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INTRODUCTION

"Air is the Guru, water, our Father and the great earth, our Mother."

- Julian Huxley, 1923

Indian people have had a deep relationship with nature since time immemorial. According to Indian philosophy, man and nature are interdependent. The age old relationship of man and nature has undergone a drastic change today. This change in the relationship between man and nature started the process whichresulted in rapidenvironment pollution. The ozone layer which acts as a shield for the earth has begun to disintegrate and the ozone hole is expanding, by which the cycle of seasons has been disturbed, acid rain has become a common phenomenon, the glaciers are shrinking, our rivers have become sewage drains, industrial effluents are poisoning the earth and there is a rise in the sea level. Our Indian society is slowly awakening to the dangers created by imbalance in the environment. Several campaigns have taken place to create awareness about the value of preserving ecology through sustainable development.

Preservation of ecological balance may mean conservation and wise management of the life support systems of land, water, flora, fauna and the atmosphere.The most important of natural resources for economic growth is land; productivity of land is basic to the economic welfare of any country. All the demands of food, energy and other requirements have to be met by land. Hence, land is the most important endowment of nature. The precious land is being polluted constantly by the explosion of human population.

Pollution is the main cause for environmental degradation. Pollution is caused by substances that directly or indirectly harm human health or the environment.Due to increase in human activity, green cover is reducing day by day. Besides overpopulation of certain species, improper disposal of harmful wastes, overuse of natural resources (water, wood, etc.), deforestation, rapid industrialization and urbanization are held responsible for environmental degradation.

Bhattacharyya(2011) also reiterate that at present, the most serious problem of pollution is the direct result of human activity. As soon as large settlements and towns become common, the problem of disposal of solid waste arose. It is considered as a serious threat by many and can broadly be defined as any pollution associated with waste and waste management practices. Typical materials that are found in household waste and which have specific environmental impacts, include biodegradable waste, batteries, aerosols, oils, acids and florescent tubes.

Today, waste has became a major environmental and economic issue for consumers and municipalities. There are many ways to reduce and dispose our household waste. Most of our waste is destined for landfillsbut because of public concern about landfill location and stricter disposal regulations in many parts of the world, acceptable landfill space is becoming scarcer and /or more expensive.Hammer, (2012) informs that environmental laws have forced many dumps and incinerators to close or modernise at a cost of millions of dollars. In areas without nearby disposal options, consumers may be paying higher rates to have waste hauled hundreds of miles to be buried or incinerated.

Human activities whether domestic, agricultural or industrial generate huge quantity of waste. Ray (2009) also informs that due to different human activities, tons and tons of waste are generated every year. The wastes generated from these activities of more advanced societies produce more complex and heterogeneous wastes because of change in life style and food habits. These activities change the quality of waste and increase quantity per capita in recent years. They also cause local pollution and contribute to global warming (http://www.dorsetforyou.com).

Waste is defined as any material unused and rejected as worthless or unwanted, useless or profitless; using or expending or consuming thoughtlessly or carelessly; if the effort brings no compensating gain it is a waste; "mindless dissipation of natural resources" (http://www.thefreedictionary.com/waste).The legal definition of waste can be found in section 75(2) of the Environmental Protection Act 1990, but for common purposes waste is anything which you decide to, or are required to, dispose of. This includes items that can be given to someone else or recycled (www.sepa.org.uk). The National Institute of Environmental Health Sciences explains that waste is anything rejected, abandoned, discarded or thrown out.Idris*et al*., (2007) express that waste is a result of human activities from the dawn of civilization which have become more

prominent during and after the Industrial Revolution and today accumulation of wastes has become a consequence of life in a developing society.

With increased migration to urban areas and income increase, consumption levels are likely to rise. It is estimated that the amount of waste generated in India will increase at a per capita rate of approximately 1 to 1.33 per cent annually. This has significant impact on the amount of land that will be needed for disposal, economic costs of collecting and transporting waste, and the environmental consequences of increased waste generation level.

Prema (2009) emphasised that the annual waste generation has been observed to increase in proportion to the rise in population and urbanization, and issues related to disposal have become challenging as more land is needed for the ultimate disposal of these solid wastes period. At this time of reduced land availability for human living, in the near future, the waste may also compete for land space.

