature of waste
b) Amount of waste
c) Waste management practices
d) Awareness of waste management

3.6 Analysis of data

Analysis is the critical examination of assembled and grouped data for studying the characteristics of the objects under study and determining the patterns of relationship among variables related to it. Different procedures used for analysis were coding, categorization, tabulation and graphs.

Coding refers to the process of assigning numerical or other symbols to answer so their response can be put into a limited numbers of categories or clauses.

Such clauses should be appropriate to the research problem under consideration. Then the data was transformed from coding sheet to comprehension table to give a clear picture of findings. The data presented in a form of applying, revealing and comprehensible with reference to the purpose of the study. This has been done in several ways such as tables, graphs, photographs etc.

The data thus collected in 110 selected households were tabulated and analysed through simple frequencies and percentage, mean, gap percentage, chi-square test. A 5 point likert scale was used to measure awareness various diseases and environmental problem due to improper waste management.

3.6.1 Statistical analysis

Analysis is the critical examination of assembled and grouped data, for studying the characteristics of the object under study and determining the pattern of relationship among variables related to it. The statistical measures which had been used in research is given below.

Frequency

It is used to find out the number of respondents in particular cell

Frequency = sum of responses (in numbers)

Percentage

Single comparisons have been made on the basis of percentage. The formula of the percentage as given below

$$\text{Percentage} = \frac{\text{Particular category}}{\text{Total no. of respondents}} \times 100$$

Mean

Mean also known as arithmetic average, is the most common measure of central tendency and may be defined as the value which we get by dividing the series by total number of items.

Mean or $X = \sum X_i$

$\overline{X}$ = The sum we use for mean

$\sum$ = Symbol of summation

X_i = Value of ith item, i = 1,2,3.....n

N = Total no. Of items

Rank

Rank was calculated from the values obtained from weighted mean score, highest was given rank 1, second highest was given rank 2 and so on.

Chi-square test

Chi-square test is a test of independence, goodness of fit and homogeneity. At times chi-square is used as a test of population variance.

$$X^2 = \sum \left[\frac{(O-E)^2}{E} \right]$$

Where O = Observed frequency

E = Expected frequency

Gap percentage

It is calculated to identify the difference or gap in between the two scores.

$$\text{Gap percentage} = \left[\frac{\text{Maximum score of likert scale - obtained score (mean)}}{\text{Maximum score of likert scale}} \right] \times 100$$

3.7 Operational definition

Illiterate:- Having little or no education; *especially* : unable to read or write. Showing or marked by a lack of familiarity with language and literature.

Nuclear family: - A nuclear family is a family unit that includes two married parents of opposite genders and their biological or adopted children living in the same residence.

Joint family: - A consanguineal family unit that includes two or more generations of kindred related through either the paternal or maternal line who maintain a common residence and are subject to common social, economic, and religious regulation.

Skilled worker:- A skilled worker is any worker who has special skill, training, knowledge, and (usually acquired) ability in their work. A skilled worker may have

attended a college, university or technical school. Or, a skilled worker may have learned their skills on the job.

Degradable waste :- Degradable waste includes any organic matter in waste which can be broken down into carbon dioxide, water, methane or simple organic molecules by micro-organisms and other living things using composting, aerobic digestion, anaerobic digestion or similar processes.

Non degradable waste :- The term non-degradable describes substances that do not break down to a natural, environmentally safe condition over time by biological processes. In other words, non-biodegradable materials do not decay.

Waste generation :- The weight or volume of materials and products that enter the waste stream before recycling, composting, land filling, or combustion takes place. Also can represent the amount of waste generated by a given source or category of sources.

Solid waste :- Any *unwanted* product which is not a liquid or gas in our surroundings and from our daily products like food and *kitchen* waste, green waste, paper, plastic metals etc.

Liquid waste :- Liquid waste can be defined as such fluids as wastewater, fats, oils or grease (FOG), used oil, and hazardous household liquids.

Pit compost :- It's a shallow hole in the ground where you put vegetable waste (including, foods, lawn clippings etc) and cover or layer them with topsoil to eventually turn it to a fertiliser known as 'compost'.

Vermi compost:- Vermicompost (or vermi-compost) is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast. This process of producing vermicompost is called vermicomposting.

Waste disposal :- Removing and destroying or storing damaged, used or other unwanted domestic, agricultural or industrial products and substances. Disposal includes burning, burial at landfill sites or at sea, and recycling.

Swacha Bharat Abhiyan :- It (Clean India Movement) is a campaign by the Government of India to clean the streets, roads and infrastructure of the country's 4,041 statutory cities and towns.

Kitchen garden:- A kitchen garden is a garden, or part of a garden, in which vegetables, herbs, and fruit are grown for own use.

Recycling :- Recycling is the process of converting waste materials into new materials and objects. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions.

Reuse :- Reuse is the action or practice of using something again, whether for its original purpose (conventional reuse) or to fulfil a different function (creative reuse or repurposing). It should be distinguished from recycling, which is the breaking down of used items to make raw materials for the manufacture of new products.

Biodiversity :- Biological diversity' means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Water pollution:- Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, aquifers and groundwater). This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Training programme :- Training is teaching, or developing in oneself or others, any skills and knowledge that relate to specific useful competencies. Training has specific goals of improving one's capability, capacity, productivity and performance.

Purposive sampling :- A purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study. Purposive sampling is also known as judgmental, selective, or subjective sampling. This type of sampling can be very useful in situations when you need to reach a targeted sample quickly, and where sampling for proportionality is not the main concern.

Proportionate sampling :- Proportionate sampling is a sampling strategy (a method for gathering participants for a study) used when the population is composed of several subgroups that are vastly different in number. The number of participants from each subgroup is determined by their number relative to the entire population.

Fig. 3.1 Map of Odisha with different districts

Fig. 3.2 Map of Koraput with different blocks

Fig. 3.3 Study of the area and interaction with the respondents

Fig. 3.4 Data collect from the respondents

Fig. 3.5 Weighting of the kitchen waste generating per day

Fig. 3.6 Open dumping of waste

Fig. 3.7 Burning of waste

Fig. 3.8 Kitchen waste used as animal feeding

Fig. 3.9 Composting of waste product through vermicompost

Fig. 3.10 Composting of waste product through pit compost

CHAPTER-IV

RESULTS AND DISCUSSION

The result of the present study entitled “Kitchen waste management practices in rural household” derived through the use of prescribed methodology are presented in this chapter. These are in concurrence with the said objectives and are presented under different heads as follows :-

4.1 General information of selected respondents

4.2 Nature and extent of kitchen waste generated

4.3 Kitchen waste management practices among rural women

4.4 Awareness of waste management practices among rural women

4.1 General information of selected respondents

Data in relation to personal profile and housing characteristics of the respondents were represented in the following tables.

In the present investigation the general profile studied included age, education, marital status, type of family, family composition, occupation and family income. The present study was limited to women.

The table 4.1.1 revealed that 30.0 percent of the sample belonged to the age group below 30 years, 31 to 45 years each and remaining 21.8 percent were in the age group of above 45 years.

According to the study 37.2 percent respondents were illiterate and 62.8 percent were literate. Among the literate respondents it was found that, 31.8 percent completed primary school education and only 10.9 percent had educational qualification of intermediate and above.

Maximum number of respondents belonged to schedule tribe (56.36%) followed by schedule caste (24.54). Around 41.81% respondents were from Christian religion while the rest of the 58.18% were Hindu.

Table 4.1.1 Profile of the respondents

n=110

Variables	Categories	Frequency	Percentage
Age	young (<30)	43	39
	middle age (31-45)	43	39
	old (>45)	24	21.8
Education	Illiterate	41	37.2
	Primary school	35	31.8
	High school	22	20
	Intermediate and above	12	10.9
Caste	general	21	19.09
	Schedule caste	27	24.54
	Schedule tribe	62	56.36
Religion	Hindu	64	58.18
	Christian	46	41.81
	Muslim	-	-
Type of family	Nuclear	87	79.0
	Joint	23	20.9
Number of family members	Small(1-4)	25	22.7
	Medium(5-6)	62	56.3
	Large (>6)	23	20.9
Occupation of respondent	Housewife	19	17.2
	Labourer	87	79
	Service	4	3.6
	Skilled worker	-	-
Total income of the family from per month	<10,000/-	33	30
	10,001/- to 15,000/-	55	50
	15,001/- to 20,000/-	22	20

It was evident from the table that 17.2 percent of the total samples were housewives and only 3.6 percent were employed. Majority of them i.e. 79.0 percent were labourers by occupation and worked in agricultural field. It was found that all of the respondents under study were married and most of them belonged to the nuclear

family (79.0 %), which showed that joint family system is gradually disintegrating from the society.

