2

REVIEW OF LITERATURE

"He sustained him in a desert land, in a howling wilderness waste; he shielded him, cared for him, guarded him as the apple of his eye."

- Shakespearenson

The literature pertaining to the study on "**Techno-Transfer through Intervention on Biodegradable Waste Management in Rural Settings"** is reviewed under the following headings**:**

A. Concept and Classification of Waste
B. Need for Biodegradable Waste Management
C. Existing Biodegradable Waste Management Practices
D. Functions of Various Agencies and Projects on Garbage Management
E. Research Related to Waste Management Practices
F. Importance of composting / Vermicomposting

A. Concept and Classification of Waste

India is developing country with 16 per cent of the world population and two percent of the total land area. The exponential increase in industrialization is not only consuming large areas of agricultural land but simultaneously causing serious environmental degradation. Industrialization and urbanization have resulted on discharge of large wastes is rich in organic matter as well as in nutrients. There are enormous quantities of industrial solid organic wastes available outside the farm from different sources and they are yet to be used judiciously in crop production. If, these wastes are properly disposed so that it do not contribute to the problem of pollution (Sundari and Mathew, 2010).

Waste is defined as discarded material which has no value in normal use or for ordinary use. Solid wastes are those undesirable, useless and unwanted materials and substances that comes from human and animal activities (http://www.recycling-waste.blogspot.in/2009). In some cases what one person discards may be re-used by somebody else (http://www.harenvironment.gov.in)

Waste, or rubbish, trash, junk, garbage, depending on the type of material or the regional terminology, is an unwanted or undesired material or substance. It may consist of the unwanted materials left over from a manufacturing process (industrial, commercial, mining or agricultural operations) or from community and household activities (www.fullcycle.co.za, 2009).

Waste is generated in all sorts of ways. Its composition and volume largely depend on consumption patterns and the industrial and economic structures in place. Air quality, water and soil contamination, space consumption and odors all affect our quality of life (www.grida.no, 2013)

Wastes are materials that are not prime products (that is products produced for the market) for which the generator has no further use in terms of one's own purposes of production, transformation or consumption, and of which one wants to dispose. Wastes may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Residuals recycled or reused at the place of generation are excluded (*The United Nations Statistics Division (UNSD), 2013)*

"Waste" is everything that no longer has a use or purpose and needs to be disposed. The right term certainly applies to discarded material, but there are specific definitions for waste that affect how waste is regulated and must be handled (www.avma.org, 2013).

Pollution and diseases, human-induced climate change is increasingly recognized as a crucial threat and natural variability. Climate change is altering migratory species patterns, causing coral bleaching, etc. (Subramani, 2012).

Ecosystems maintain global environmental balance. Anything that alters the function of ecosystems creates an imbalance that affects all life on Earth (www.ehow.com, 2013).

On account of the increasing industrialization and rapid growth of population, the solid wastes generation has not only increased but its nature has also been changed. In this context proper solid waste management is highly required to save public health and to protect environment. Environmental pollution needs diverse innovative technologies and managerial plans for better remedies. We should also encourage

private and community effort to reuse discarded material (http://www.huntington-study-group.org/Portals/BecomingASiteGreenGlobe.jpg)

Classification of Waste

In India especially in rural areas, waste is a severe threat to the public health concern and cleanliness. The absence of disposal of solid and liquid waste are leading through vector borne diseases such as diarrhea, malaria, polio, dengue, cholera, typhoid, and other water born infection such as schistosomiasis. Eighty eight percentage of the total disease load is due to lack of clean water and sanitation and the improper solid and liquid waste management which intensify their occurrence (http//:www.indiasanitationportal.org).

Types of waste:

Waste is any material/ liquid that is thrown away as unwanted. As per physical properties, waste can be categorized as A. solid waste and B. liquid waste (UNICEF, 2012).

i) Solid waste:

Any waste other than human excreta, urine and waste water is called solid waste. Solid waste in rural areas generally includes house sweeping, kitchen waste, garden waste, cattle dung and waste from cattle shades, agro waste, broken glass, metal, waste paper, plastic, cloths, rubber, waste form markets and shopping areas, hotel, etc. solid waste can also be defined as the organic and inorganic waste materials produced by households, commercial and industrial establishment that have no economic value to the owner.

Solid waste means any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or an air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities.

Solid waste can be classified into different types depending on their source: a) Household waste is generally classified as municipal waste, b) Industrial waste as hazardous waste/ hospital waste as infectious waste.

Household waste is any product labelled toxic, poison, corrosive, flammable, combustible or irritant. These include many common hazardous waste items such as

paint, batteries, oil, and pesticides. These products, if mishandled, can be dangerous to your health and the environment, and therefore should be disposed of in an environmentally friendly manner. Also, these products should never be discarded in a sink, storm drain or in your regular trash (http://www.hood.army.mil/netzero /files/RecyclingHouseholdWasteBrochure.pdf)

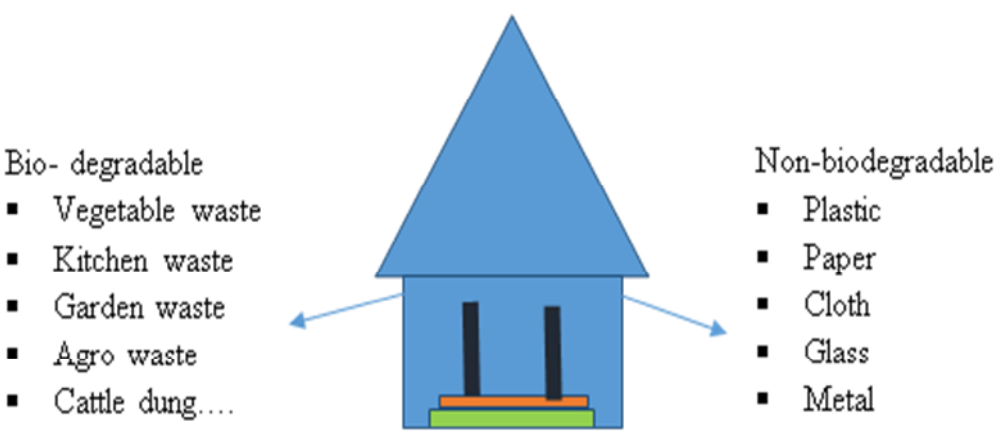
a. Municipal solid waste

Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes. Proper handling of the biodegradable waste will considerably lessen the burden of solid waste that each city has to tackle (http://www.edugreen.teri.res.in/explore/solwaste/segre.htm).

b. Hazardous waste

Industrial and hospital waste is considered hazardous as they may contain toxic substances. Certain types of household waste are also hazardous. Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive; and react when exposed to certain things e.g. gases. India generates around 7 million tonnes of hazardous wastes every year (http://www.environment-agency.gov.uk/static/documents/Business/low_guide_v1.2_ 1397222. pdf)

According to UNICEF (2006), the solid can be classified into biodegradable and non- biodegradable waste.



As per bio-degradability, solid waste can be classified as

- Biodegradable: waste that are completely decomposed by biological processes either in presence or in absence of air are called biodegradable. E.g. Kitchen waste, animal dung, agricultural waste etc.
- Non- biodegradable: waste which cannot be decomposed by biological processes is called non- biodegradable waste. These are of two types
  - Recyclable: waste having economic values but destined for disposal can be recovered and reused along with their energy value. Eg. Plastic, paper, old cloth etc.
  - Non-recyclable: waste which do not have economic value of recovery. Eg. Carbon paper, thermo coal, tetra packs etc.

ii) Liquid waste:

Used and unwanted water is called waste water. Black water: waste water generate in the toilet is called “Black water”. It contains harmful pathogens

- Grey water: waste water generated in the kitchen, bathroom and laundry is called “Grey water”. It may also contain pathogens.
  Creation of awareness
- Waste management should primarily be focused at household level for sustainability and cost effectiveness. Certain elements which cannot be managed at the household level should be managed at community level.

"Bio-waste" is defined in the Waste Framework Directive (WFD) as "biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants" (http://ec.europa.eu/environment/waste/compost/, 2014).

"Biodegradable waste" is a term which is crucial to the working of the draft Directive. The definition given by the Commission ("any waste that is capable of undergoing anaerobic or aerobic decomposition") was criticised as being too broad (http://www.publications.parliament.uk).

Bio-degradable waste are the by-products which consists of natural stuff, such that when you throw it out side nature (Small tiny atomic creatures) will degrade it and release the natural products back to atmosphere (www.flexiguru.com,2013).

Biodegradable wastes are those that can be broken down (decomposed) into their constituent elements by bacteria and other microorganisms. Human and animal wastes, food waste, paper, and agricultural wastes are all biodegradable. This natural biological decomposition process ensures that, under the right conditions, these wastes do not accumulate in the environment (http://www.google.co.in/url?meaning_ and_concept_of_biodegradable_waste_management)

Biodegradable waste products can also be called green waste, food waste, or organic waste. When biodegradable products are exposed to nature, including oxygen and moisture, they break down relatively efficiently (http://www.ecolife.com/ define/biodegradable.html).

The most significant benefits of proper bio-waste management - besides avoided emissions of greenhouse gases - would be the production of good quality compost and bio-gas that contribute to enhanced soil quality and resource efficiency, as well as a higher level of energy self-sufficiency. (www.issuu.com)

Solid-waste management is a major challenge in urban areas throughout the world. Without an effective and efficient solid-waste management program, the waste generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment (http://www.apo-tokyo.org/publications/files/ind-22-swm.pdf).

To glimpse the future, a World Bank expert suggests you peer into your garbage bin.

- By Sarah Zhang

B. Need for biodegradable waste management

We know that the key to a sustainable future for Protected Areas lies in the development of partnerships. It is only through alliances andpartnerships that Protected Areas can be made relevant to the needs of society.'

- Nelson Mandela,

According to the Central Pollution Control Board (CPCB) of India, the average Indian generates about 490 grams of waste per day. Although the per capita waste is

low compared to Western countries, the volume is huge. The generation of solid waste in Indian cities has been estimated to grow with 1.3 percent annually. The expected generation of waste in 2025 will therefore be around 700 grams per capita per day. Considering that the urban population of India is expected to grow to 45 percent from the prevailing 28 percent, the magnitude of the problem is likely to grow even larger unless immediate steps are taken (http://www.greenbiz.com).