According to the information given by DDWS-UNICEF (2008) the quantity of waste generated is also increasing in rural areas as a result of increased population, consumerism and commercial activities. Chakraborty (2010) stated that it is estimated that 15,000 to 18,000 million litres of gray water and 0.3 to 0.4 million metric ton of solid waste are generated each day in rural areas. About 77% of the waste generated in the village was used as domestic fuel, animal fodder and organic fertilizer for crop production. The rest (23%) was left out in open fields for natural decomposition. Although the quantity of waste generated in rural areas is increasing, it is still relatively low compared to urban areas. In rural areas, compared to urban, land availability is not often a constraint. Also, there are more options possible in rural areas for reuse of waste, such as composting of biodegradable material, which can be used in kitchen gardens, agricultural fields, etc.

Naveen *et al.,*(2011) state that it is also estimated that about 700 metric tons of agricultural waste is available in the country every year. About 1800 metric tons of animal dung per annum is available, from which 120 million cubic meter of biogas is produced and in addition 440 metric tonnes of manure is generated (which is equivalent to 2.9 metric tons, 2.75 metric tonnes and 1.89 metric tonnes of N,P,and K respectively). Coir pith availability is to an extent of 10 lakh tonnes per annum.

Other than agricultural waste, the disposal of hazardous household waste using common disposal methods can also cause a number of problems and recommendations for proper disposal will depend on both the particular type of waste and the waste disposal options available in the community. Household waste is waste which is generated in the day to day operations of a household. It includes everything from lawn clippings to burnt out light bulbs (http://www.wisegeek.com)

Household wastes are generally classified into solid and liquid waste. Solid waste can be further classified as biodegradable and non-biodegradable. Biodegradable waste is anything that comes from plants or animals that is biodegradable (www.organicdisposal.net,2009). 'Biodegradable' means anything that rots, for example, food scraps and garden waste. Biodegradable waste rots down it releases methane, a potent greenhouse gas, and creates a liquid that can pollute the surrounding area if not managed correctly. (http://www.devon.gov.uk). Wossinkand Boonsaeng (2011) indicates that the term bio waste or bio-degradable material is a form of biomass that refers to any organic matter which is available on a renewable basis including agricultural crops and agricultural waste and residues, wood and aquatic plants usually expressed as dry weight/unit area. Bio-waste is a waste material capable of decomposing under aerobic or anaerobic condition.The non-biodegradable wastes are recyclable or non-recyclable. Liquid waste may be of household or community or industrial origin.

Baby and Govindarajalu (2012) feel that biodegradable wastes which are produced in large quantities all over the world create major environmental and disposal problems. Kannaiyan and Lilly (1999); Edwards (1999) and Waller (2013) feel that these materials cause major unpleasant odour problems and need a large land area for disposal and are often a source of contamination of ground water.

Bhandyopadhyay (2011) stress that India is on the edge of a massive waste disposal crisis and is likely to face a massive crisis situation in the coming years.Untillrecently, the problem of waste was seen as one of cleaning and disposing rubbish, but a closer look at the current and future scenario reveals that waste needs to be treated holistically, recognizing it as a natural resource with impact on health. The problem of industrial solid waste different and the nature and quantity depends on the

product, raw materials and the process involved in this requires careful consideration of management (www.nswai.com).

U.S. Environment Protection Agency (2012) has defined waste management as "Reducing the amount of material entering the waste stream by redesigning products or pattern of production or consumption". Waste management is a distinct practice which focuses on delaying the rate of consumption of natural resources. All waste material, whether they are solid, liquid, gaseous or radioactive fall within the limit of waste management (http://en.wikipedia.org/wiki/Waste_management).Sincethe accumulation of waste material is directly proportional to the growth of cities, it is high time that strong methods should be adopted for proper management of biodegradable waste to minimize the hazardous situation to the maximum extent. Hence, the evolution of an environmentally feasible household waste disposal method to manage the waste is an urgent task.

Waste management refers to the many methods and processes of dealing with waste at every stage from generation through collection to final disposal. Waste needs to be managed in order to prevent contact with humans or their immediate environment. Therefore, the main purpose of waste management is to isolate waste from humans and the environment, and consequently, safeguard individual, family and community health. In addition, the aesthetic value of a better exterior and a clean physical environment is important for our emotional wellbeing (www.labspace.open.ac.uk, 2011).