The family size was broadly categorized into three sections i.e. small comprising 4 or less than 4 members, medium family comprising 5 to 6 members and large family comprising more than 6 members. It was evident from the table that majority (56.3%) of the respondents had medium family size where as small sized families and large families comprised only 22.7 and 20.9 percent respectively.

The table also showed that 50.0 percent of the sample belonged to the income range Rs 10,000/- to 15,000/-followed by 20.0 percent belonged to income range Rs 15,001/- to Rs20,000/- and 30.0 percent belonged to the income range below Rs10,000/- per month.

An observable number of illiteracy was found. Very few respondents had higher education. It may be due to the absence of college and school in the nearby area as well as poor transportation facility in that area. Majority of the respondents belonged to the nuclear family, which showed that joint family system is gradually disintegrating from the society.

Table 4.1.2 Household characteristics of respondents

n=110

Variables	**Categories**	**Frequency**	**Percentage**
Housing or residential unit	Own	110	100.0
Type of housing	Katcha	5	4.5
	Semi Pucca	83	75.4
	Pucca	22	20.0
Electricity in house	Have Electricity	110	100.0
Water facility	Supply water at a distance	110	100.0
	Tube well	110	100.0
Latrine facility	Open defecation	53	48.1
	Govt subsidised latrine	57	51.8
Frequency of cooking per day	Twice	88	80.0
	Thrice	22	20.0

House is one of the basic needs of human life. The type of house and housing condition are influenced by local environment or availability of construction materials locally and the level of development. The term household characteristics means dwelling units, its structure type and facilities such as electricity, drinking water, cooking fuel, toilet, etc.

Table 4.1.2 depicted the household characteristics of the respondents of study area. All of them had their own residential units with both electricity and water facility. Supply water at a distance and common tube well were available to all the respondents. Majority of respondents had semi pucca house (75.4%) followed by 20% had pucca house, rest of the 4.5% respondents (4.5%) lived in katcha house. Around 51.8% respondents were using govt subsidised latrine, while 48.1% respondents were still practising open defecation, some of them were on the process of building a latrine. Majority of the respondents (80.0%) were cooking twice daily followed by 20.0% were cooking three times per day. Frequency of cooking per day increases on special occasions like festivals, guest arrivals etc.

All the respondents had own house with electricity facility and common water facility at a distance. But half of them didn't had latrine at their residence and practised open defecation, as well as majority of the respondents had semi pucca house. This was due to the unavailability of govt support, financial problem or traditional practices in that locality as opined by the respondents.

4.2 Nature and extent of kitchen waste generated

Kitchen waste is a vital part of municipal waste. A variety of waste can be included into the category of kitchen waste which can be biodegradable or non biodegradable in nature and vary in amount due to different reasons.

Table 4.2.1 Average amount of waste generated per day per household

Family size	Biodegradable (n=110)			Non biodegradable (n=110)	
	<500 gm	501 – 1000 gm	>1000 gm	<10 gm	>10 gm
Small	6(5.4)	18(16.3)	1(0.9)	20(18.1)	5(4.5)
Medium	2(1.8)	59(53.6)	1(0.9)	20(18.1)	42(38.18)
Large	1(0.9)	10(9.09)	12(10.9)	9(8.1)	14(12.7)

- Number in parenthesis indicates percentage.

In recent time people suffer from a growing threat of an ever-increasing volume of waste generated because of an increasing population. Prior to waste management, waste separation is the first step and very important for it which can be only possible at grassroot level.

Average amount of waste generated per day per household is depicted in table 4.2.1 The analysis of the sample observation in the study area indicates that average biodegradable waste generated was 501 to 1000 gm in 16. 3 percent, 53.6 percent and 9.09 percent respondents in small, medium and large family respectively. The biodegradable waste generation was found to be more than 1kg in 10.9 percent households of large family.

Non biodegradable waste included metal waste, glass waste, plastic waste etc. Further the non-biodegradable waste of >10 gm was generated by 4.5 percent, 38.18 percent, 12.7 percent of small, medium and large family respectively. The non biodegradable waste generation was found to be <10 gm in rest of the households in average per day.

The generation of biodegradable waste was more frequent in comparison to non-biodegradable waste, may be due to consumption pattern in that area. Compare to small and medium families, large families were generating more quantity of household waste because they consume more in comparison to others.

The findings of the researcher was in line with the findings of Sridhar.MKC. (2006) and Ogwueleka.TC. (2009) that biodegradable waste are generated more frequently in comparison to non biodegradable waste.

Segregation of waste is the first and most important step in waste management and environment preservation. Lack of segregation is the root cause of clogged landfills, blocked drains, soil and water pollution and can hinder the entire process of waste disposal, recycling and reuse. Various reason are responsible for not separating waste before disposal which varies from person to person.

Table 4.2.2 Practice of separation of waste prior to disposal by the respondents

n=110

Variables	Categories	Frequency	Percentage
Separation of waste	Solid and liquid waste	82	74.54
	Biodegradable and non biodegradable waste	4	3.63
	Do not separate	24	21.8
Feeling about separation	Like it very much	24	21.8
	In a habit to do so	62	56.3
Reasons for not separation	Laziness	4	3.63
	Not aware	15	13.6
	Lack of discipline in home	5	4.54

Table 4.2.2 depicted the waste disposal methods used by the households. Out of the 110 respondents 74.54% separated the solid and liquid waste and only 3.63% separated biodegradable and non biodegradable waste prior to disposal. The rest of the respondents didn't bother to separate the waste. The results of the study were in agreement with the findings of Warunasinghe and Yapa (2015).

While questioning the respondents about the reason of waste separation, 56.3% replied that they were in a habit of doing so.

Reason for non separation of waste was due to unawareness (13.6%), laziness (3.63%) and lack of discipline in home (4.54%).

It can be concluded that solid and liquid waste separation was quite in practice and awareness must be created among other respondents about practise of biodegradable and non biodegradable waste to separate prior to disposal. The main reason of not separating was lack of awareness fallowed by laziness and lack of discipline in home.

The findings of research conducted by Adong *et al.* (2015) and Yoada *et al.* (2014) was in agreement with the findings of the researcher that majority of respondents don't separate waste prior to disposal.

Table 4.2.3 Study the frequency of different type of waste generation and their disposal

n=110

Waste product	Frequency of waste generated and disposal				Mean	Rank
	Daily	Weekly	Monthly	Yearly		
Remaining food after consumption	**110**	-	-	-	4	1
Spoiled food due to extra cooking	2	**97**	11	-	2.91	5
Spoiled fruit or vegetables	4	**96**	10	-	2.94	4
Peels of fruit and vegetables	**107**	3	-	-	3.97	2
Non veg waste	-	**106**	4	-	2.96	3
Paper/card board	9	**62**	34	5	2.68	7
polythene bags or wrapper	7	**90**	4	-	2.78	6
Glass waste	-	-	7	**103**	1.06	10
Metals waste	-	-	-	**110**	1	11
Clothes/napkins	-	-	**88**	22	1.8	8
Electronic waste	-	-	28	**82**	1.25	9

Waste comes in many different forms and may be categorized in a variety of ways. These various type of waste not only varies according to their property like biodegradable and non biodegradable but also varies in amount and frequency of generating as well as have different disposal methods.

According to the data of table 4.2.3 the most common waste generated and disposed in daily basis was remaining food after consumption with weighted mean score (WMS) 4 and ranked 1 which was followed by peels of fruits and vegetables with WMS 3.97, ranked 2.

Three waste products i.e. non-veg waste, spoiled fruits and vegetables and spoiled food due to extra cooking had nearly equal WMS i.e. 2.96, 2.94, 2.91 with ranked 3, 4, 5 respectively. Generation and disposal of waste product such as paper or cardboard, polythene varied from household to household, so that secure mean score of 2.68, 2.78 and ranked 7 and 6 respectively. It is noted that some waste products were generated and disposed occasionally such as metal waste, glass waste, electronic waste and clothes which had WMS of 1, 1.06, 1.25, 1.8 respectively.