Each household on an average generates about 1kg of garbage per day that reaches the road side bins or heaps of garbage. Rural India produce nearly 7000 million metric tonnes of organic waste every year which is either burnt or land filled. Density values of refuse in villages varied from 300 to 500kg/m^2. Production of garbage is increasing much faster than the previous decades in a similar stage of economic development. The scenario is worse in the village front. The earth is polluted beyond imagination (Dhanuja, 2006),

India generates around 0.2 to 0.3 million tonnes of waste on an average everyday. A city like Bangalore generates around 3500-4000 tonnes of waste while Mumbai and Delhi average almost double of this. The onus of disposing this waste in a safe way falls on the municipal corporation. While the developed nations also face the complicated issue of waste disposal, there is a fundamental difference – other nations have been able to achieve high levels of source segregation and have done much more scientific studies on the various disposal techniques and more importantly, implemented them through active public-private participation (Chakraborty, 2010).

Municipal waste is waste that generated by households and similar waste generated in connection with industrial, service and other operations. Households and the service sector are the largest source of municipal waste. In the period 2000-2006, the amounts of municipal waste have varied between 2.4 and 2.6 million tonnes. In 2005, the total was 2.48 million tonnes (http://www.ymparisto.fi, 2005).

The total yearly production of bio-waste in the EU amounts to 118 to 138 Mt of which around 88 Mt originate from municipal waste and between 30 to 50 Mt from industrial sources such as food processing. In the EU, bio-waste usually constitutes between 30% and 40% - but can range from 18% up to 60% - of municipal solid waste (MSW). The bio-waste part of MSW comprises two major streams: green waste

from parks, gardens etc. and kitchen waste. The former usually includes 50-60% water and more wood (lignocellulose), the latter contains no wood and up to 80% water.

The upward trend is at the global level. "Solid waste is the kind of problem that in the past people didn't want to pay attention to. Now people are starting to pay attention to it because it's become a very big deal" (www.greenbiz.com). Solid waste management must deal with everything from different regulatory schemes to bad infrastructure.

The sources of solid waste include: domestic waste, commercial waste, hospital waste, and hazardous waste. The amount of solid waste generated in the cities is much higher than in rural areas. The generation rate in rural areas can be as low as 0.15 kg/cap/day, while in the urban areas the rate can be above 1.0 kg/cap/day. (http://www.learner.org). "The fastest way to reduce solid waste volumes is to have a recession," (Hoornweg, 2012).

Home waste management isn't one thing or one habit, but a set of home installations and diligence that aims to keep your home beautiful and protect the environment without spending hours and hours each week on a seemingly endless list of tedious chores (Berg*, 2013*). According to Environment Protection Act, 1986, “Environment is intended to serve three purposes. Firstly, it is to protect and improve the environment; secondly to prevent hazards to human beings and thirdly, it is in respect of living creatures, plants and property” (Ramunajam *et al.,* 2004).

Human life cannot be thought of without an environment. The physical, chemical, biological, psychological and social factors in the environment are essential and play an important role in the normal functioning of a human being. Hence to protect the environment, to promote the health and wellbeing of the population and also 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 there by promoting economic potentials.

www.dinamalar.com

றெக்கையே இல்லாம பறக்குது...குப்பை!

1,54,936

திருமலை 3.12.2013

ஒரு குப்பைத்தொட்டி விலை ஒரு கோடி ரூபாயா?

தீர்வைத் தேடி...!

இடம்: வார்டு எண் 57, குமாரசாமி காலனி, பீளமேடு.

கவுன்சிலர்: மாரப்பன் - 94890 94257

உதவி பொறியாளர்: கருணாமூர்த்தி - 94421-04116

"கோவை மாநகராட்சி 57வது வார்டிலுள்ள குமாரசாமி காலனியில், குப்பை தேக்கமடைந்துள்ளது. பல நாட்களாகியும் குப்பை அள்ளப்படாமல் உள்ளது. கவுன்சிலரிடம், காலனி மக்கள் பலமுறை சொல்லியும் தீர்வுகாணப்படவில்லை,"

—கார்த்திக் • குமாரசாமி காலனி.

தீர்வைத் தேடி...!

இடம்: வார்டு எண் 58, நீலிக்கோணாம்பாளையம் ரோடு, வரதராஜபுரம்.

கவுன்சிலர்: ராஜேந்திரன் - 94890 94258

உதவி பொறியாளர்: புவனேஸ்வரி - 94421 04100

"வரதராஜபுரம் நீலிக்கோணாம்பாளையம் ரோட்டில், குறுகலான ரோட்டில், குப்பைத்தொட்டி வைக்கப்பட்டுள்ளது. சுற்றுப்பகுதி மக்கள் அனைவரும் ஒரே குப்பைத்தொட்டியில் கொட்டுவதால், ரோடு முழுவதும் பரவுகிறது. இதனால், சாக்கடையில் அடைப்பு ஏற்படுவதுடன், பொது சுகாதாரம் பாதிக்கிறது. வெவ்வேறு பகுதியில் குப்பை தொட்டி வைக்க வேண்டும்..."

— நாராயண பாண்டியன் • வரதராஜபுரம்

தீர்வைத் தேடி...!

இடம்: வார்டு எண் 21, வீரகேரளம் ரோடு, பனைமரத்தூர்.

கவுன்சிலர்: செந்தில் - 94890 94221

உதவி பொறியாளர்: செந்தில்பாஸ்கர் - 94437 99215

"பனைமரத்தூர் மெயின் ரோட்டில் சாக்கடை வசதி இல்லாததால், கழிவுநீர் தேங்கி நிற்கிறது. வீடுகளின் முன் கழிவுநீர் தேங்குவதால், கொசுத்தொல்லை அதிகரித்து, துர்நாற்றம் ஏற்படுகிறது. சாக்கடை கால்வாய் கட்டி, கழிவுநீர் தேங்காமல் வெளியேற நடவடிக்கை எடுக்க வேண்டும்"

— தேவி • பனைமரத்தூர்.

தீர்வைத் தேடி...!

இடம்: வார்டு எண் 46, செல்வநாயகி நகர், ரத்தினபுரி.

கவுன்சிலர்: பிரபாகரன் 94890 94248

உதவி பொறியாளர்: நசீர் 94421 04104

"ரத்தினபுரி செல்வநாயகி நகரில், குப்பை தொட்டி எண்ணிக்கை குறைவாக உள்ளது. இதனால், குடியிருப்பு பகுதியில் ரோட்டோரத்தில் கொட்டப்படும் குப்பை, காற்றில் பறந்து சுகாதாரகேடு ஏற்படுத்துகிறது. குப்பை தொட்டி எண்ணிக்கையை அதிகரிக்க வேண்டும்".

— லட்சுமி பிரியா • செல்வநாயகி நகர்.

Accumulation of Waste : Composting - A Solution

Some of the more common hazardous waste materials include motor oil and other automotive fluids, pesticides, paint and paint products, household cleaners, batteries, aerosols, and some other cosmetic products (Marcus Pickett, 2012)

In the United States, the Environmental Protection Agency (EPA) regulates household, industrial, manufacturing and commercial solid and hazardous wastes under the Resource Conservation and Recovery Act(RCRA). ("US Environmental Protection Agency - Topics - Waste", 2012)

Effective solid waste management is a cooperative effort involving federal, state, regional, and local entities ("Texas Municipal Solid Waste Policy", 2012).

There is a strong movement in many countries to reduce the volume of wastes to be dumped. The increase of composting sites is an indication that organic fraction of garbage can be converted into a useful and commercial product with a higher value (www.earthwatch.unep.net)

The organic, biodegradable component of MSW is important, not only because it constitutes a sizable fraction of the solid waste stream in a developing country but also because of its potentially adverse impact on public health and Environmental quality ("Texas Municipal Solid Waste Policy", 2012). Typically, domestic waste from industrial countries has a high content of packaging made of paper, plastic, glass, and metal, so the waste has low density. In many developing countries, domestic waste contains a large proportion of inert materials, such as sand, ash, dust, and stones, and has high moisture levels because of the high usage of fresh fruit and vegetables. These factors make the waste very dense (high weight per unit volume) (Da Zhu, 2007). Recycling or salvaging operations often reduce the proportion of combustible paper and plastic in waste before it reaches the treatment stage, further reducing its suitability for incineration (www.springer.com).

Solid waste problems and approaches to tackling them vary from country to country. While thousands of people depend on waste for their livelihood throughout the world, many others face problems due to poor waste management. There are huge changes in waste management in different parts of the world at different times in history (http://www.whqlibdoc.who.int/php/WHO_PHP_38.pdf).

The activities associated with managing solid waste from the generation point to final disposal normally include generation, reduction, reuse, recycling, handling,

collection, transfer and transport, transformation (e.g., recovery and treatment), and disposal. Depending on site specific conditions, a sound waste-management program can be established by combining some of the necessary activities into integrated solid-waste management. On the other hand, legislative efforts and effective implementation are vital for the safe management and disposal of solid waste. Incentives may be provided for the development and practice of safe treatments, harmless manufacturing processes, and methods for converting solid waste into valuable resources by recycling and reuse (http://www.nswai.com/aboutnswai.php-national-solid-waste-association-india).

The growing population and their changing consumption patterns have made Waste Management a serious environmental and social problem. This has led to the increase the quantity of waste and variations in types of waste that is being generated. The situation has further aggravated as the final disposal is predominantly open dumping leading to increasing environment degradation and growing health problems (http://www.eecentre.org/Modules/DWMG/docs/8/Sri_Lanka_Practical_Action. pdf).

Waste management is necessary because if it is not done the waste may lead to environmental and health problems harmful for mankind. Our planet is going to be filled with waste soon if we don't manage our garbage and trash properly. Even though at some point some people (even us) don't notice this kind of damage we have for the environment, this might show up at the times when our kids are the ones occupying our planet (http://wiki.answers.com/Q/Why_do_you_need_waste_ management).

Communities are seeing nuisance problems from poorly or improperly maintained landfill sites and concerns have been expressed that the many, unsightly dumps are not in keeping with the expectations of the province's growing tourism industry. Many of the landfill sites experience problems with uncontrolled burning at the sites, smoke, vermin, odours and excessive wind borne litter. Waste management is the responsibility of everyone – individuals, communities, businesses, industries, and government (http://www.ma.gov.nl.ca/ma/publications/pswms/wastemanagement strategy_ apr2002.pdf)

While the quantity of waste generated and general waste practices remain similar to before the offensive, the conflict has led to further stress upon the systems that were already insufficiently resourced. This is resulting in and increased public

health risk to the population as a result of public health practices (www.unispal.un.org, 2008)

The three R's (reduce, reuse, recycle), hardly encapsulates effective home waste management. Composting outdoor trash and, even some indoor trash, such as non-animal kitchen scraps and paper and with worms, composting can be done in indoors with virtually no residual odours (Pickett, 2012).