Waste management may be thus associated with the control of generation, storage, collection, transport and processing the disposal wastes in a manner that is in accordance with the best principles of public health economies, engineering, conservation, aesthetics and other environmental considerations. Ploughingwaste from one source to another,could benefit the economy system of the country (Diaz *et al*, 2006). Thus, waste management is significant environment issue. Many of the environmental burdens cited above are more often borne by marginalized groups, such as racial minorities, women and residents of developing nations. However, the need for expansion and setting up of waste treatment and disposal facilities is increasing worldwide (Dean,2008). Thus, the enormous quantity of solid waste that India currently disposes on land could be reduced by recovering materials and energy in a cost effective and environmental friendly manner (www.waste-management-world.com/, 2012).

Common methods adopted in waste management conversion of garbage into energy through burning is also a method of waste management. According to the Planning Commission, there was a potential of 2,700 mw of power generation from urban and industrial waste in the country. In the recycling method, garbage is segregated into organic, inert and recyclable waste. In India, unlike Western economies, segregation of waste at the household-level is not widely practised (http://www.livemint.com/2007).

Bhandari (2006) opines that ordinary land filling (unscientific land filling) leads to air and waste pollution, which may cause serious health problems and also needs large area every year. The associated high transportation cost and extremely slow decomposition rates make it an unfavourable method of disposal.

Waste recycling is the process of transferring waste into new products in such a manner that the original matter may lose its identity and in turn become a useful product. It should be realized that waste is a treasure which could be recycled to from “Wealth” (Mitchell and Overend, 2005).

Recycling is a way to manage waste to reclaim the potential waste so that the product can be used. Recycling helps reduce the overall demand for hazardous household products and the amount of waste produced (www.karmayog.org). Recycling is a solution for accumulative household waste. It is important to practice the three "R"s of recycling and waste management: reduce, reuse and recycle(www.niteshcapecod. co.in).

Recycling of over 80 percent of the household waste promotes a green lifestyle and makes the home more eco-friendly. It also makes people more conscientious of what one should buy and bring into the home. This means making better choices on buying packaged foods or buying in bulk to save on packaging and household waste output. Investing in reusable shopping bags will help to eliminate excess plastic and paper and an overabundance of recyclable items (www.livestrong.com).

Agriculture in a broader sense refers not only to growing of field or garden crops but also to allied land based activities including dairy, poultry, agroforestry, etc. In fact, many enterprises have become a part and parcel of modern day agriculture named integrated farming or farming systems. Agricultural waste is composed of organic wastes such as animal excreta in the form of slurries and farmyard manures, spent

mushroom compost, soiled water and sullage effluent. Sankar*et al.,* (2009) mention that there are a number of potential environmental impacts associated with agricultural waste. If it is not properly managed and drained off, its nutrients in surface waters can cause over enrichment of the water body. Leaking and improper storage of agricultural waste can also pose serious threat to surface waters. In addition, farming activities can give rise to emissions of ammonia and methane, which can cause acidification and contribute to greenhouse gas emission (www.georgiarecycles.org, 2009).

Lakshminarayanan (2011) recalls that agricultural waste affects the environment and the harmonious relationship between the biotic and abiotic components of the ecosystem and hence we should follow safe disposal techniques of these wastes. Demand of chemical fertilizers would be 35 million tonnes of plant nutrients;atleast10 million tonnes can come from organic source.

Gitanjali(2007) feels that to reduce the risk associated with biodegradable waste and to attain maximum benefits from it, it may be treated by adopting any of the following technology options: Composting and Vermicomposting.

Composting means the controlled biological decomposition and stabilisation of organic substrates, under conditions that are permanently aerobic and that allow the development of thermophilic temperatures as a result of biologically produced heat. It results in a final product that has been sanitised and stabilised, high in humid substances and can be used as a soil improver, as an ingredient in growing media (www.audit-commission.gov.uk).

Aira*et al.* (*2007*) express that, the farmers go for recycling of these agricultural byproducts among which vermicomposting is considered as an important activity aimed at getting a better quality organic manure for maintenance of soil fertility. Vermicomposting is described as “Bioxidation and stabilization of organic material involving the joint action of earthworms”.