Waste generated in the kitchen showed that food waste contributed the largest proportion followed by polythene and paper waste. Waste such as glass metal and electronic waste were very rarely generated and disposed due to the consumption pattern of respondents in that area.

The finding was in line with study of Kumara and Grover (2007) that documented the multiple nature of waste generated in rural households.

4.3 Kitchen waste management practices among rural women

Waste management or waste disposal is all the activities and actions required to manage waste from its inception to its final disposal. This part deals with different waste handling methods of different waste products practised by the respondents.

Table 4.3.1 Kitchen waste management practices by the respondents

n=110

Variables	Categories	Frequency	Percentage
Responsibility of cleaning	Respondent	90	81.8
	Any other member	20	18.1
Method of collection	polythene bags	27	24.5
	Covered dustbins	10	9.09
	Uncovered dustbin	61	55.45
	Any other	12	10.9
Transportation of waste from home to final point	Respondent	90	81.8
	Any other member	20	18.1
Method of transportation	Hand carrying to the Community disposal point	110	100

Kitchen waste management practices at household level is important because it is only possible to separate waste from the grassroots level before disposal. Proper waste disposal is critical due to the fact that certain type of waste can be hazardous and can contaminate the environment. Although household refuse does not usually contain such large amount of germs but still proper handling is important. Table 4.3.1 showed the waste handling process by the respondents in the study area.

According to the data majority of the respondents (81.8%) preferred to clean their house themselves as well as transport waste from home to final disposal point.

Around 18.1% respondents revealed that both cleaning of house and disposal of waste was performed by other members of the family like daughter-in-law or daughter etc.

Uncovered dustbins was preferred for waste collection by 55.45% of respondents while 9.09% of respondents used covered dustbins for waste collection. Around 24.5% respondent stated that they used polythene bags to store waste products and 10.9% respondents used to throw in open space directly as soon as the waste was generated.

As there was no community waste disposal facility or any other waste disposal facility available in the study area, waste was carried by hands and thrown at disposal point. It is also observed that none of the male members were involved in kitchen waste management practices like cleaning, collection and transportation of waste from household to final point. Only female members were responsible for such activities.

The findings of research was disintegrating with the findings of the research of Adogu *et al.* (2015) and Yoada *et al.* (2014) which revealed that wheeled barrower or paid collector were more effective method of waste transport and covered dustbin was primary choice to store waste.

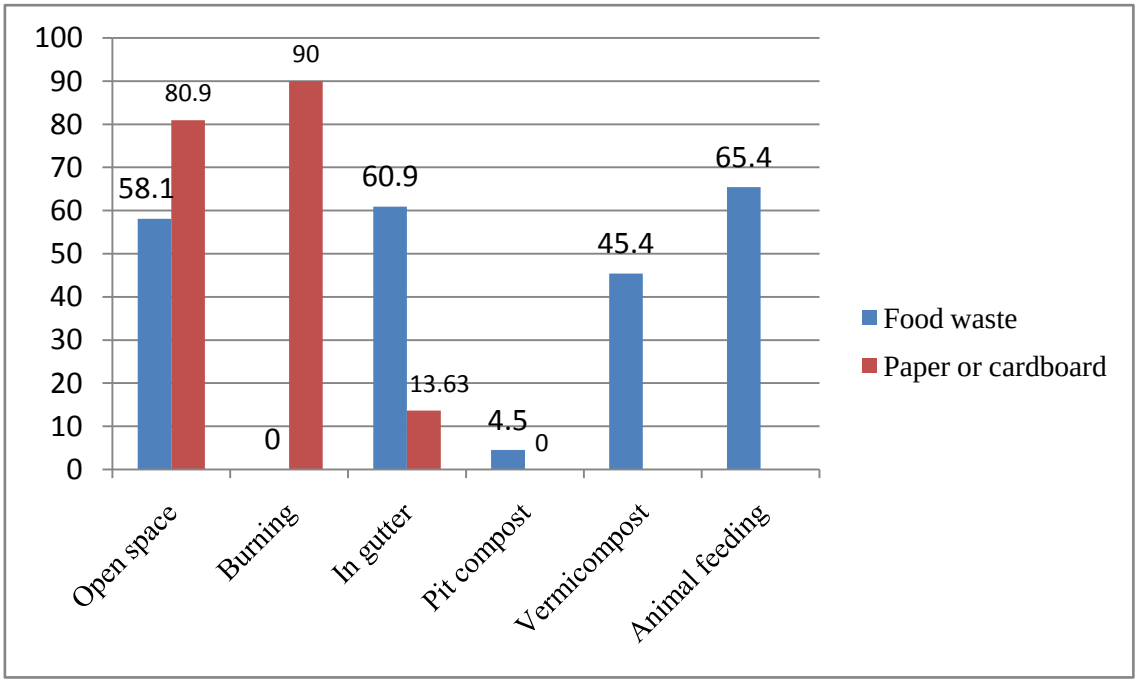

Fig. 4.1 Waste disposal practices for biodegradable kitchen waste products

❖ Multiple response.

Waste management or waste disposal is all the activities and actions required to manage waste from its inception to its final disposal. There are various kind of disposal practices are in action, some are good some are not. Figure 4.1 revealed the waste disposal practices by the respondents for biodegradable kitchen waste product.

Biodegradable kitchen waste in study area included food waste generated before (vegetable waste) and after cooking, paper and cardboard. It was observed that many of them practised improper waste disposal method such as dumping the food waste in open space (58.1%) and in gutter (60.9%). Though composting was one of the environmentally friendly way to manage the biodegradable waste, only 45.4% of the respondents prepare vermicompost and 4.5% prepare pit compost domestically. Very fewer amounts of paper and cardboard waste was generated which they either threw in open space (80.9%) and gutter (13.63%) or burnt it (90.0%).

Multiple responses were observed in this table because of the type of biodegradable waste such as veg - nonveg, solid-semisolid waste etc.

Improper waste disposal methods such as dumping in open and gutter, burning were practised more readily in comparison to environmental friendly methods like composting for biodegradable kitchen waste due to laziness and lack of discipline. As per food waste was concern majority of the respondents used the waste as animal feeding.

The finding of researcher was not in line with the findings of Warunasinghe and Yapa (2015) that majority of respondents dispose the waste in garbage tractors followed by burning.

Non biodegradable waste should be handled separately like plastic bags, glass bottles etc. which cannot be decomposed, their disposal posses a big problem. Waste disposal practices by the respondents for non biodegradable kitchen waste product is described in figure 4.2.

Non biodegradable kitchen waste includes plastic, glass, metal and E-waste, which most of the respondents were in a practice of throwing it in an open space. There was an increased use of plastics due to changes in life style and industrialisation

in which plastic packages replace other forms of packaging. It was estimated that over 65.45% of households burn plastic waste, a non biodegradable component of their domestic waste which add toxic gaseous emissions in atmosphere. Burning plastic pollutes air and destroy the ozone layer, thereby increasing the risk of health hazards, including cancers.