The house in which you and your family live needs to be clean and tidy as well as hygienic for the good health of your family. The household waste management promotes the safe use, storage and disposal of hazardous materials by educating consumers to identify and avoid potentially hazardous products buy only what is needed, use it up completely or share leftovers with someone who can use it recycle those materials that can be recycled, and dispose of leftover or unwanted products through hazardous waste collection facilities (http://www.boldsky.com)

Waste will always be around while human subsist. It is just a matter of proper waste disposal along with a little care and a kind of initiative to give resolution to this undying problem. We have to remember that the earth ticker won't wait till we act. It is just a little awakening of responsibility and love for the environment, with a starting point of concern, the end product will surely be a zero waste society (http://www.articlesbase.com).

C. Existing biodegradable waste management practices

The management of biodegradable waste that is diverted from landfills, there is no single environmentally best option. The environmental assessment of the advantages and disadvantages of the various biowaste management options is complex because they occur in different phases of the biowaste lifecycle, during collection, treatment and recycling, while contributing to different environmental effects, ranging from greenhouse effects, material depletion, acidification and toxicity for humans and ecosystems. The analysis equally highlights that the environmental balance of the various options available for the management of this waste depends on a number of local/regional factors, inter alia collection systems, waste composition and quality,

climatic conditions, the potential of use of various waste derived products such as electricity, heat, methane-rich gas or compost. In particular, the positive environmental effects of recycling and energy recovery are related to the avoided products (e.g. electricity, fertilizers etc). These positive effects can exceed the environmental burdens of the waste collection and treatment, while further benefits can exist from waste prevention (Bersani *et al.,* 2008).

The definition of Biowaste as proposed by the European Parliament in the legislative resolution on the proposal for a directive of the European Parliament and of the Council on waste.'Biowaste' means waste of animal or plant origin, for recovery purposes, which can be decomposed by microorganisms, soil-borne living organisms or enzymes; soil material with no significant biowaste content and plant remains from agricultural production.

The definition of bio-waste is provided by the Waste Framework Directive (WFD) “Bio-waste includes garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises as well as comparable waste from food processing plants. It does not cover forestry or agricultural residue” (Directive 2008/98/EC). Biowaste should not be confused with the broader category of “biodegradable waste”. Biodegradable waste, as defined by the Landfill Directive, includes “any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard” (Directive 1999/31/EC)

Bio-waste converted to treated compost (or digestate) contains elements (nutrients, lime, humus and organic matter) that lead to positive environmental effects (e.g.,resource protection, soil protection, climate protection) when, the compost is used on land as, for instance, a replacement of fertilisers produced elsewhere. However, at the same time, bio-waste may possess characteristics that require appropriate solutions for its management, as listed in (Saintmard, 2005)

Prevention of bio-waste simply reduces the amount of bio-waste that needs to be collected and treated. Prevention of the actual generation of bio-waste by changing the behaviour of consumers is preferable as a first step, as per the waste hierarchy, but is outside the scope of this study and is not been considered here.

Home-composting is, in some studies, considered as a form of prevention, as diversion of waste from the municipal waste flow. While being more a peculiar form of

treatment than a prevention process, home composting is interesting especially in areas with gardens because the compost can be directly used without transport for improving the soil of gardens. This avoids the use of other soil improvers, while its potential for use in energy generation is not available. It is however uncertain if home-composting is to be preferred over other types of biowaste treatment due to lack of data on home-composting.

The burning of biowaste at home is not considered as a preferable option because the incineration at home cannot be carried out in an efficient way with emission control and generally does not lead to the production of energy or other types of positive results (Krutwagen *et al.,* 2008).

Composting can be divided into two major methods, namely open and closed methods. Open methods release the greenhouse gas methane in large amounts into the open air, while the closed vessel methods make it possible to collect the methane for combustion. The resulting product can be a mature (or stabile) or immature (or fresh) compost depending on the processing duration. Mature compost is no longer active and does not produce CO_2 or methane in large quantities in contrast with immature compost. Both types have useful but different applications in agriculture. The accumulation of heavy metals from compost in agriculture may occur under certain circumstances. Among other issues, heavy metals may originate from the soil where the biomass has been growing and the content is locally dependent. In case of composting it is very important to have separate biowaste collection to produce high-quality compost (Saintmard, 2005)

Composting is the aerobic degradation of waste by micro-organisms and fungi to produce compost that can be used as a soil improver and organic fertiliser. Due to the high temperature generated (55°C and more) by the process, harmful microorganisms and undesirable seeds and weeds or roots are destroyed. Though CO_2 (of biogenic origin) is the main gaseous emission from the composting process, other gases are typically found including methane, ammonia and nitrous oxide. To reduce environmental impacts from composting, it is therefore important to minimize generation and emission of these gases, e.g., using biofilters (Smith, 2001).

The compost is considered as “mature” when it is stabilised, i.e., when any subsequent change to its texture and its composition is extremely slow. Compost can

have an added value on fields as it can improve soil structure and quality by adding organic matter, nutrients and a diversified biologic life (microorganisms) (Franckx *et al*., 2009).

To prevent green waste from park and gardens means, for instance, selecting plants that grow slowly in order to lower the amount of maintenance waste or to apply grass mulching when cutting grass. Production of park and garden waste does not always have adverse effects on the environment. Hence, prevention of green waste is not always beneficial to the environment.

If bio-waste management includes energy production and compost production, it may be environmentally beneficial to produce and manage green waste (production captures CO_2 and this CO_2 is largely emitted back during end-of-life). If there are limited benefits (incineration with lower energy recovery), it should be assessed (by LCA) whether these benefits compensate or not the impacts of collection and handling.

When there are virtually no benefits (e.g. when the bio-waste would be landfilled, or sent to MBT), prevention is likely to be more favourable. Although there might be some methane production and carbon storage, possible methane losses are likely to make the environmental balance unfavourable. If compost is not valorised (though this should not be a frequent case for quality compost) and there are significant adverse environmental consequences from selective collection, prevention might also be preferable to composting (Manfredi *et al.,* 2011).

Solid wastes have the potential to pollute all the vital components of living environment (i.e., air, land and water) at local and at global levels. The problem is compounded by trends in consumption and production patterns and by continuing urbanization of the world. The problem is more acute in developing nations than in developed nations as the economic growth as well as urbanization is more rapid (Tchobanaglous *et al.,* 1997).

Composting urban waste in India has a long history. Sir Albert Howard developed the Indore process nearly 75 years ago by systemizing the traditional process that was carried out in India (Howard, 1940). Government intervention to promote this practice can be traced to the 1940s and the early 1970s, when the national government initiated a scheme to revive urban composting (Selvam, 1996). However, centralized large-scale composting plants in urban areas promoted in the 1970s proved

to be uneconomical (Dulac, 2001). Only a few installations are currently still operational (UNDP, 1991). Due to high operating and transport costs and the poorly developed market for compost, the expected profits could not be realized as planned. Composting of mixed waste also had a negative effect on compost quality and, thus, on its acceptance by farmers.

As the world economy grows so does its production of wastes. As regulation of international trade in waste has been tightened (Basel Convention), and public opinion has become increasingly environmentally conscious, industrialized countries have had to develop means to deal with the waste they produce. Traditional waste management strategies include reusing materials, recovering materials through recycling, incineration and landfills. In recent years recycling has become the preferred choice of waste disposal for many industries. On the commercial level, government regulation usually works to the advantage of big firms and to the disadvantage of small ones. Due to a shortage of research on its possible economic and environmental spillovers, the practice of reusing materials remains as yet a gray area. Each method of waste disposal has its drawbacks.

1) Resource Recovery

Numerous thermal processes, now in various stages of development, recover energy in one form or another from solid waste. These systems fall into two groups: combustion processes and pyrolysis processes.

- A number of companies burn in-plant wastes in conventional incinerators to produce steam. A few municipalities produce steam in incinerators in which the walls of the combustion chamber are lined with boiler tubes; the water circulated through the tubes absorbs heat generated in the combustion chamber and produces steam.

- Pyrolysis, also called destructive distillation, is the process of chemically decomposing solid wastes by heat in an oxygen-reduced atmosphere. This results in a gas stream containing primarily hydrogen, methane, carbon monoxide, carbon dioxide, and various other gases and inert ash, depending on the organic characteristics of the material being pyrolyzed

2) Recycling

- The practice of recycling solid waste is an ancient one. Metal implements were melted down and recast in prehistoric times. Today, recyclable materials are recovered from municipal refuse by a number of methods, including shredding, magnetic separation of metals, air classification that separates light and heavy fractions, screening, and washing.
- Another method of recovery is the wet pulping process: Incoming refuse is mixed with water and ground into a slurry in the wet pulper, which resembles a large kitchen disposal unit. Large pieces of metal and other non-pulpable materials are pulled out by a magnetic device before the slurry from the pulper is loaded into a centrifuge called a liquid cyclone. Here the heavier non-combustibles, such as glass, metals, and ceramics, are separated out and sent on to a glass- and metal-recovery system; other, lighter materials go to a paper-fiber-recovery system. The final residue is either incinerated or is used as landfill.
- Increasingly, municipalities and private refuse-collection organizations are requiring those who generate solid waste to keep bottles, cans, newspapers, cardboard, and other recyclable items separate from other waste. Special trucks pick up this waste and cart it to transfer stations or directly to recycling facilities, thus lessening the load at incinerators and landfills.http://www.greenbiz.com/blog/2012/08/07/trash-problem-profit-opportunity

Disposal Methods – Disposal of solid wastes on land is by far the most common method in most of the countries and probably accounts for more than 90 percent of the world's municipal refuse. Incineration accounts for most of the remainder, whereas composting of solid wastes accounts for only an insignificant amount. Selecting a disposal method depends almost entirely on costs, which in turn are likely to reflect local circumstances.

3) Landfill

- Sanitary landfill is the cheapest satisfactory means of disposal, but only if suitable land is within economic range of the source of the wastes; typically, collection and transportation account for 75 percent of the total cost of solid waste management.

- In a modern landfill, refuse is spread in thin layers, each of which is compacted by a bulldozer before the next is spread. When about 3 m (about 10 ft) of refuse has been laid down, it is covered by a thin layer of clean earth, which also is compacted.
- Pollution of surface and groundwater is minimized by lining and contouring the fill, compacting and planting the cover, selecting proper soil, diverting upland drainage, and placing wastes in sites not subject to flooding or high groundwater levels.
- Gases are generated in landfills through anaerobic decomposition of organic solid waste. If a significant amount of methane is present, it may be explosive; proper venting eliminates this problem.