Ravi (2010) point out that the heavy use of chemicals has spoiled the texture of the soil. The soil health has deteriorated to the extent that it has become useless at some places. Chemicals are seeping in tovarious food grains, leading to spread of disease, such as cancer. There is high incidence of heart disease, kidney problems and liver ailments. According to Singh (2011) “All that because of the irrational and injudicious use of chemical fertilizers and pesticides”. Hence composting techniques

can be applied for its health benefits. Nutrients and water being the major constraints in the development of Indian agriculture, harvesting the nutrient energy of bio-waste is of prime importance for maximizing the food, feed and fodder and fuel production in the country.

Organic farming is the correct tool for farmers to improve soil fertility and the health of the agro-ecosystem, making farming sustainable over a longer period. Also the popularity of organic farming is gradually increasing and now organic agriculture is practiced in most of the countries of the world.

Organic farming provides better and balanced environment, better food and living conditions to the human beings. It also provides low-cost agriculture development in the long run. Organic farming reduces the cost of production by utilization of organic waste or itsby products against chemical fertilizers, which are said to be potential sources for pollution unless they are used in productive and efficient ways.Rawals*et.al*.,(2009) describe that organic matter becomes very important in organic cropping systems, which are increasing due to the demand for chemical free products from the temperate developed regions and the ever increasing prices of fertilizers. In organic systems, where inorganic fertilizers are not used, the replenishment of nutrients and soil quality maintenance is dependent on organic materials due to beneficial impacts in terms of physical, chemical and biological properties of soil.

Tolanur (2009) states that organic manures not only supply plant nutrients but also improve soil health. Among the different organic manures, green manure provides a good amount of nutrient to the soil. According to Dharwad (2011), Organic farming can also bail out farmers from the debt trap as well. It requires less financial inputs, relies on available resources, ensures better environment and improved health conditions.

Today, farmyard manure is being used as a major source of organic manure in field crops. In view of poor efficiency of farmyard manure, vermicompost has been advocated as a good source of organic manure along with inorganic sources for use in integrated nutrient management practice in field crops.

In recent years farmers are interested in producing organic manure by recycling these organic wastes through composting. Among many composting techniques,

vermicomposting is gaining popularity day by day. The use of earthworm not only results in reducing the composting periods, greater volume reduction and better quality of final decomposed product but also has social and environmental benefits like recycling of farm wastes, better utilization of leisure and generation of employment opportunity for youth and extra income for women as well.

Kumar (2002) stress that vermicompost is extremely useful for enriching and fertilizing the soil. It is odourless and safe to handle. It is rich in hormones, antibiotics and vitamins that promote healthy plant growth. Although its nitrogen, phosphorus and potassium values are not as high as chemical fertilizers, it isa multi-purpose compost that provides all the ingredients needed to improve most soils and is much better for the environment as well.

Kale (1993) feels that *Eiseniafoetida* (a local earth worm species), in particular, has been widely studied and used for developing vermicomposting by degrading organic wastes. Mitchell (2005) express that it has been an essential bio-convertor of organic residues into high grade vermicompost. Pandey*et al*., (2008) state that earthworms constitute more than 80 percent of soil invertebrates' biomass in many ecosystems. Khadilkar (2011), suggests that bio digested slurry can be mixed with plant materials in equal proportions to produce good quality vermicompost. Shivakumara (2008) informs that with regard to the economic benefits, vermicompostproduction is a subsidiary occupation and it involves less investment. In one gunta of land (1/40 ac) one can produce 14 to 15 tonnes vermicompost.

Thus, hundreds of tonnes of biodegradable organic waste which are being generated in cities and towns in our country creating disposal problems can be converted into valuable compost by applying home composting and vermicomposting technology. This approach would reduce pollution and could provide a valuable substitute for chemical fertilizers. This process is profitable at any scale of operation, provided proper process parameters are maintained (http://www.ch28.pdf.).