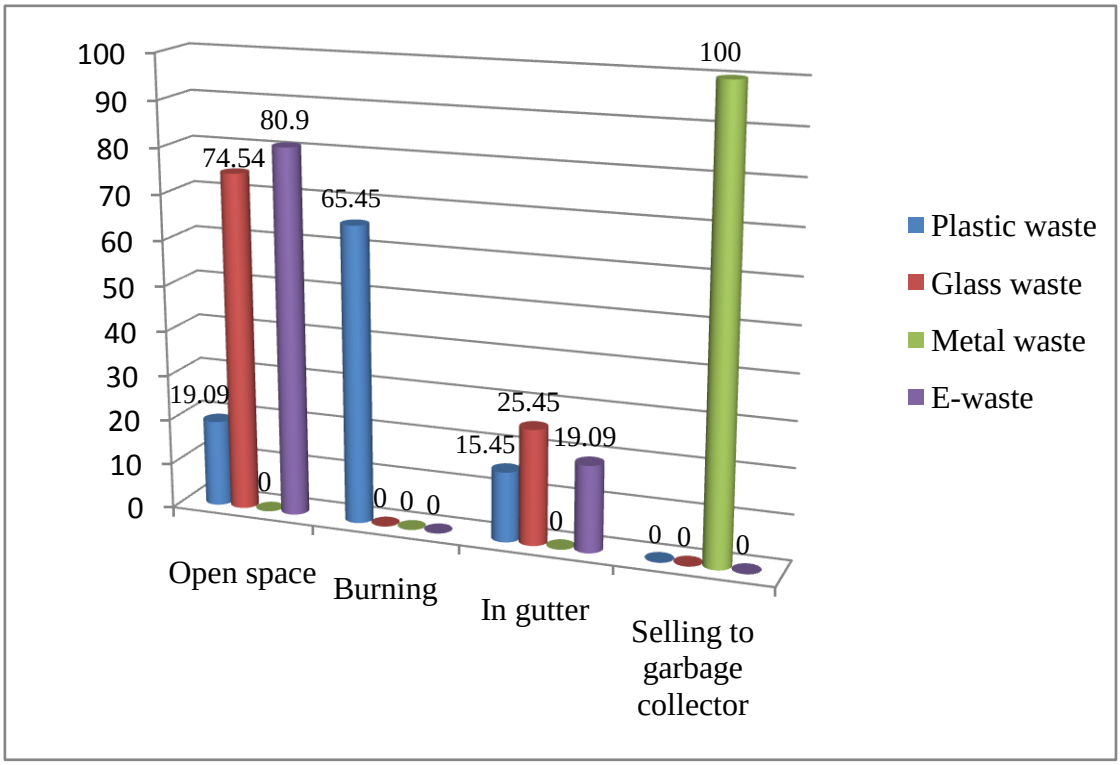

Fig. 4.2 Waste disposal practices for non biodegradable kitchen waste product

The findings of the researcher was in line with the findings of Yoada *et al.* (2014) that burning plastic was practise more which is harmful to both health and environment.

Glass waste and E-waste were thrown in gutter by 25.45% and 19.09% respondents respectively. Different type of metal waste was generated which was either sold to garbage collector or purchased new one with exchange offer.

The common disposal practices for non biodegradable kitchen waste was dumping at any place followed by burning, resulting due to lack of awareness about the effect of such action on human life as well as environment. Due to available facilities metal waste was the only waste which was either sold or exchanged rather than throwing.

It is felt that there is a need for effective disposal facilities for biodegradable and non biodegradable waste. The respondents suggested that there should be proper and adequate placement of municipality waste bins or door to door collection regularly by Municipal Corporation to enable effective management of waste at community level.

The findings of researcher were not in line with the findings of Warunasinghe and Yapa (2015) that majority of respondents disposed the waste in garbage tractors followed by burning.

4.4 Awareness of waste management practices among rural women

Awareness is the ability to directly know and perceive, to feel, or to be cognizant of events. More broadly, it is the state or quality of being conscious of something. A critical component in any waste management programme is public awareness and participation, in addition to appropriate legislation, strong technical support and adequate funding. This part of the study is to find out the level of awareness of the respondents.

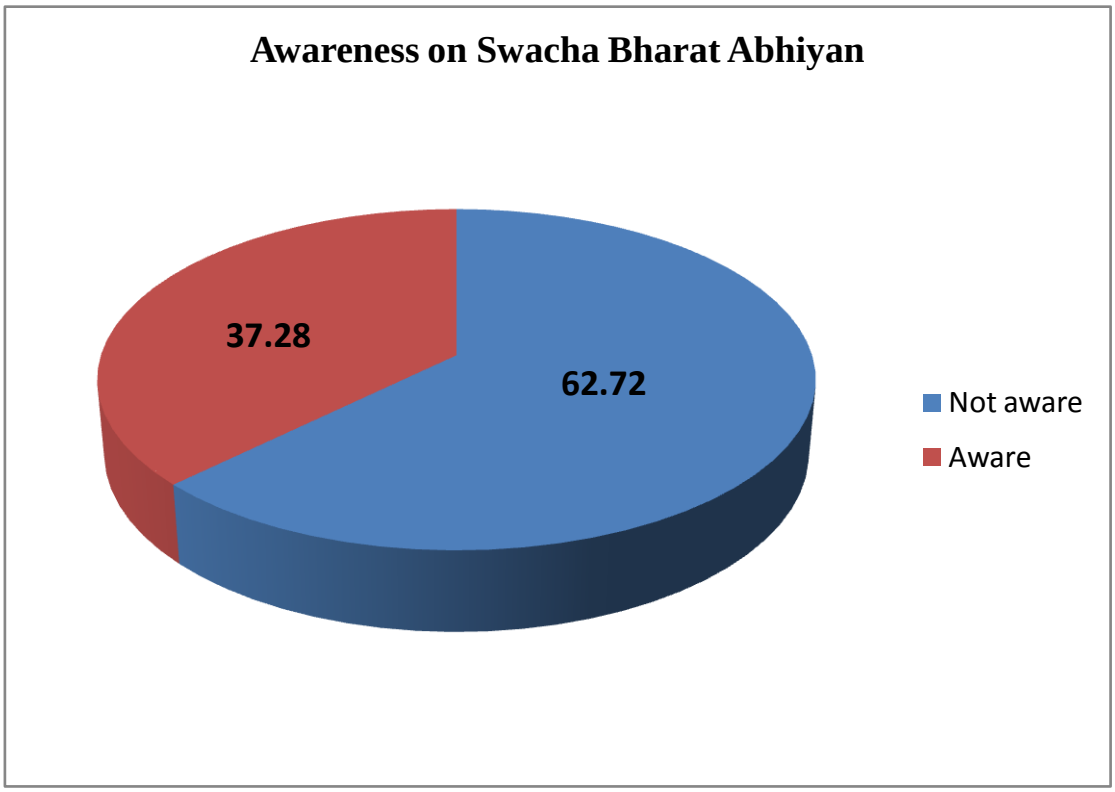

Fig 4.3 Respondent's awareness regarding Swacha Bharat Abhiyan

During the recent past the management of kitchen waste has revealed considerable attention from central, state govt. and local authorities in India. Govt. has launched many programs for rural as well as urban developments. The following figure 4.3 revealed the awareness of respondents regarding various programmes under Swacha Bharat Abhiyan.

It was revealed that majority of respondents (62.72%) were not aware about various programmes under Swacha Bharat Abhiyan like "Swacha Indhan - Sukhi Jiwan", "Compost Banao – Compost Apnao" etc.

Table 4.4.1 Respondent's knowledge regarding source of information about the training programme

n=110

Variables	Categories	Frequency	Percentage
Methods	Television	24	21.8
	Campaign	21	19.09
	Fair	24	21.8
	Training camp	96	87.2
Personal	Extension agent (kvk+asha)	96	87.2
	Family/friends	56	50.9
	NGO persons	21	19.09

Waste management training is the most effective mean for creating awareness specially among the rural population. There are various extension methods and extension personals available to provide information about such training programmes. Table 4.4.1 presented the respondents knowledge regarding different source of information on various training programme associated with waste management.

It can be concluded that extension methods i.e. training camp (872%) and extension personal such as extension agent (87.2%) were the most effective source of information about waste management training in the study area. Around 50.9%and 19.09% of respondents got information about waste management training through family or friends and NGO personals respectively. Both television and fair was used as a source of knowledge about waste management training by 21.8% respondents

and campaign recorded the least number of respondents (19.09%) as a source of information about waste management training.

The data on the above table revealed that extension personals from state govt. KVK, Asha etc were working more effectively towards creating awareness on waste management in the study area. None of the respondent remarked positively towards radio and newspaper as a source of information.

The findings of Adogu *et al.* (2015) was disintegrating with the findings of the researcher that mass media fallowed by neighbours were the main source of training information.

Table 4.4.2 Waste management training programme attended by the respondents

n=110

Variables	Categories	Frequency	Percentage
waste management training	Attended waste management training	98	89.09
	Not attended waste management training	12	10.9
Source of training	Govt organisation	89	80.9
	Non Government Organisation	9	8.18
Number of training attended	1	17	15.4
	2	59	53.63
	3	22	20.0

Knowledge leads to development. So by creating awareness about waste management, the problem of proper utilisation of increasing waste volume can be achieved. This awareness can be developed through different training methods and training sources. Waste management training programme attended by the respondent is depicted in table 4.4.2.