(http://www.saferenvironment.wordpress.com)

At the end of World War II, under the Grow More Food campaign, composting was widely encouraged by the Indore method of layering waste with soil and cowdung. This thrust faded as the Green Revolution of the sixties replaced organic farm inputs with cheap and subsidised chemicals and pesticides. A renewed attempt at composting in 1975 failed dismally as it blindly imported Western technology for 12 “Ferti-plants”, copying sorting-conveyors, magnets and crushers designed for developed-country wastes containing mostly clean dry packaging and not more than 16-24% organics. This is quite unlike soggy, compact Indian waste containing over 70% organics, after recyclables are removed from garbage in advance and before inserts are added during co-collection. Hence pre-sorting before composting is virtually impossible except for removal of very bulky items (coconut-leaves etc) and the pre-crushing resulted in fine sharp glass splinters in the compost that made it unacceptable to farmers and their animals (http://www.ehc.bstarconsulting.com/WasteProblems.htm)

For instance, if waste is wet or has a low heating value, it would not be possible to incinerate it without adding supplemental fuel. If a portion of the waste stream consists of organics and can be easily separated from other waste materials, bioconversion of the waste may become a viable strategy. On the other hand, the waste generated by industrialized countries may be different from those generated by nonindustrialized countries. Nonindustrialized societies may have more organic waste

than those generated by industrialized countries. If this is the case, composting or anaerobic digestion may be more suitable for organic waste management.

The activities associated with managing solid waste from the generation point to final disposal normally include generation, reduction, reuse, recycling, handling, collection, transfer and transport, transformation (e.g., recovery and treatment), and disposal. Depending on site specific conditions, a sound waste-management program can be established by combining some of the necessary activities into integrated solid-waste management. On the other hand, legislative efforts and effective implementation are vital for the safe management and disposal of solid waste. Incentives may be provided for the development and practice of safe treatments, harmless manufacturing processes, and methods for converting solid waste into valuable resources by recycling and reuse. On the part of industry, industrial waste-management is also indispensable from the viewpoint of both the social responsibility of business corporations and ISO 14000, which will influence their survival in global markets (Dahle´n et al., 2007).

Every year, the United States generates approximately 230 million tonnes of "trash"--about 4.6 pounds per person per day. Less than one-quarter of it is recycled; the rest is incinerated or buried in landfills. With a little forethought, we could reuse or recycle more than 70 percent of the landfilled waste, which includes valuable materials such as glass, metal, and paper. This would reduce the demand on virgin sources of these materials and eliminate potentially severe environmental, economic, and public health problems. http://www.learner.org/interactives/garbage/solidwaste.html

The waste segregation that we do in our workplace and residential areas are very much appreciated nowadays, it is very necessary that after the collection of wastes there should be a proper waste management pick up services that will ensure that these things get to their destinations safely and orderly. Such clean up services will always be a priority for those who are managing waste disposal efforts in cities and other places. When there are proper recycling facilities, the people will find it easier to follow waste management techniques. The choice of an effective waste management pick up also plays a very good role in letting the people know of the importance of recycling efforts. It is therefore necessary to choose a waste disposal pick up service that will fulfill the requirements of the people and provide the necessary functionality for proper waste management and safety. These vehicles are complemented by a waste management dumpster that will be easy to use and is environment friendly (Roberts, 2011)

Another worrying trend seen worldwide and which is now starting off in India is due to the Clean Development Mechanism(CDM) based ventures mushrooming in the country. Based on the UN convention, if a venture reduces greenhouse gas emissions, that will directly earn them carbon credits which is market tradable. This means that all the waste management firms can claim to reduce greenhouse gas (GHG) emissions and using the carbon credits they might earn in the future, raise funds in advance. While these firms might just end up incinerating the waste, they directly are throwing millions of livelihoods literally into the dumps as the informal sector of rag pickers get displaced. Especially in India, where this network is huge, this problem will become rampant when corporates undertake what the rag pickers have been doing for ages and is their sole source of livelihood. (Bangalore, CDM, Development, Essay, waste management, India, Technology, http://beta.bodhicommons.org/article/waste-management-in-india

Effective placement of trash cans and bins throughout home is also key to good home waste management. Part of creating a beautiful home is creating a home that requires a manageable amount of maintenance. Interior designers are great professionals to consult with as they attack every angle of home design, including waste management (Pickett. 2012).

All properties should have a wheeled bin or refuse sacks for household waste and variety of bins are available for recycling. Flats and houses of multiple occupancy are usually supplied with communal waste and recycling containers by using the 'When will my bins be emptied'. https://www.barnsley.gov.uk/services/environment-and-planning/recycling-rubbish-and-waste/household-waste-collection

Waste is stored at the plants until it is needed to fuel the boilers to create energy. The most widely used process is the 'mass burn'. The mass burn involves rubbish being burnt on a moving great. Air is normally injected both above and below the grate to make sure that the rubbish is burnt properly. The inside of the boiler's combustion chamber is filled with metal pipes, which are filled with water.

The water in the pipes is heated and turn into steam when the waste is burnt. It is this steam that turns the blades of the turbine, which is like a giant propeller. The rapid rotation of the turbine is used to turn an electromagnet that produces the electricity. Around 10% of this electricity is used to run the plant and the rest is sold outside. Once the steam has turned the turbines it is cooled and turned back into water.

This water is then used to start the whole process again. Once the process is complete there is only ash left in the combustion chamber. The ash is passed along a conveyor belt, which passes by a magnet where any magnetic metals are removed. The remaining ash is then sent to landfill and in some instances used for road construction. http://www.boldsky.com/home-n-garden/2006/household-waste-management.html

The separate collection of biodegradable waste, the volume of waste has been reduced by at least 35% (in some regions even as much as 60%). The biodegradable waste separated from household waste is then used to create compost or for power generation. This relieves the load on existing landfills and waste incineration plants, new plants can be designed to be smaller and operated more cost-effectively. http://www.ssi-schaefer-asia.com/waste-management/ biodegradable-waste.html

Methods to overcome

Waste segregation is the initial stage for GP practices. Residents are encouraged to separate their waste and bring it to the appropriate locations for collection. Paper, scrap metal, glass, and plastic are the common items segregated and collected by the waste pickers. Waste pickers play a significant role in recycling activities. They-individuals or groups-collect saleable items from the waste-collection bins, households, and dumpsites. Organic waste is converted into compost in several cities as a part of their recycling activities. However, the rate of recycling in Asian developing countries is far from satisfactory. The low recycling rate can be attributed to poor strategic planning and to the implementation and enforcement of the policies. Lack of good incentives can also be a main factor in the poor waste recycling rate.

GP measures for solid-waste management not only reduce waste, but recover useful resources as well. Some Asian cities have long-term plans for zero-waste generation. Even though it may be a difficult task to achieve in the near future, measures and policies are being developed to move toward the target of zero-waste generation. http://www.apo-tokyo.org/publications/files/ind-22-swm.pdf

Recycling efforts could also be done effectively in the workplace and offices. Each staff or employee can be provided with recycling bins aside from their regular trash cans. This will make it easier for the waste management pick up truck to collect and segregate things when they do the collection process. There should be a guide posted on cubicles in the offices regarding which items could and could not be recycled.

The existence of a specialized waste management dumpster in locations that are not far from these places should be implemented by both office administrators and the local government units. Color coded systems in the segregation of waste materials and in collecting bins will also make it easier for the waste disposal service to do their jobs in keeping the workplace clean and free from trash and environmentally harmful wastes (Solomon, 2010).

In residential areas, recycling can be implemented effectively by adding locations that are specifically designed for waste segregation and collection. The ideal areas for this include the garage, the kitchen or the back portion of the house. There should be provisions for separate materials such as bottles, papers, plastics, and metal containers. Waste management pick up services could be easier if the materials to be collected are already segregated. The existence of clean and green programs and its success all over the world is totally dependent on how people and societies are able to follow these measures.

Other institutions out there that include the education, medical and tourism sectors should also have their own systems of effective waste management pick up and recycling. Containers that are friendly to the environment within each sector should be given adequate features to make it possible for individuals staying within the proximity of the area safe and healthy. In businesses, they can request for adequate and regular waste disposal services within ideal time frames and conditions http://EzineArticles.com/3956984

D. Functions of Various Agencies and Projects on Garbage Management

Agencies

Council on Environment Quality (CEQ)

It is a federal agency formed under the terms of national environmental policy act (1969) for the improvement of environmental protection measure. The aim of the act is to encourage productivity and enjoyable harmony between man and his environment, to promote efforts which prevent to eliminate damage to the environment and bio sphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the nation and establish a “CEQ”.

MONDAY, NOVEMBER 13, 2013

UDHAGAMANDALAM MAXIMUM 20 YESTERDAY MINIMUM 11

Coimbatore Airport Today 31°C

Corporation to compost wet waste in R.S. Puram

13.11.13

The civic body in talks with an NGO in this regard

Staff Reporter

COIMBATORE: Close on the heels of launching the segregated waste collection system in a few streets in R.S. Puram (Ward 23) under the 'Shunya' zero waste management scheme, the Coimbatore Corporation has made the next move: processing wet waste.

According to Corporation Commissioner G. Latha, the civic body had identified a vacant plot west of Thadagam Road in R.S. Puram to process the wet waste – kitchen waste and other degradable items. The waste the workers collect from residents who have begun segregating wastes will go to the compost yard, where it would be turned into manure. The Corporation was in talks with an NGO in this regard.

This would help the Corporation in more ways than one – reduce the quantity of waste taken to the Vellalore dump yard and also reduce fuel expenditure. Plus, the waste generated locally would be processed locally.

As and when the Corporation perfected the model, it would extend it to other wards. At present, the civic body was keen on strengthening the zero waste management model in Ward 23. As part of the strengthening measure, on Tuesday the Corporation had honoured residents of T.V. Samy Road (West), Ponnurangam Road (West), Venkatasamy Road (West), Periyasamy Road (West) and Bashyakarulu Road (West). Thirty residents from the aforementioned streets had segregated the wastes as per the Corporation's instructions.

The civic body also honoured the conservancy workers who played their part in ensuring that the residents of the aforementioned streets segregated their wastes, a Corporation release said.

The workers sold the recyclable dry wastes they collected to the ITC under its Wealth Out of Waste (WOW) project and made money at Rs. 3 a kg.

Ms. Latha said that a few dedicated workers like Nagaraj have thus far collected around 1,000 kg plastic and paper waste.

FELICITATION: *Mayor S.M. Velusamy honours Karthikeyan (right), a conservancy worker, for his active involvement in the implementation of the 'Shunya' pilot project in Ward No.23, in the city, on Tuesday. Corporation Commissioner G. Latha (left) is in the picture.* — PHOTO: K. ANANTHAN

Waste segregation programme gains momentum

Karthik Madhavan

COIMBATORE: On Tuesday morning, a few conservancy workers and residents of R.S. Puram – Ward 23 – will receive certificates of appreciation from the Coimbatore Corporation's top brass. The appreciation is for a seemingly insignificant work they have done every morning in the past few days: segregation of waste. Sources in the Coimbatore Corporation say the residents chosen have done exceedingly well in segregating the waste and handing it over to the conservancy workers. And the workers identified have collected the maximum plastics waste.