Vanitha (2009), inform that in domestic activities 30 to 40 per cent of the domestic waste is organic in nature, which needs to be disposed on day to day basis. The bins overflow and the entire street becomes dirty and attracts street dogs and rag pickers. Snowleopard(2010) states that most of our household or kitchen waste is composed of biodegradable organic matter. When we throw the waste out, the

municipal corporation has the problem of segregating it into compost-able, recyclable and hazardous waste. Most of the time, the waste is dumped as it is in the land fill sites. Due to this, there is a big problem of water table and soil in that area is getting contaminated. Most of the dump sites are ill maintained. Land is not something which we have in excess. Recycling the waste or composting the waste at home and recycling of reusable plastic waste ensure that throw out is less. This will save the city, time and money wasted on waste segregation. Moreover, the compost helps improve the landscape and the soil quality. Composting alone helps to reduce the waste by 80%. As responsible citizens we can do our bit for the environment.

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948).Yadav*et.al.*, (2010) express that recently, people have become more aware about their health related issues such as what are their food habits or what should be their food habits etc., mainly due to the harmful effects of chemicals used in production, processing and preservation of food. Many families today have become conscious about consumption of organic food from the view point of health.

Organic food means food crops grown without the use of conventional pesticides, chemical fertilizers and processed without ionizing radiations and food additives or growth promoters. Organic food is produced without the use of genetically modified organisms. Organic is not only a matter of final product but the whole process of production has significance under the organic production system.

Pandey (2010) points out, organic foods are a simple way to reduce an individual's toxin burden of pesticides and food additives and increases their nutrient intake, and perhaps alter their consumption patterns away from less healthy choices. Doyle and Kelleher(2009) feel that vegetables produced with less chemical residue will be a boon for public health. This is of special importance for vegetables which are consumed either raw or mildly cooked. Enhanced shelf-life of organically produced vegetables will go a long way in reducing the pre and post-harvest losses of these commodities, which at present is about 25-40%.

A study conducted by Yadav (2009) investigated the effects of different levels of vermicompost on seed germination parameters and the growth of greenhouse tomato (Lycopersicunesculentum) and concluded that there were significant differences

between treatments. The highest seed germination rate was in 25% vermicompost.Organic crops were found to contain significantly more vitamin C, iron, magnesium, and phosphorus and significantly less nitrates than conventional crops.

Das (2007); Andrew (2012)president of UN's IFOAM, said the current focus was on food security and poverty reduction. "With a great concern he revealed that if food security and poverty reduction has to be achieved, logically the focus should be small growers who make 70 percent of farming in the world". Environment is our heritage. Our forefathers bequeathed a glorious, unpolluted, mineral rich, resourceful environment. It is unethical to pass on a polluted and degraded environment to our successors. It is our prime duty to sustain a healthy environment and pass it on to our successors as our legacy.

The complex relationship between health and the environment extends the responsibility for promoting health to all groups in the society. Health is no longer the sole responsibility of doctors, nurses, mid wives and other health professionals, who seek to prevent or cure disease or of those who seek to remove pathogens from the human environment and reduce accidents. It is also the responsibility of planners, architects, teachers, employers, industrialists and all others who influence the physical or social environment. It is also the responsibility of health professionals to work with all the groups in the society in promoting health.

Hence, realizing the importance of training and uses of biodegradable waste management, this study has been undertaken with the following specific and general objectives.

General objectives:to

- enhance the health of the people living in the selected rural areas
- reduce the environmental pollution and making rural areas clean
- promote recycling and reuse of the bio degradable waste
- convert biodegradable waste into bio fertilizers and pesticides and
- generate employment opportunities for rural women by adopting cost effective, eco-friendly and environmentally sound bio degradable waste management technologies

Specific objectives:to

- assess the availability of biodegradable waste in the selected rural households,
- identify the methods of disposing the biodegradable waste,
- evolve a training curriculum to impart education to women on biodegradable waste management,
- train the homemakers on biodegradable waste management practices and
- evaluatethe impact of the training programme conducted.

The Hypothesis framed for the study

- Training on biodegradable waste management practices will not improve the knowledge of the women leaders to solve the environmental problems
- Training on biodegradable waste management will not change the attitudes of the women leaders and does not influence the health of the family members
- Training will not bring about any significant improvement in the adoption of biodegradable waste management practices and do not offer opportunities for income generation.

It is hoped that this study will help to protect the environment, to promote the health and wellbeing of the population and also in order to improve the standard of living of rural households. It is essential to create awareness for proper disposal of biodegradable waste which automatically leads to resource recovery for promoting economic potentials.

At best we hope that communities, families and especially their children will reap great benefits.

"All of science is nothing more than the refinement of everyday thinking"

- Einstein