It was revealed that 89.09% of respondents attended some sort of waste management training out of which most of them i.e. 53.63% attended two number of training programmes on waste management. Further, 15.4% respondents attended at least one training programme and 20.0% of respondents attended three training

programmes on waste management. Various organisation such as KVK, Asha played an important role in imparting training on different waste management practices opined by 80.9% respondents. Around 8.18% received training from NGOs.

Most of the respondents attended waste management training and govt. organisations as well as NGO were working together more effectively in this line. Though their awareness level was elevated still they were fallowing the traditional method of waste disposal because of the mind set.

The findings of the researcher was in agreement with the findings of Kumari. and Grover (2007) that maximum number of respondents attended 1 to 2 training programme on waste management.

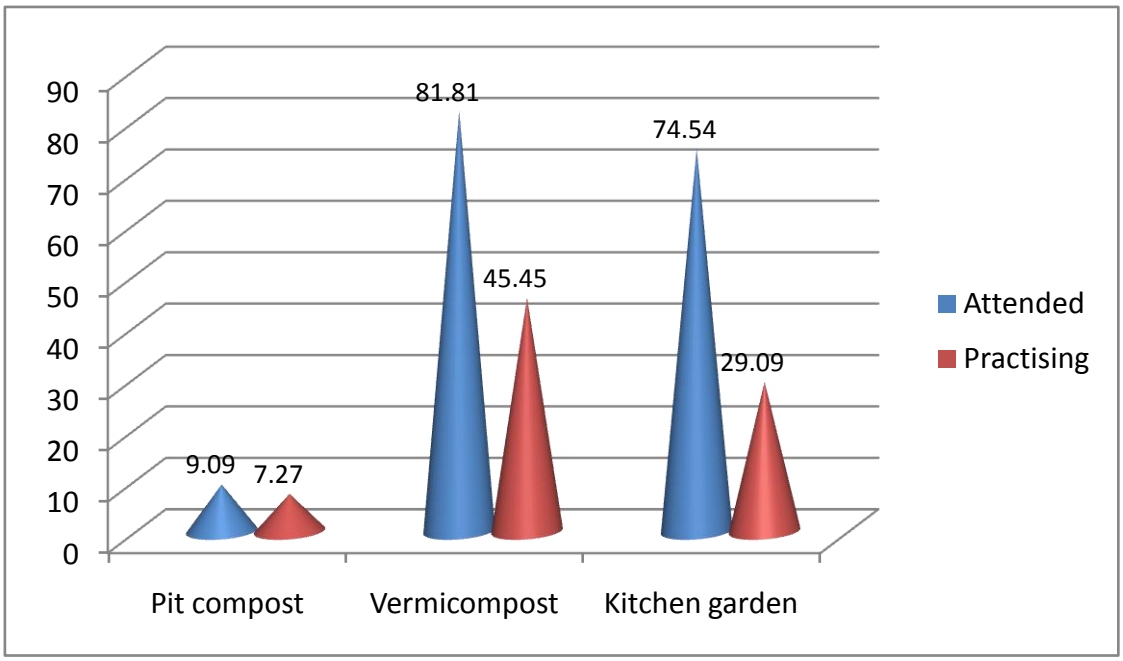

Fig. 4.4 Formal training received and practised on waste management

Waste management training enables a person to change waste into wealth as well as gives other benefits indirectly like batter environment. But it is very necessary that the knowledge is implemented practically. Figure 4.4 showed the availability of training on waste management as well as its practical implementation by the trainee.

No such training exclusive of kitchen waste management was imparted to the respondents. However some training programme on compost pit, vermicompost and kitchen garden was imparted to them. It was noted that 81.81% respondents attended

training on vermicompost out of which around half (45.45%) of the respondents were practising vermicomposting in their premises. Very less number of respondents (9.09%) attended training on pit compost out of which 7.27% were practising. The data revealed that although 74.54% attended formal training on kitchen garden, 29.09% respondents instead of throwing the kitchen waste in open space utilised in kitchen garden.

Illiteracy, laziness, lack of technical knowledge were the reasons for not adopting any waste management practice by the respondents though attended formal training, like the compost pit provided by the govt. was used for other purposes rather than for vermicompost.

The findings of Kumari and Grover (2007) was in agreement with the findings of the researcher that vermicompost was the most accepted waste management practise.

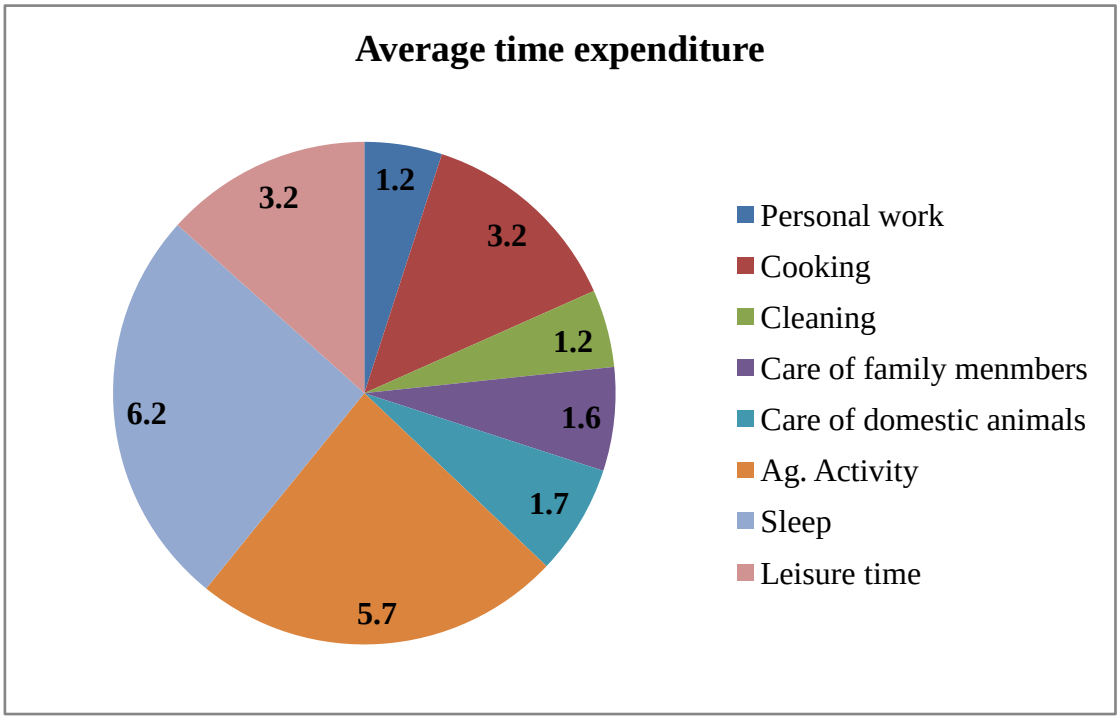

Fig. 4.5 Time utilization pattern by the respondents

Time is constant and precious, so it should be used wisely. Time utilization pattern helps to identify the average time expenditure on different activities performed by the respondents, which was describe in figure 4.5.

Average time expenditure by the respondents was 5.7 hours on agricultural activities such as field work, post harvest activity etc. followed by 3.2 hours on cooking. After performing other activities of the house such as care and cleaning of house, care of domestic animal, sleeping, an average time expenditure on leisure time was calculated to be 3.2 hours.

Leisure time was available to the respondents which were wasted in gossip or other unproductive activities. It can be used in a productive way by motivating them.

Table 4.4.3 Awareness of various diseases caused due to improper waste management practices

n=110

Awareness / Diseases	Very much aware	Much aware	Aware	Little aware	Not aware	Mean	Gap %
Malaria	12	22	35	39	2	3.02	39.6
diarrhoea	14	56	35	5	-	3.71	25.8
typhoid	13	7	52	36	3	2.94	41.2
dengue	12	5	52	34	6	2.81	43.8
Respiratory diseases	7	3	24	36	40	2.1	58.0
Anthrax	15	3	53	35	4	2.9	42.0

When waste is not properly disposed and is left to accumulate, poses a serious health hazard. People living near the accumulated heaps of waste are at a risk of infectious disease, as the accumulated waste produce an unpleasant odour and the decomposing materials is highly infectious in nature which can result in many disease.