The appreciation is part of the Corporation's 'Shunya' zero waste management project, which it implemented in association with the Residents Awareness Association of Coimbatore (RAAC), Siruthuli, ICLEI, an NGO, and a few other organisations.

The sources said that since the start of the programme on October 2, the conservancy workers had collected nearly three tonnes of plastics and recyclable waste. The workers take the waste to the Corporation's ward office in the area, where the Corporation officials weigh the same, record the weight of waste collected by each worker and pass on the information to the ITC WOW programme managers, who deposit money – calculated at Rs. 3 a kg given – into the workers' bank account.

R. Raveendran, Honorary Secretary, RAAC, said that a few workers have earned up to Rs. 1,000 in the recent past because of their enthusiastic participation in the programme.

B. Nagaraj, a conservancy worker, said that since the start of the programme he had been picking up all the plastics and recyclable waste that he found in his area of operation. Though satisfactory, their workload had increased, said A. Murugan, another worker. The work that earlier got over at 10 a.m. now extended up to noon and sometimes even beyond, for they would have to further segregate the dry waste collected.

The residents said they were only happy to segregate the waste. It was not a difficult job at all – all that the residents had to do was dump them into two different containers, said Manjula Sharkis, a resident of Bashyakarulu Road.

She added that she was happy that the Corporation had initiated the programme.

திடக்கழிவு மேலாண்மை திட்ட விழிப்புணர்வு

உதகை

உதகை நகராட்சியில் திடக்கழிவு மேலாண்மை திட்டப் பணிகள் குறித்த விழிப்புணர்வுப் பேரணியை, மாவட்ட ஆட்சியர் சங்கர் துவக்கி வைத்தார்.

உதகை நகராட்சி, ஐ.டி.சி. நிறுவனம் இணைந்து நடத்திய இந்த விழிப்புணர்வுப் பேரணி, சேரிங்கிராஸ் சந்திப்பிலிருந்து கமர்சியல் சாலை வழியாக நடைபெற்றது. பிளாஸ்டிக், உலோகம், காகிதங்கள் மற்றும் மறுசுழற்சி செய்யக்கூடிய அனைத்துக் கழிவுகளையும் தனியாக சேகரிக்க பொதுமக்களிடம் ஆட்சியர் பைகளை வழங்கினார். நகராட்சி சார்பாக வாரம் ஒரு முறை மேற்கொள்ளப்படவுள்ள கூட்டு துப்புரவுப் பணியினை ஆட்சியர் தொடங்கி வைத்தார். இவர்கள் வாரம் ஒரு முறை கூட்டு துப்புரவுப் பணி மேற்கொண்டு, பொதுமக்களிடம் இருந்து நேரடியாக சேகரிக்கும் கழிவுகளை, மறுசுழற்சி செய்வதற்காக ஐ.டி.சி. நிறுவனத்திடம் ஒப்படைப்பார்கள்.

நகர்மன்றத் தலைவர் சத்தியபாமா, ஆணையர் சிவகுமார், துணைத் தலைவர் கோபாலகிருஷ்ணன், அரசு அலுவலர்கள், தேசிய மாணவர் படை மாணவர்கள், மகளிர் சுய உதவிக்குழுவினர் மற்றும் பொதுமக்கள் கலந்துகொண்டனர்.

கழிவுகளை சேகரிக்க பைகளை வழங்குகிறார் ஆட்சியர் சங்கர்

பேரணியின்போது நடைபெற்ற துப்புரவுப் பணி.

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Dec 7, 2013

Campaign to promote recycling of waste

D. Radhakrishnan

UDHAGAMANDALAM: With concern growing over the lack of initiative on the part of the citizens to keep this hill station clean notwithstanding campaigns organised off and on by the district and civic administrations to enhance awareness about the need to protect the environment, a programme was organised here on Friday to combat litter-related problems and promote recycling of waste.

Leading the campaign organised by the municipality in association with the ITC Limited, The Nilgiris Collector, P. Shankar, exhorted the people in general and members of the mercantile community in particular to constantly bear in mind that this town is a popular vacation destinationPointing out that the campaign was part of the Wealth out of Waste (WOW) scheme which was being jointly implemented by the municipality and the ITC, he said that the objective was to recycle discarded items like paper, broken plastic items, biscuit wrappers, milk sachets, water bottles, soft drink cans etc. In the conservation work augment their earnir

Municipal Comn K. Sivakumar said th gin with the source tion scheme wo implemented at Cross and Commerc

A campaign to create awareness about waste management was held in Udhagamandalam o Friday. - PHOTO: M. SATHYAMOORTHY

Campaigining Programme on Waste Recycling

Environmental Protection Agency (EPA)

Independent federal agency of the U.S government established in 1970, that is responsible for dealing with the pollution of air, water and solid waste, pesticides, radiations and with nuisances caused by noise.

Municipal, State and Federal Organization

The federal government does much safety work. The United States environmental protection agency was formed in 1970 under the national Environmental Protection Act. The consumer product safety commission, formed in 1973, enforces safety standard under the consumer product safety act of 1972 and collects data on product related injuries and deaths.

United Nation Environment Programme (UNEP)

UNEP, a United Nations, agency charged with coordination of inter-governmental measures for environmental monitoring and protection, formed just after the UN human environment conference (Stockhelm, 1972) General assembly of united nation created this institution. To coordinate the UNEP programmes, environmental coordination Board was also created.

Natural Conservancy Council (NCC)

The official body, founded in Britain by act of parliament in 1973 to be responsible for conservation of flora and fauna, geological and physiographic features throughout Great Britain. It established and maintains national natural reserves, give advice and education on nature conservation and carries out research into related topics. It is financed by the department of environment.

World Commission on Environment and Development (WCED)

The commission was setup in 1984 comprising in pursuance a 23 members United Nations general assembly resolution in 1983 to reexamine the critical environment and development issues and to formulate proposals to deal with them. It has call for decisive political action to manage better environmental resources to ensure human progress and survival. The commission visualizes a very grim future if changes are not made. It recommended that emerging technologies other the process promise of higher productivity, increased efficiency and decreased pollution.

The Waste Prevention and Management Regulation, 2012, which came into effect on 18 April 2012 in Bhutan is a comprehensive regulation for the waste minimization and management. It establishes various agencies and monitoring authorities for the effective implementation of this regulation, and is applied to all point sources and/or point of origin of different types of waste and their management.

National Environment Commission (NEC) is the apex monitoring body under this regulation which shall coordinate and monitor the overall performance of Implementing Agencies designated to efficiently implement the provisions of this Regulation. And, the Royal Bhutan Police shall assist the implementing agencies in achieving full compliance.

This regulation is a strong measure to deal with the existing bad scenario of waste disposal and management in Bhutan (Sambyal, 2013**)**

Role of Government and Non Government Agencies

In India government is also playing a important role in promoting awareness, among the masses about environment issues, by educating them regarding the seriousness of the environmental problems. Government agencies like department of environment, department of science and technology, department of oceans development, council of scientific and industrial research academy, department of atomic energy and also various state level agencies are funding for environmental research.

As a result of increasing awareness of the environmental problems, efforts are being made through various government agencies, research laboratories, educational institutions and non-governmental organizations to find remedial measures to various problem related to proper management of our environment. A number of universities have started research as well as teaching programmes in the field of environmental science.

For organic waste, four local authorities (Galway City and County and Waterford City and County Councils) have organic waste collection schemes established in the past few years for both single and multi-store dwellings, and two Dublin local authorities (Fingal County Council and Dublin City Council) have recently commenced pilot schemes. For the most part, the organic waste collection schemes in Ireland serve

single-dwelling houses with a very small number of apartment complexes included (Carey *et al,.* 2008).

Projects

An Integrated Solid Waste Management scheme for six municipal towns namely - Champdani, Baidyabati, Rishra, Serampur, Uttarpara-Kotrung and Konnagar for a common shared disposal scheme at Dirghangi mouza under Hooghly district was conceived by KMDA, as the towns did not have enough land for individual solid waste disposal. The total population of the 6 municipalities is around 9 lakhs (approx.) and projected population that will be benefited is around 11 lakhs upto 2025. The 50 acres of land at Dirghanghi mouza will be utilized for the sanitary land fill site construction. From the study done by the SAPROF mission, it is found that out of an annual generation of 1,02,582 sq. tones of waste, compost waste is to the tune of 46,000 sq. tones and recyclable waste to the tune of 10,000 sq. tones.

The project has primarily been divided into 5 packages which are - Primary Collection, Secondary Transport, Setting up of Transfer Station and Compost Plants, Setting up of Regional Waste Management Centre (RWMC) with Sanitary Landfill Site with Septic Tank sledge treatment facility. The project will be monitored by a Project Management Unit (PMU) to be headed by Secretary, KMDA. The PMU will function under the guidance of a Steering Committee under the Chairmanship of Principal Secretary, Urban Dev. Deptt., Govt. of West Bengal, Finance Deptt., Chairpersons of 6 municipal towns and representatives from JBIC-New Delhi.

Total project cost is ₹ 170.20 crores out of which JBIC contribution is around 145 crores and rest ₹ 25 crores to be borne by State Government. The project is likely to be completed by 2010.

Recycling and composting prevented 85.1 million tonnes of material away from being disposed of 2010, up from 15 million tonnes in 1980. This prevented the release of approximately 186 million metric tonnes of carbon dioxide equivalent into the air in 2010—equivalent to taking 36 million cars off the road for a year. Learn more about how common wastes and materials, including food and yard wastes, paper, metals, and electronics, contribute to MSW generation and how they can be recycled.

Surveys carried out by various agencies show that the health care establishments in India are not giving due attention to their waste management .After the notification of the Bio –medical waste (Handling and Management) Rules ,1998, these establishments are slowly streamlining the process of waste segregation, collection ,treatment, and disposal . Many of the larger hospitals have either installed the treatment facilities or are in the process of doing so (www.swlf.ait.ac.th).

b) Projects taken up Municipal Engineering Directorate

The Municipal Engineering Directorate has also framed a few detailed project reports for the 22 municipalities outside KMA and Bidhannagar Municipality within KMA. All the 23 DPRs have been approved by WBPCB. Besides, M.E.Dte. Has prepared preliminary report of 63 towns. Apart from that, 3 municipalities - Durgapur M.C., Siliguri M.C. and Chandannagore M.C. has been prepared by the concerned ULBs by engagement of consultants and all these DPRs have been approved by WBPCB.

From 1990's decentralized composting schemes have been implemented by NGO's with the help of international funding. The decentralized composting schemes became very popular and widespread in a short span of time. Various types of composting have been adopted by these schemes e.g. Bin-composting, Shallow windrow, Pit composting and vermicomposting. However, the maintenance of such schemes proved to be difficult because the household involvement was sporadic, as many people believe that it is the municipal corporation's responsibility to collect waste and do not want to make additional payments. This study states that though decentralized composting has more advantages than centralized composting, the market for MSW compost is limited and is rarely financially competitive to heavily subsidized chemical fertilizers and traditional cow dung or poultry manure (Zurbrügg *et al.,* 2002).

However, in Class II, Class III and Class IV cities an urban agricultural set up exists and functions, where there is optimal use of municipal solid waste. The farmers buy the organic waste from the municipality at very low costs and use it as manure. There are also companies that have taken over the responsibility segregating, decontaminating and composting MSW. This high quality compost is then sold to the farmers at a very high cost compared to the raw MSW. It has been observed that the farmers prefer the raw MSW to the processed high quality compost, because the latter is too expensive (Nunan, 2000).

Currently, there are few large-scale composting plants around India that are running successfully. For e.g. composting plant in Hyderabad run by AP technology development and promotion center (intake of 200MT/day, composting plant in Vijaywada by Exel industries (intake of 125 MT/day), composting plant in Bangalore by Karnataka Compost Development Authority (KCDC)(intake of 300MT/day) and composting plant in Bangalore by Terra Firma Bio-technologies (100MT capacity). All these compost plants have a high demand for their products and want to increase their processing capacity to meet the huge demand. The awareness for organic manure is increasing rapidly in India that will in turn increase the demand for the manure produced from MSW (Garibay *et al*., 2003).

According to Waste Act, MoE's task is to draw up a national waste plan. This strategic plan sets targets for the reduction of the amounts and harmful properties of waste, for waste recovery, for the prevention of risks to human health and the environment, for further development of waste management infrastructures and for supervision of waste transport. The national waste plan also presents the administrative and legal, economic and informative instruments to be used in implementation. It also includes a separate national waste prevention programme. http://www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/finland/WASTE.pdf.

E. Research Related to Waste Management Practices

According to the DEFRA's municipal waste management survey the National household waste analysis programme in UK, "Household waste arisings have been increasing in the UK, yet no systematic review of the drivers behind these increases has been conducted. The statistical analysis of waste increases undertaken for the Strategy Unit is intended as an initial step in a more systematic analysis. In particular it explores the influence of weight based recycling targets, which are not material-specific, on variations in district household waste arisings across England". (http://webarchive.nationalarchives.gov.uk).

According to the U.S. Environmental Protection Agency (EPA) notes there are certain ways to go about recycling household waste. Begin by establishing the own recycle system within the household. Create bins for all of the main recyclable products, such as paper, plastic, glass, newspaper and food waste. Many communities offer curbside service for picking up waste and recycle products. Seek a recycle drop-off

center, which is a self-service center where one can dispose of the recyclable items. Create a small indoor compost container that can later be transferred to a larger compost pile site where one can create organic matter that will benefit the yard and garden. National Institute of Environmental Health Sciences: Reduce, Reuse and Recycle,

Recovery of recyclables also exists at composting plants, such as the one in Monterrey, Mexico, which allows scavenging activities in its premises. At this plant, scavengers are allowed to sort inorganic materials from mixed wastes before the organic fraction is composted. This does not interfere with composting operations and reduces the presence of inorganic materials in the compost. Inorganic materials are considered as contaminants if present in the compost, and thus scavenging improves the quality of the final product (Medina, 2011).

Since organic matter usually contains a high moisture content, evaporation and decomposition can reduce the weight of the material by about 50%. Composting also prevents pollution and extends the life of landfills. It is socially desirable to divert as much organic matter from the landfills as possible, if it can be done at a low cost. (5^{th}_pl5.2_martin_medina_martinez_paper.pdf)

India is also experiencing tremendous growth in urban areas. Urban centers of India produce 120,000 tones of solid waste per day. Some metropolitan cities like Bombay, Calcutta, Bangalore, and Pune showing typical urban pollution. Among these Pune is also one of the city which produces large quantity (1000-2000 mt/day) of Municipal Solid Waste (MSW). There is major problem of its disposal and management. Pune Municipal Corporation (PMC) dispose municipal solid waste at Urali Devachi Depot which is 20 km .away from Pune city.

According to Maharashtra Pollution Control Board due to unscientific disposal of MSW the huge hips are produced at the disposal site. The decomposition of waste produce leachate .This leachate gets percolated in surrounding ground water. In the present study leachate and well water of near by area is analyzed for the concentration of chromium and zinc. The analytical data showed that concentration of chromium and zinc in leachate is 5 to 8 mg/l and 10 to 15 mg/l respectively which is more than permissible limit of MPCB.

Open dumping of solid waste affect the aesthetic value of the surrounding area of the disposal site. It also produces very bad smell at the time of decomposition process. At the time of decomposition it released a various gases within the surrounding area due to that air get polluted and this pollution leads to global warming. All this gases e.g. SO_2, CH_4, CO_2 etc. are very harmful to human health. The released of this beyond average limit causes disorders related to respiratory tract. Leachate formed from waste mixed with ground water and pollutes that water.

Concentration of all parameters found in well water is exceeds the limit so it is not safe for drinking, commercial used, irrigation and industrial purpose. These leachates have corrosive activity which is also dangerous for human health. So the dumping ground not only affect environment but also damage the property in the vicinity area. The current practices needs to improve for managing waste (Mane *et al.,* 2012)

Municipal solid waste (MSW) is a priority area of concern. MSW represents a valuable source of resources, such as materials and energy. At the same time it is also a source of pollution and land degradation when treated inappropriately. It has significant impact on human health as well. Along with economic growth and changes in production and consumption patterns MSW generation has steadily increased and, according to estimations, will continue increase during the next few decades. Environmentally sound management of increasing amounts of municipal wastes is among the topics of major concern today in most countries.

However, avoiding waste generation is not always possible, particularly in poor countries such as Armenia. The collapse of Soviet Union led to disruption of the traditional trade chain and led to serious economic decline. Lack of financial resources and unsuitable infrastructure has not allowed following environmental regulation and standards. As a result MSW management was neglected for many years (Arzumanyan *et al.,* 2004).

According to Jamshidi *et al.* (2011) the existing waste collection and disposal systems will not be able to meet the needs of sustainable waste management. Applying technology without knowledge of the waste materials and adaptation to local factors is not worthwhile. In other words, when proposing a proper waste management plan it is necessary to identify the current situation of the area and the appropriate method

should be adopted. Study ahead as a descriptive approach aims at examination of the potential ways for management of municipal solid waste in a sustainable manner.

According to Montserrat *et al,.* (2004) the present production systems usually do not take into account the need to protect the environment versus simple economic benefits. This fact produces normally an exertion against environment, certain difficulties to guarantee food quality, and specially the generation of a huge volume of wastes which must be treated. European Union prepared and is preparing different instruments to reduce the amount of waste and especially in the case of organic one to undergo an adequate treatment/management to achieve a maximum recycling and to avoid problems and wasting by landfill or incineration.

Agriculture systems produce organic wastes and at the same time have capacity to assimilate them and others wastes from different sources. Their management through the soil for plant production could generate enormous economic and environmental benefits which contribute to sustainable development. For that it is necessary to take into account aspects related to soil protection and nutritional crops needs. This could lead to sustainability in the management of residues and in the crop system. This is particularly important in Mediterranean soils which are traditionally rather poor in organic matter. Such an improvement of the soil, besides the increasing of the fertility, represents also a reinforcement of its capacity to fix CO_2.

The research carried by Susan A. Thorneloe *et al*,. (2012) they explained there is a need to move toward a more sustainable use of resources. Concern for the environment and future generations is leading us to shift the focus from waste management to resource management. Effort is underway to develop a web-accessible version of the tool. This will make for easier and cheaper access to the tool. Updates will be conducted as better data and information become available. We anticipate wider use of the MSW-DST (Municipal solid waste- decision support tool) once the web accessible version is available. This will help in supporting the goals of EPA's Resource Conservation Challenge and lead towards more sustainable resource and waste management.

According to Carmel Carey *et al.,*(2008) organic waste (i.e. food and garden waste) constitutes the single largest component (~36%) of household waste. Irish waste management policy requires source separation of organic household waste to divert this

material away from landfill to higher treatment options. The preferred sustainable option is to biologically treat organic waste and produce a valuable reusable end product, i.e. compost. Governmental awareness-raising campaigns and increased participation in new source-separate waste collection schemes have seen a move away from the traditional method of disposal to landfill to recycling and recovery.

The separate collection of organic waste at apartments can often be overlooked, as there can be challenging issues at these dwellings associated with the storage, presentation and collection of this material. However, national and international studies show that when key considerations are taken into account at the earliest possible stage, the implementation of source-separated collections of organic waste is possible from apartments. Successful organic waste collection is not always possible from all types of multi-store dwellings in some areas.

Biodegradable Municipal Waste is considered as the organic biogenetic fraction of municipal waste from garden and kitchen and is indicated as “biowaste”. The definition of Biowaste as proposed by the European Parliament in the legislative resolution on the proposal for a directive of the European Parliament and of the Council on waste (ref. T6-0029/2007) notes: 'biowaste' means waste of animal or plant origin, for recovery purposes, which can be decomposed by microorganisms, soil-borne living organisms or enzymes; soil material with no significant biowaste content and plant remains from agricultural production falling within the scope of biowaste.

The EU waste policy aims to reduce the negative environmental impact of biowaste management and to contribute to an overall reduction of the environmental impact of the use of resources. The environmental assessment of the (dis-) advantages of the various biowaste management options is complex because they occur in different phases of the biowaste lifecycle, during collection, treatment and recycling, while contributing to different environmental effects, ranging from greenhouse effects, material depletion, acidification and toxicity for humans and ecosystems. The environmental assessment of biowaste management requires therefore detailed description of inputs of resources and outputs of emissions and useful products that are related to these different phases (Bart, 2008)

According to Sunil Kumar et al., (2009), Solid waste management is one of the most challenging issues in urban cities, which are facing a serious pollution problem

due to the generation of huge quantities of solid waste. Initiation of house-to-house collection system Adoption of large variety of community bins in cities having community bin system Adoption of front end loaders for mechanical lifting of waste at open collection spots Adoption of source specific collection system Emphasis on segregation of dry and wet waste at source. Avoiding open dumping of MSW Creation of sanitary landfills Selection of landfill site as per the guidelines of CPCB/NEERI Monitoring of management of hazardous wastes in keeping with the legislation Adoption of separate treatment and disposal facilities for hazardous waste Discontinuing the mixing of biomedical waste with the MSW Ensuring proper segregation of various categories of biomedical waste as also treatment and disposal of these wastes as per legislation Strict compliance on adoption of protective devices such as gumboots, hand gloves, and masks etc.