It was evident from this table 4.4.3 that respondents were aware of various diseases with various mean score like diarrhoea (3.71), malaria (3.02), typhoid (2.94), anthrax (2.9) resulting due to improper waste management practices. The highest awareness gap % in relation to different disease were observed with respect to

respiratory disease (58%) which was followed by dengue (43.8%) and anthrax (43.0%) with nearly equal gap %.

Therefore, it was concluded that the respondents had awareness gap in respiratory diseases, dengue and anthrax resulting due to improper waste management practices. So the researcher suggested that more sensitization programmes and awareness camps should be done on respiratory disease, dengue, anthrax in the sample area by the NGO and line department.

The findings of the researcher was integrating with the findings of Virk *et al.* (2004) and disintegrating with the findings of Yoada *et al.* (2014).

Table 4.4.4 Awareness of respondents regarding environmental problems due to waste accumulation

n=110

Awareness / Problems	Very much aware	Much aware	Aware	Little aware	Not aware	mean	Gap %
Spreading of waste	12	22	36	40	-	3.05	39.0
Foul smell	34	37	38	1	-	3.94	21.2
Animals gathering around (street dogs)	4	2	8	25	71	1.57	68.6
Blockage or over flow of drainage system	8	9	18	63	12	2.76	44.8
Water pollution	5	5	15	44	41	1.99	60.2
Biodiversity	-	-	13	23	74	1.44	71.2

Present day kitchen wastes are collected in mixed scale and disposed in places, which are environmentally very sensitive as well as have negative effects on economy, aesthetic values and environment. It result in all type of pollution : air, soil, and water. Awareness of various environmental problem due to waste accumulation was presented in table 4.4.4.

It can be depicted that respondents were aware of different environmental problems which had a mean score of foul smell (3.94), spreading of waste (3.05), blockage of drainage system (2.76) due to waste accumulation. The highest awareness gap % in relation to environmental problems resulting due to improper waste management was observed as biodiversity (71.2%), followed by animals gathering around waste (68.6%) and water pollution (60.2%).

So the researcher suggested that there should be more awareness programmes organised by the line department in the study area on waste management and its effect on environment, such as water pollution, biodiversity etc.

The conclusion of Virk *et al.* (2004) was in line with the findings of the researcher that the respondents were more aware about problems such as foul smell, waste spreading etc. due to waste accumulation.

Table 4.4.5 Respondents knowledge regarding benefits of proper waste management

n=110

Awareness / Benefits	Very much aware	Much aware	Aware	Little aware	Not aware	Mean	Gap %
Ability to reuse/multipurpose use	3	9	22	62	14	2.31	53.8
Increases the ability to recycle	3	5	30	32	40	2.08	58.4
Reduces the cost of raw materials	7	9	25	28	41	2.2	56.0
Utilisation of time in a better way	-	34	36	27	13	2.82	43.6
Extra income generating capacity	-	26	68	10	2	3	40.0
Gives a feeling of unity in the family	-	-	-	73	37	1.66	66.8

Along with the environmental benefits proper waste management is a great way to save money, resources and time utilization in a batter way. It also provide

many social benefits at personal level like unity in family, extra income etc. The awareness of respondents about these social benefits was stated in the table 4.4.5.

The mean value of the benefits of proper waste management as opined by the respondents were extra income generating activity (3.0), utilization of time in a batter way (2.82), ability to reuse (2.31). The highest gap % was observed that it gives a feeling of unity in the family (66.8) followed by the ability to recycle (58.4%). Hence, training on the above aspects should be imparted to the respondent to increase their awareness on benefits of waste management.

According to the findings, the highest awareness gap % was observed as unity in the family, ability to recycle, multipurpose use and low cost raw material. In relation to benefits of proper waste management the present line department and govt. organization should take action to create awareness on these aspects in the study areas.

Table 4.4.6 Association of educational level of respondents with awareness about different disease resulting due to improper waste management

Education / **Disease**	**Illiterate** **n=41**	**Literate** **n=69**
Malaria	39	69
Diarrhoea	41	69
Typhoid	40	67
Dengue	36	68
Respiratory diseases	13	57
Anthrax	38	68
Mean	**34.5**	**66.33**

Table 4.4.6 indicates that literate respondents (mean score66.33) showed more awareness towards disease resulting due to improper waste management in comparison with illiterate respondents (mean score 34.5). Thus it can be concluded

that level of education influence the awareness towards diseases resulting due to improper waste management.

Table 4.4.7 Awareness of respondents about various waste management benefits in relation to their educational level

Education / Benefits	Illiterate n=41	Primary school n=35	High school n=22	Intermediate and above n=12	Mean
Increases the ability to reuse/multipurpose use.	36	30	18	12	**24.0**
Increases the ability to recycle	11	25	22	12	**17.5**
Reduces the cost of raw materials	11	27	20	11	**17.25**
Utilisation of time in a better way	34	32	19	12	**24.25**
Extra income generating capacity	40	34	22	12	**27.0**
Gives a feeling of unity in the family	34	21	9	10	**18.5**
Mean	**27.666**	**28.166**	**18.333**	**11.5**	

$\chi^2 = 25, P>0.05$

Test result

χ^2 calculated = 29.548

χ^2 table (0.05) = 24.996

Table 4.4.7 shows that calculated χ^2 value is more than the table χ^2 value (cal. χ^2 =29.548 > tab. χ^2 = 25,P>0.05). This implies that level of education had statistical significant influence on awareness about various waste management benefits. So awareness about various waste management benefits was dependent on education.

Table 4.4.8 Association of age of respondents with awareness about different disease resulting due to improper waste management

Age / Diseases	Young n = 43	Middle age n= 43	Old age n=24
Malaria	43	41	24
Diarrhoea	43	43	24
Typhoid	43	40	24
Dengue	43	37	21
Respiratory diseases	39	12	19
Anthrax	43	41	22
Mean	**42.33**	**35.66**	**22.33**

$\chi^2 = 12.237, P<0.05$

Test result

χ^2 calculated= 12.237

χ^2 table (0.05) = 18.307

It can be concluded from the table 4.4.8 that the calculated χ^2 value (12.237) is less than the tabulated χ^2 value at 5% (18.31). Therefore awareness about various diseases resulting due to improper waste management is not dependent of age. The finding of the researcher is in line with the findings of Jatau AA, 2013.

Table 4.4.9 Awareness of respondents about various waste management benefits in relation to their age

Age / Benefits	Young n=43	Middle age n=43	Old age n=24	Mean
Increases the ability to reuse/multipurpose use	39	33	24	32.00
Increases the ability to recycle	39	38	3	26.66
Reduces the cost of raw materials	41	26	2	23.00
Utilisation of time in a better way	41	36	20	32.33
Extra income generating capacity	43	41	24	36.00
Gives a feeling of unity in the family	23	32	18	24.33
Mean	**37.66**	**34.33**	**15.16**	

$\chi^2 = 34.407, P>0.05$

Test result

χ^2 calculated= 34.407

χ^2 table (0.05) = 18.307

Table 4.4.9 shows that calculated χ^2 value is more than the table χ^2 value (cal. χ^2 =34.407 > tab. χ^2 = 18.31, P<0.05). This implies that age had statistical significant influence on awareness about various waste management benefits. So awareness about various waste management benefits was dependent on age.

CHAPTER-V

SUMMARY AND CONCLUSION

Increasing population level, urbanization and increasing living standards have enhanced the waste generation in developing countries. Present day waste are collected in mixed scale and the problem of waste disposal in a proper way is becoming a serious threat as it can result in health hazard and environment pollution with its growing magnitude. Family is the basic unit of society. Practices and knowledge in grass root level affects the whole community. As kitchen waste is generated from home, waste management should start right at household level. Realizing the importance of proper waste management practices there is a need to study the kitchen waste management practices in rural household with the following objectives:-

- To study the nature and extent of kitchen waste generated in rural household.
- To investigate the kitchen waste management practices among the rural households.
- To study the general awareness of waste management practices among rural women.