According to Mane *et al.* (2012) at present the most serious problem of pollution is the direct result of human activity. As soon as large settlement and towns become common, the problem of disposal of solid waste arose. India is also experiencing tremendous growth in urban areas. Urban centers of India produce 120,000 tonnes of solid waste per day. The decomposition of waste produce leachate .This leachate gets percolated in surrounding ground water. In the present study leachate and well water of nearby area is analyzed for the concentration of chromium and zinc. There is higher concentration of these metals in well water. The people residing in these areas are using well water for drinking, domestic and for agricultural use. It is observed that the people living in this area having health and hygienic problems such as allergic, asthmatic, bronchitis, skin irritation and gastro intestinal diseases. These problems are discussed in this paper.

Ittiravivongs (2012) stated that, the study reveals that improving of recycling facilities, services and relevant support systems should be primarily concerned intensive attentions should be paid on the service accessibility and standard of disposal containers. People should be well educated how to recycle household waste in practice; what materials should be separated, how to sort, and where to deposit them. The support systems and recycling skills are crucial because these factors were found to largely affect recycling intention. Policy for reinforcing positive attitude toward recycling should also be carefully taken notice. Besides, people's recycling intention tends to depend on recycling norm of their engaging communities. Thus, it is important to make

recycling an activist and favorable practice performed by a majority of people in the societies.

An experiment conducted to determine the effects of vermicompost on the growth, yield and fruit quality of tomato (*Lycopersicum esculentum* var. Super Beta) in a field condition by (Azarmi *et al.,* 2008) revealed that the addition of vermicompost at a rate of 15 t ha-1 significantly increased growth and yield compared to the control. Vermicompost applied at this rate also increased electrical conductivity of fruit juice and percentage of fruit dry matter up to 30 and 24%, respectively. The content of K, P, Fe and Zn in the plant tissue increased 55, 73, 32 and 36% compared to untreated plots respectively. Moreover, the result of this experiment showed that the addition of vermicompost had significant positive effects on growth, yield and elemental content of plants as compared to the control.

A study conducted by (Arouiee, 2009) which investigated the effects of different levels of vermicompost on seed germination parameters and the growth of greenhouse tomato (*Lycopersicun esculentum*) concluded that there were significant differences between treatments. The highest seed germination rate was in 25% vermicompost. Tomato seedlings growing in 100% vermicompost had the lowest amount of chlorophyll, the lowest leaf diameter, lowest dry weight and were the shortest seedlings between all treatments. Furthermore, the application of 50% vermicompost increased the inter-node number, root dry weight and nitrogen content of tomato seedlings significantly as compared to the control plants. Also, the incorporation of 25% vermicompost increased significantly the shoot dry weight and leaf area of tomato seedlings compared to the control.

Anwar *et al.* (2005) also reported that the combination of vermicompost at 5tha-1 and fertilizer NPK 50:25:25kgha-1 performed the best with respect to growth, herb, dry matter, oil content, and oil yield in an experiment conducted with six different combinations of organic manure (farm yard manure and vermicompost) and inorganic fertilizers (NPK) to study their effects on yield and oil quality in basil (*Ocimum basilicum* L. cv. Vikas Sudha).

Another study done by Alam (2006) also validated the combined effects of vermicomposts and chemical fertilisers on the growth and yield of potatoes. The results for this experiment revealed that the application of vermicompost at a rate of 10 t ha^{-1}

with 100% of the recommended NPK fertiliser produced the highest growth and tuber yield of potato. However, the lowest yields were recorded in the control treatment.

A few studies have also been done on vermicomposted plant based residues in Guyana. Ansari (2006) showed that, the combination of biodung composting and vermicomposting of grass clippings, water hyacinth and cattle dung could be successfully processed within 60 days using *Eisenia fetida*. Similarly, Sullivan (2005) conducted an experiment whereby kitchen wastes comprising plantain and eddo skins were converted into vermicompost over a 70 day period. Moreover, each of these studies conducted in Guyana utilized the *Eisenia fetida* species of earthworm in the vermicomposting process.

Studies elsewhere have also indicated the potential of vermicomposting plant based residues. As such, Sukumaran (2008) investigated the possibility of utilizing vegetable wastes for vermiculture using *Megascolex mauritii* species of earthworms. The results obtained from this study indicated that the NPK values were maximum in the compost obtained from vegetable waste amended with soil and cow dung (N 1.76, P 1.60 and K 4.98) as compared to the other treatments which included the soil alone (control) (T1), soil + cow dung (T2), and soil + vegetable waste (T3). Moreover, Suthar (2009) also conducted a study whereby vegetable solid waste amended with wheat straw, cow dung and biogas slurry was converted in vermicompost. Evidently, vermicomposting resulted in a decrease in organic C (12.7-28%) and C:N ratio (42.4-57.8%), while an increase in total N (50.6-75.8%), available P (42.5-110.4%) and exchangeable K (36.0-78.4%) contents. Furthermore, the results from this study indicated that vermicomposting can be an efficient technology to convert insignificant vegetable-market solid wastes into nutrient-rich biofertilizer if mixed with bulking materials in appropriate ratios.

F. Importance of Composting / Vermicomposting

Healthy Soils = Healthy Plants = Healthy Environment = Healthy Society

Wastes are nothing but misplaced resources. A large volume of organic matter is generated from agricultural activities, dairy farms and animal shelters which are usually dumped in corners where it putrefies, usually emanating foul smell. This valuable resource can be utilized by properly composting it into a value-added end

product called manure. The chief objective is to compost organic wastes not for the disposal of solid organic wastes but also to produce superior quality manure to feed our “nutrient/organic matter for hungry soils” (www.indg.in).

The principal advantages in making own compost are composting is a good treatment option for many agricultural wastes and can produce a marketable product; and composting stabilizes organic materials so they can be stored safely, transported easily, and applied at a convenient time.

Compost increases soil workability, water holding capacity, porosity and drainage, compost minimizes wind and water erosion. Soil temperatures are moderated, making plants less susceptible to extremes of heat or cold. Healthier plants lessen the need for fertilizers or pesticides. Less fertilizers and pesticides pose less of a danger to animals and humans who are exposed to toxic residuals through food, water, soil and air (www.wormpost.com).

Compost is organic matter that has been decomposed and recycled as a fertilizer and soil amendment. Compost is a key ingredient in organic farming. At the simplest level, the process of composting simply requires making a heap of wetted organic matter (leaves, "green" food waste) and waiting for the materials to break down into humus after a period of weeks or months (www.en.wikipedia.org).

Compost pit of any convenient dimension can be dug in the backyard or garden or in a field. The most convenient pit of easily manageable size is 2m x 1m x 0.75m. [A tank may be constructed with brick and mortar with proper water outlets, or a plastic crate (600 mm x 300 mm x 300 mm) with holes drilled at the bottom or empty wooden crates (deal wood boxes/apple cases) or well rings made of cement or clay of 750 mm diameter and 300 to 450 mm height can also be used with slight modifications in the thickness of layers used. If nothing is available then four worn out car-tyres be placed one above the other and composting start

An interesting fact is that it was Charles Darwin who was one of the first persons who noted the importance of earthworms, more than a century ago. These "creepy-crawly" creatures are the most useful gardeners. They break down dead plant material and other organic wastes, recycle the nutrients, and turn over the soil (www.erfindia.org).

சமையலறைக்கு ஒரு தோட்டம்

ஒரு செடியில் தினமும் முன்னூறு கிராம் வெண்டைக்காய் வீதம் பத்து செடிக்கு 3 கிலோ கிடைக்கும். இந்தப்பத்து செடிகளும் குறைந்தபட்சம் மூன்று மாதங்களுக்கு இதே அளவு விளைச்சலைத் தரும்.

என் வீட்டுத் தோட்டத்தில்

தி இந்து — ஊர் வலம் 3

வாழையில் மண்ணில்லா விவசாயம்: இருமடங்கு மகசூல்

» கருத்தரங்கில் தகவல்

▪ கோவை

மண்ணில்லா துல்லிய பண்ணை மேம்பாடு எனும் முறையில் வாழையில், மண்விதை விவசாயத்தைவிட இருமடங்குக்கு மேலான மகசூலை தருகிறது என கருத்தரங்கில் தெரிவிக்கப்பட்டது.

வாழைப்பயிருக்குண்டான தேசிய துல்லிய பண்ணை கருத்தரங்கம், கோவை வேளாண்மைப் பல்கலைக் கழகத்தில் நடைபெற்றது.

தமிழ்நாடு வேளாண் பல்கலைக்கழக பொறியியல் விஞ்ஞானிகள், திருச்சியில் இயங்கும் இந்திய அரசு வாழை ஆராய்ச்சிநிலைய விஞ்ஞானிகள் பட்டமேற்படிப்பு ஆராய்ச்சி மாணவ- மாணவிகள் இக்கருத்தரங்கத்தில் வாழை மேம்பாட்டிற்கான பல்வேறு ஆராய்ச்சிக் கட்டுரைகளை சமர்ப்பித்தனர்.

கருத்தரங்கம் குறித்து, தமிழ்நாடு வேளாண்மை பல்கலைக்கழக துல்லிய பண்ணை மேம்பாட்டுத் திட்டம் முதன்மை ஆராய்ச்சியாளர் பேராசிரியர் ஐ.முத்துசாமி கூறியதாவது:

சம காலத்தில், விவசாய நிலங்களுக்கான பரப்பளவு குறைந்து வருகிறது. பல கட்டுமான விஷயங்களினால் மண் உள்ள நிலங்களில் விவசாயம் செய்வதற்கான வாய்ப்புகள் குறைந்து வருகின்றன. எனவே மண்ணில்லாமல் விவசாயம் செய்வது, மண்ணுக்கு பதிலாக மாடியில், மொட்டை மாடியில், அப்பார்ட்மெண்டில் காய்கறி உள்ளிட்ட விவசாயத்தை பெருக்குவதற்கான ஆராய்ச்சிகள் முடுக்கி விடப்பட்டுள்ளன. சிறு தொட்டிகள், பெட்டிகள், குழாய்கள் போன்றவற்றில் மண்விதை விவசாயத்திற்கு பதிலாக கோ கோ பீட், சைலக் ஸ்டோன், மணல், சிறு கற்கள் ஆகியவற்றை பயன்படுத்தி தக்காளி, மிளகாய் போன்ற தாவரங்களை பசுமைக்கூடாரத்தில் வளர்க்கிறோம். மண்ணில்லா துல்லிய பண்ணை மேம்பாடு எனும் இந்த முறை மண்விதை விவசாயத்தைவிட இருமடங்குக்கு மேலான மகசூலை தருகிறது.