As exploratory research design was adopted for this study. Age, education, income group and type of family were the various independent variables taken for the study. The various dependent variables were nature of waste, amount of waste, waste management practices, awareness of waste management etc. The locale for this present study was Similiguda and Nandapur block of Koraput district, in the state of Odisha, selected purposively. Further, from a total of 37 Gram panchayat from the above two blocks, Khurji and Subai Gram panchayat were selected purposively as the researcher could easily reach the respondent. Two villages from each gram panchayat such as Muliaput, Khatalaput, Dalaiguda, Luhaba were selected randomly. Proportionate random sampling technique was used to select 110 co-operating respondents for the study. A pre tested interview schedule was prepared and used as a tool for collecting information. The schedule consists of four sections such as :-

- General information
- Nature and extent of kitchen waste generated
- Kitchen waste management practices among rural women
- Awareness of waste management practices among rural women

The information was elicited from the respondents by visiting their household with the help of direct interview cum observation method. The collected data was analysed and interpreted with appropriate statistical tools.

5.1 Major findings of the study

- All the respondents were married women out of which 30.0% of the sample belonged to the age group below 30 years and 31 to 45 years each. Remaining 21.8% were in the age group of above 45 years.
- An observable number of illiteracy was found (37.2%) followed by 31.8% received primary education. Only 10.9% respondents had higher education. It may be due to the absence of school and college in the nearby area as well as poor transportation facilities. Majority of the respondents belonged to the nuclear family (79.0%), which showed that joint family system is gradually disintegrating from the society.
- All the respondents had own house with electricity facility and common water facility at a distance. But half of them (48.1%) didn't have latrine at their residence and practised open defecation, as well as majority of the respondents i.e. 75.4% had semi pucca house. This was due to the unavailability of govt support, financial problem or traditional practices in that locality as opined by the respondents.
- The generation of biodegradable waste was more frequent in comparison to non biodegradable waste, which may be due to consumption pattern in that area. Compare to small and medium families, large families were generating more quantity of household waste because of their family size.
- It was observed that solid and liquid waste separation was quite in practice by 74.54% respondents and awareness must be created respondents about practise of biodegradable and non biodegradable waste to separate prior to disposal. The main reason of not separating was lack of awareness (13.6%) fallowed by laziness (3.63%) and lack of discipline in home (4.54%).

- Waste generated in the kitchen showed that food waste contributed the largest proportion followed by polythene and paper waste. Waste such as glass metal and electronic waste were very rarely generated and disposed due to the consumption pattern of respondents in that area.
- As there was no community waste disposal facility or any other waste disposal facility available in the study area, waste was carried by hands and thrown at disposal point. It was also observed that none of the male members were involved in kitchen waste management practices like cleaning, collection and transportation of waste from household to final disposal point. Only female members were responsible for such activities.
- Uncovered dustbins were preferred for waste collection by 55.45% of respondents while 9.09% of respondents used covered dustbins for waste collection. Around 24.5% respondent stated that they used polythene bags to store waste products and 10.9% respondents used to throw in open space directly as soon as the waste was generated.
- Improper waste disposal methods such as dumping in open space (80.9%) and gutter (60.9%), burning (90.0%) were practised more readily in comparison to environmental friendly methods like composting (4.5%) for biodegradable kitchen waste which was due to laziness and lack of discipline. As per food waste was concern majority of the respondents i.e. 65.4% used the waste as animal feeding.
- The common disposal practices for non biodegradable kitchen waste was dumping at open place followed by burning. It was due to lack of awareness about the effect of such action on human life as well as environment. Due to available facilities metal waste was the only waste which was either sold or exchanged rather than throwing by the respondents.
- It was felt that there is a need for effective disposal facilities for biodegradable and non biodegradable waste. The respondents suggested that there should be proper and adequate placement of municipality waste bins or door to door collection regularly by Municipal Corporation to enable effective management of waste at community level.
- It was revealed that majority of respondents (62.72%) were not aware about various programmes under Swacha Bharat Abhiyan like “Swacha Indhan - Sukhi Jiwan” , “Compost Banao – Compost Apnao” etc.

- Extension personals (87.2%) from state govt. KVK, Asha etc were working more effectively towards creating awareness on waste management. None of the respondent remarked positively towards radio and newspaper as a source of information.
- Majority of the respondents i.e. 89.09% attended two to three number of waste management training programme such as pit compost, vermicompost, kitchen garden. Government organisations and non government organisations were working more effectively in this line. Though their awareness level was elevated still they were following the traditional method of waste disposal because of the mind set.
- It was noted that 81.8% respondents attended training on vermi compost out of which around half (45.45%) of the respondents were practising vermi composting in their premises. Very less number of respondents (9.09%) attended training on pit compost out of which 7.27% were practising. The data revealed that although 74.54% attended formal training on kitchen garden, 29.09 % respondents sometimes instead of throwing the kitchen waste in open space utilise in kitchen garden.
- Illiteracy, laziness, lack of technical knowledge were the reasons for not adopting any waste management practice by the respondents though attended formal training. Inspite of effort and facility provided by govt. for construction of vermicompost pit, it was misutilised by few of the respondents.
- After performing all the personal work and other activities, average leisure time of 3.2 hour was available to the respondents which was wasted in gossip or other unproductive activities. It can be utilised in a productive way by motivating them.
- It was concluded that respondents were aware of various diseases with various mean score like diarrhoea (3.71), malaria (3.02), typhoid (2.94), anthrax (2.9) resulting due to improper waste management practices. The highest awareness gap % in relation to different disease were observed with respect to respiratory disease (58%) which was followed by dengue (43.8%) and anthrax (43.0%) with nearly equal gap %. So the researcher suggested that more sensitization programmes and awareness camps should be done on respiratory disease, dengue, anthrax in the sample area by the NGO and line department.

- It can be depicted that respondents were aware of different environmental problems which had a mean score of foul smell (3.94), spreading of waste (3.05), blockage of drainage system (2.76) due to waste accumulation. The highest awareness gap % in relation to environmental problems resulting due to improper waste management was observed as biodiversity (71.2%), followed by animals gathering around waste (68.6%) and water pollution (60.2%). So the researcher suggested that there should be more awareness programmes organised by the line department in the study area on waste management and its effect on environment, such as water pollution, biodiversity etc.
- The mean value of the benefits of proper waste management as opined by the respondents were extra income generating activity (3.0), utilization of time in a batter way (2.82), ability to reuse (2.31). The highest gap % was observed that it gives a feeling of unity in the family (66.8) followed by the ability to recycle (58.4%). Hence, training on the above aspects should be imparted to the respondent to increase their awareness on benefits of waste management.
- According to the findings as per the knowledge regarding benefits of proper waste management was concerned the highest awareness gap % was observed as unity in the family (66.8%), ability to recycle (58.4%), multipurpose use (53.8%) and low cost raw material (56.0%). In relation to benefits of proper waste management the present line department and govt. organization should take action to create awareness on these aspects in the study areas.
- According to the findings of the study age had no statistical significant influence on awareness about various diseases resulting due to improper waste management.
- The results of the study shows that level of education had significant influence on awareness about various waste management benefits and different diseases resulting due to improper waste management.
- It was suggested that there should be more awareness programmes to be organised by the line department in the study area on waste management and its effect on environment, such as water pollution (60.2%), biodiversity (71.2%) etc. to reduce the awareness gap on the effect of improper waste management on environment.

5.2 Conclusion

As per the study findings, it seems that education had significant influence on awareness about waste management. Due to lack of education the respondents were practising unhygienic practices more readily. Traditional mind set was another vital reason for practising improper waste management. Therefore, education should be used as a catalyst to promote awareness about various impacts of waste accumulation and improper waste handling which had direct impact on health and economy as well as on environment. Though there was a number of training programmes organised on various aspects such as pit compost, vermicompost, kitchen garden, there was no evidence of organisation of training programme particularly on kitchen waste separation and management which was another reason for not recycling or reusing kitchen waste. Although they had leisure time available but it was wasted in unproductive work. Their leisure time can be utilised for recycling or reusing of waste products. Assistance from municipality was another lacuna in that area. Providing waste bins and regular collection of waste products will motivate them for batter management of waste

5.3 Suggestions

Based on the findings of the study, the fallowing recommendations were proffered:

1. As there was no community waste disposal facility or any other waste disposal facility available, government and private sector should work together to facilitate such facilities in that area.
2. The first step of waste management is shorting of waste. As the level of biodegradable and non biodegradable waste separation was very low, steps should be taken to motivate them for separating the waste at the point of waste generation.
3. It can be done by adequate placement of waste bins, separate for biodegradable and non biodegradable waste, regular collection and disposal of waste by Municipal Corporation.
4. Though composting was one of the environmental friendly way to manage the biodegradable waste, very few of the respondents use biodegradable waste as

compost. So they should be motivated to use the biodegradable waste as compost which was been thrown.