இதில் விளைந்த உணவுப் பொருட்கள் தரமானதாகவும் இருக்கின்றன. இதற்கான ஆராய்ச்சி பல்கலையில் ஓர் ஆண்டாக நடந்து வருகிறது. நீள, நீளமான மண்ணில்லா வாய்க்கால்களில் ஜல்லிகள் போட்டு உணவுப்பயிர்களை விளைவித்து, இந்த விவசாய ஆராய்ச்சியை செய்து வருகிறோம். இதில் ஒரு பிரிவாக, வாழைக்கான கருத்தரங்கமாக இது நடைபெற்றுள்ளது. துல்லிய நீர், துல்லிய உரம், துல்லிய மண், துல்லிய களைக்கட்டுப்பாடு, துல்லிய பூச்சிக்கட்டுப்பாடு, துல்லிய நோய்க்கட்டுப்பாடு என அனைத்திலும் துல்லியமான பரிசோதனைகள் நிகழ்த்தப்படுகின்றன.

வழக்கமாக உள்ள சொட்டு நீர்ப் பாசனத்திலிருந்து மாறுபட்டு தனிநடவு முறை பற்றி ஆராய்ச்சிக் கட்டுரைகளும் விவாதங்களும் வந்துள்ளன. சாதாரண சொட்டு நீர்ப்பாசனத்தில் 10 லிட்டர் வரை கொடுத்து வந்த நீர்முறை தற்போது இதுவே, வெறும் 2 லிட்டர் நீர் தந்தால் போதுமானது என்கிற அளவுக்கு இந்த ஆராய்ச்சிகள் சென்று கொண்டிருக்கின்றன. இந்த ஆராய்ச்சிகள் முடிவுக்கு வந்த பயன்பாட்டுக்கு வரும்போது கிராமப்புற விவசாயிகள் மட்டுமல்ல; கிராமத்திலிருந்து நகரத்திற்கு வந்துவிட்டவர்களு நகரத்திலேயே வசி நகரவாசிகளும் பயன்பெறுவார்கள்.

இவ்வாறு அவர் கெ...

மண்ணில்லா விவசாயத்தில் விளைந்த வாழைப்பயிர்

Biodegradable Waste as Manure for Kitchen Graden and Gardening

Composting is a natural process, not an exact science. Therefore, a lot of flexibility exists in developing a composting system.

The backyard compost pile is the ideal way to reuse most of the garden and kitchen waste and get benefits galore. Composting is essentially a way of speeding up the natural process of decomposition by which organic materials are broken down and their components returned to the soil. The decaying process happens naturally but slowly. The proximity, moisture, and air circulation of a compost pile encourages this process. Composting converts plant and other organic wastes into a loose, peatlike humus that provides nutrients to growing plants and increases the soil's ability to control water.

Compost is best used as a soil conditioner in the vegetable garden and when planting ornamental plants. Broadcast compost one to two inches deep over the planting area and incorporate it into the top six to eight inches of soil. (www.aggie-horticulture.tamu.edu, 2009)

Composting is a biological decomposition process where microorganisms convert raw organic materials into relatively stable humus-like material. During decomposition, microorganisms assimilate complex organic substances. An adequate composting process kills pathogens and stabilizes compost organic carbon before the material is land-applie (http://www.imok.ufl.edu/vegetable_hort /compost/utilization/) Compost is nature's one stop fertilizer shop. The true benefit of compost however, lies in the long term effect on the soil and relates to its content of living organic matter. Compost is the aerobically derived remnants of organic materials, and to simplify that rather grand definition, it is what you get when you combine plant and animal residue with oxygen, water and nitrogen.

Composting is one of the options for treatment of solid waste. In composting process the organic matter breaks down under bacterial action resulting in the formation of humus like material called compost. The value of compost as manure depends on the quantity and quality of feed materials poured into the compost pit.

Recycling organic materials in the home landscape makes sense, not only it helps to save our valuable landfill space but also it will actually improve our soils and growing conditions in our home environment. The utilization of the organic matter being continuously produced by most households every day in the form of leaves, grass clippings kitchen waste and the like, without having to pay to have it carted away to land fill, is going to have a positive impact on the health of our environment as a whole (http://www.bettervegetablegardening.com/how-to-compost.html).

The recycling of compost to land is considered as a way of maintaining or restoring the quality of soils, mainly because of the fertilizing or improving properties of the organic matter contained in them. Furthermore, it may contribute to the carbon sequestration and may partially replace peat and fertilizers (Smith *et al*, 2001).

In rural areas, agriculture, animal husbandry and related activities generate large quantities of organic wastes. Considerable quantities of tender twigs, dry leaves, grass, weeds, etc., are also available. These organic wastes contain organic carbon and plant nutrients in appreciable amounts. Organic wastes are safer and more useful when composted and applied, rather than when they are directly applied. The process of composting organic wastes using earthworms is called 'vermicomposting' (http://www.home.howstuffworks.com/composting-for-a-vegetable-garden.htm).

Usable organic wastes that are gathered in our kitchen's today are always made available but also needs constant disposal, this is where vermicomposting can help in. It is the fastest way in converting organic waste into a quality-made natural fertilizer (produced for about 4 to 6 weeks). Vermicomposting is very environment friendly. Bear in mind that using earthworms for composting is very beneficial, as they only feed on organic materials that are ecological. And to some extent, this process also helps in minimizing garbage disposals and soil will be immunized with a lot of micronutrients; and the amount of helpful soils microbes will also increase (Vikram, 2011).

Organic wastes can be broken down and fragmented rapidly by the earth worms, which has a potentially high economic value and also act as soil conditioner for plant growth. Vermicompost supplies a suitable mineral balance, improves nutrient availability and could act as complex-fertilizer granules. Vermicomposting also leads to decrease the environmental problems arising from their disposal, without needing in many cases to complete the process. It should be realized that vermicomposting can be a useful cottage industry for the underprivileged and the economically weak as it can provide them with a supplementary income (www.agropedialabs.iitk.ac.in).

A good portion of this biomass is nitrogen fixing, taking nitrogen out of the air, and converting it to available forms. There are of course advantages the other way involving feasibility and economics, but as far as the finished product goes, vermicompost is your best dirt (www.Composting-vs-vermicomposting-Dirt-Maker-Article.htm).

At each household, two manure pits should be dug. When one pit is closed the other one is used. In 5 to 6 months time, the refuse is in converted into manure. This is the most effective and simplest method of disposal of waste for the rural households. Manure from composting gives better yield to farmers and it is also environment friendly. Bio degradable waste can be composted either in compost pit or in a vermicompost pit. Vermicomposting uses earthworms to turn organic wastes into very high quality compost. Many gardeners use vermicomposting systems for all their garden and kitchen wastes, many more use both types of composting. This is probably the best way of composting the wastes is reducing the garbage and providing own organic soil for pot plants and container gardens on balconies and roofs to grow their own healthy food (www.journeytoforever.org).

Vermicompost offered by us is prepared using earth worm feeding on biological waste material; plant residues. Besides this, the Vermicompost increases earthworm populations on mulching and improves soil quality while being harmless to plants. Odorless, clean and organic material, the Vermicompost consumes low energy and is recycled biological product (www.srigaythribiotec.com).

Vermicompost contains a high level of humus. Humus is a key to being a successful gardener or farmer. Humus helps the soil hold nutrients, air, and moisture.

Humus also helps keep your plants healthy by resisting and breaking down bad intrusions such as pathogens and harmful bacteria (www.compostteasystems.com)

Vermicompost is an ecofriendly natural fertilizer prepared from biodegradable wastes and is free from chemical inputs. It does not have any adverse effect on soil, plant and environment. It promotes better root growth and nutrient absorption (www.aaqua.persistent.co.in).

Vermicompost is considered as an excellent product, since it is homogenous, has desirable aesthetics, has reduced levels of contaminants and tends to hold more nutrients over a longer period without impacting the environment. Rapid urbanization resulted in an ever-increasing accumulation of urban solid waste. In India, domestic waste is mostly of organic nature and contributes 70- 80% to the total solid urban waste. However, it can be used as a potential resource for transformation from expensive disposal problem to stabilized vermicompost production for sustainable land restoration practices (Singh, 2008).

Vermicomposting is a modified and specialised method of composting -the process uses earthworms to eat and digest farm wastes and turn out high quality compost in two months or less. Vermicompost can also be used to make compost tea. Vermicompost tea is useful as a prophylactic against pests and diseases, for pest repelling and as a foliar spray. A by-product of vermicomposting called vermiwash (which can be collected if there is a tap at the base of the vermicompost tank) also serves the same purpose (www.satavic.org).

Vermicomposting is less labor-intensive then traditional plant composting because the worms do almost all of the work and adding worms also improves soil structure. Due to the slime produced by worm bodies, nutrients stay in soil even after a good rain. It acts as a plant tonic and help to reduce many plant diseases.

Vermicomposting has applications that can reduce global warming. Using worms for composting has been shown to reduce the methane and nitrous oxide levels in landfills, which are worse for the environment than carbon dioxide gas. Worms studied by Dr. Rajiv Sinha in India and Australia have been shown to remove heavy metals from soil, which he termed vermiremediation. Worm castings hold beneficial microorganisms longer (www.2273.pdf).

Vermicomposting is best done in a series of bins. The easiest way is to build a multi-tiered structure, at least three bins high, made out of material that is compatible with the environment where the bins will be stored. The bottom bin should be lined with chicken wire, a layer of bedding such as leaves and shredded paper, a layer of worms and a layer of organic waste. When it is full the worms will migrate up to the next tier, which will be filled with organic waste. When the migration occurs, the bottom bin is ready to use, just make sure all the worms are out (Pollution Control Department, 2009)

Vermicompost has many good qualities and its application to soil has many benefits. Vermicompost is rich in organic carbon, which plays a key role in soil fertility, and contains all essential plant nutrients in appropriate proportions. Thus it is a complete and balanced plant food. It also contains biochemical substances that promote plant growth and fight plant diseases.

The use of vermicompost not only increases the rate of water intake into soil but also improves the soil's ability to hold water. Its use enhances colour, smell, taste, flavour and keeping quality of flowers, fruits, vegetables and foodgrains and helps the growers to sell their products at a higher price in the market (Pollution Control Department, 2009).

The making of vermicompost provides livelihood support to the unemployed in rural areas. Enterprising villagers can take up commercial production of vermicompost and earn good profits by selling the compost in the market, which is constantly growing.