5. Provision of appropriate waste collection and disposal equipment like compost machine should be available in every locality which enables easy composting method.
6. Education on waste management would promote practice of healthy methods like recycling, reusing, composting etc. at household. So inclusion of waste management practices as a subject in educational curriculum is important to create awareness.
7. Encouragement of waste recycling and reuse by conducting various training programmes on waste management.
8. Monitoring and enforcing of existing waste management legal framework is the need of the hour.

5.4 Scope for future research

1. Conducting similar study in different environment and geographical location.
2. A larger sample should be used to carry out any future research in this field.
3. Study the attitude of male towards kitchen waste management practices.
4. Study the kitchen waste management practices in urban area.

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APPENDIX

Kitchen waste management practices in rural household.

PART 1

1. Name-
2. Address- At- Village-

   District- Pin code-

   Mobile-

3. Age- young (<30) ☐ middle age (31-45) ☐ old (>45) ☐
4. Education – No formal education ☐ Primary school ☐ Secondary school ☐
   Intermediate ☐ Graduation ☐ More than graduation ☐
5. Type of family – Nuclear ☐ Joint ☐
6. Number of family members- Small(1-4) ☐ Medium(4-6) ☐ Large (>6) ☐
7. Occupation of the respondent – Housewife ☐ Labourer ☐
   Service ☐ Skilled worker ☐
8. Total income of the family from all sources per month –
9. Housing or residential unit – own ☐ rented ☐
10. Type of housing – katcha ☐ semi pakka ☐ pakka ☐
11. Facilities –
    (i) Electricity in house - yes ☐ no ☐
    (ii) Water facility – yes ☐ no ☐
    (iii) If yes then supply water ☐ motor boring ☐ need to go and bring ☐
    (iv) Latrine facility- open defecation ☐ simple pit latrine ☐ flush pit latrine ☐
    govt subsidised latrine ☐
12. Is there any self-help group in your village – yes ☐ no ☐ don't know ☐
13. Are you a member of that group – Yes ☐ No ☐

PART 2

14. Who cook at home – respondent ☐ other ☐

15. Frequency of cooking per day –

once ☐ twice ☐ thrice ☐ more ☐

16. Amount of waste generated per day in an average –

	Day 1	Day 2	Day 3
Degradable waste			
Non degradable waste			

17. Study the frequency of different type of waste generation and their disposal.

Waste product	Frequency of waste generated and disposal			
	Daily	Weekly	Monthly	Yearly
Remaining food after consumption				
Spoiled food due to extra cooking				
Spoiled fruit or vegetables				
Peels of fruit and vegetables				
Non veg waste(egg cell, fish skin etc)				
Tea leafs				
Paper/card board				
Polythene bags or wrapper(milk packets)				
Unused or broken glass				
Unused or broken metals				
Clothes/napkins				
Electronic waste				

PART 3

18. Do you separate

(i) solid and liquid waste – yes ☐ no ☐

(ii) degradable and non degradable waste – yes ☐ no ☐

19. If yes then how you feel about it- like it v. Much ☐ like it ☐ don't like ☐

20. If no then why –

(i) Shortage of time ☐

(ii) Laziness ☐

(iii) Not aware ☐

(iv) Lack of discipline in home ☐

(v) Any other ☐

21. Do you think kitchen waste management is important- yes ☐ no ☐

22. Do you educate your family members about the importance of waste management – yes no ☐ ☐

23. Responsibility of cleaning –

(i) servant ☐ (iii) wife ☐ (v) any other member ☐

(ii) children ☐ (iv) husband ☐

24. Method of collection-

(i) polythene bags ☐ (iii) paper bags ☐

(ii) covered dustbins ☐ (iv) uncovered dustbin ☐

25. Transportation of waste from home to waste disposal point is done by-

(i) Servant ☐

(ii) Wife ☐

(iii) Husband ☐

(iv) Children ☐

(v) Any other member ☐

26. Method of transportation

(i) Hand carrying to the community disposal point ☐

(ii) Wheeled borrower of municipality ☐

(iii) Any other methods ☐

PART 4

27. Do you have community waste disposal facility (CWDF)- yes ☐ no ☐

28. Do you have any other type of waste disposal facility – yes ☐ no ☐

29. Type of CWDF-

    (i) Waste collection point – ☐

    (ii) Waste collection trolley – ☐

30. Distance of waste collection point from home-

    (i) Nearby (with in 1 km)- ☐

    (ii) Far away (>1 km) – ☐

31. Type of disposal bins –

    (i) Cemented ☐

    (ii) Metal ☐

    (iii) Any open place ☐

    (iv) Covered dustbins ☐

    (v) Uncovered dustbins ☐

32. Frequency of waste collection trolley service –

    Daily ☐ Alternative day ☐ Weekly ☐

33. Do you pay for community waste disposal facility-yes ☐ no ☐

34. How much-

35. Are you ready to pay more for better service-yes ☐ no ☐

36. Level of satisfaction with CWDF-

Criteria	Satisfied	Not satisfied
Regularity of collection		
No of dustbins		
Maintenance of dustbins		
Cleanliness around dustbins		
Quality or mode of transport		
Fee charged		

37. Waste disposal practices for different waste products

Categories	Food waste after consumption	Cooking waste	Paper or cardboard	Polythene or wrapper	Glass waste	Metal waste	E-waste
Open space							
Road side							
backyard							
burring							
burning							
In river							
In gutter							
MWDF							
Reuse							
Pit compost							
Biogas							
Animal feeding							
Selling to garbage collector							
Any other							

PART 5

38. Have you ever heard about waste management programmes-

(i) Swacha Bharat Abhiyan ☐

(ii) Govt. subsidised housing scheme ☐

(iii) Govt. Subsidised latrine ☐

(iv) Anti litter campaign ☐

(v) Any other- ☐

39. If yes then from where-

a. Methods

TV ☐ Radio ☐ newspaper ☐ campaign ☐ fair ☐ training camp ☐

b. Personal

Ext agent ☐ family/friends ☐ NGO persons ☐

40. Did you had waste management training - yes ☐ no ☐

41. If yes then from where-

(i) Tv ☐ (iii) Radio ☐ (v) Newspaper ☐

(ii) Family/friends ☐ (iv) Govt organisation ☐ (vi)Any others ☐

42. If yes then on what-

Pit compost ☐ Biogas plant ☐ Kitchen garden ☐ Any others ☐

43. Are you practising it – yes ☐ no ☐

44. If no then why-

45. Are you aware of the nearby KVK - yes ☐ no ☐

46. Are you getting sufficient help from KVK – yes ☐ no ☐

47. Do you want any kind of change in KVK-

48. Spending pattern of time –

(i) Personal time expenditure-

(ii) Cooking-

(iii) Cleaning of house-

(iv) Care of family members-

(v) Care of domestic animals-

(vi) Ag. Activity/post harvest activity-

(vii) Sleeping-

(viii) Leisure time-

49. Do you aware of various diseases cause due to improper waste management practices

Diseases	Very much aware	Much aware	Aware	Little aware	Not aware
Malaria					
Diarrhoea					
Typhoid					
Plague					
Dengue					
Respiratory diseases					
Anthrax					

50. Do you aware of the fallowing environmental problems due to waste accumulation-

Problems	Very much aware	Much aware	Aware	Little aware	Not aware
Spreading of waste					
Foul smell					
Animals gathering around (street dogs)					
Blockage or over flow of drainage system					
Water pollution					
Biodiversity					

51. Do you feel that proper waste management can give the fallowing benefits-

Benefits	Very much aware	Much aware	Aware	Little aware	Not aware
Increases the ability to reuse/multipurpose use					
Increases the ability to recycle					
Reduces the cost of raw materials					
Utilisation of time in a batter way					
Extra income generating capacity					
Gives a feeling of unity in the family					