



UNIVERSITY OF AGRICULTURAL SCIENCES
College of Agriculture, Gandhi Krishi Vigyan Kendra, Bengaluru -
560065, Karnataka, INDIA

DEPARTMENT OF AGRICULTURAL EXTENSION

SEMINAR REPORT ON

Waste to wealth

Converting burden into blessing

SUBMITTED TO
SEMINAR TEACHER

Dept. of Agricultural Extension
GKVK, UAS(B)
Bengaluru-560065

SUBMITTED BY
KAVYASHREE C

PALB 8027, III Ph.D.
Dept. of Agril. Extension
GKVK, UAS(B)

CONTENTS

SL. NO.	PARTICULARS	PAGE NO.
1.	Introduction	3- 5
2.	Objectives of seminar	5
3.	Agricultural waste and its different form	6-7
4.	Agricultural waste management system	7-14
5.	Food loss and waste	15- 26
6.	State of APMCs in India	26- 30
7.	Case studies	31
8.	Conclusion	32
9.	Discussion	33- 35
10.	References	36
11.	Synopsis	37-38

WASTE TO WEALTH: CONVERTING BURDEN INTO BLESSING

I. INTRODUCTION

“There are few things certain in life – one is death, second is change and the other is waste.” No one can stop these things to take place in our lives. But with better management we can prepare ourselves. Most businesses define waste as “anything that does not create value” (BSR, 2010). In a common man’s eye anything that is unwanted or not useful is garbage or waste. However scientifically speaking there is no waste as such in the world. Almost all the components of solid waste have some potential if it is converted or treated in a scientific manner. Hence we can define solid waste as “Organic or inorganic waste materials produced out of household or commercial activities, that have lost their value in the eyes of the first owner but which may be of great value to somebody else.”

There may be different types of waste such as Domestic waste, Factory waste, Waste from oil factory, E-waste, Construction waste, Agricultural waste, Food processing waste, Bio-medical waste, Nuclear waste, Slaughter house waste etc. We can classify waste as follows:

- Solid waste- vegetable waste, kitchen waste, household waste etc.
 - E-waste- discarded electronic devices such as computer, TV, music systems etc.
 - Liquid waste- water used for different industries, tanneries, distilleries, thermal power plants
 - Plastic waste- plastic bags, bottles, bucket, etc.
 - Metal waste- unused metal sheet, metal scraps etc.
 - Nuclear waste- unused materials from nuclear power plants
- Further we can group all these types of waste into wet waste (Biodegradable) and dry waste (Non-Biodegradable).

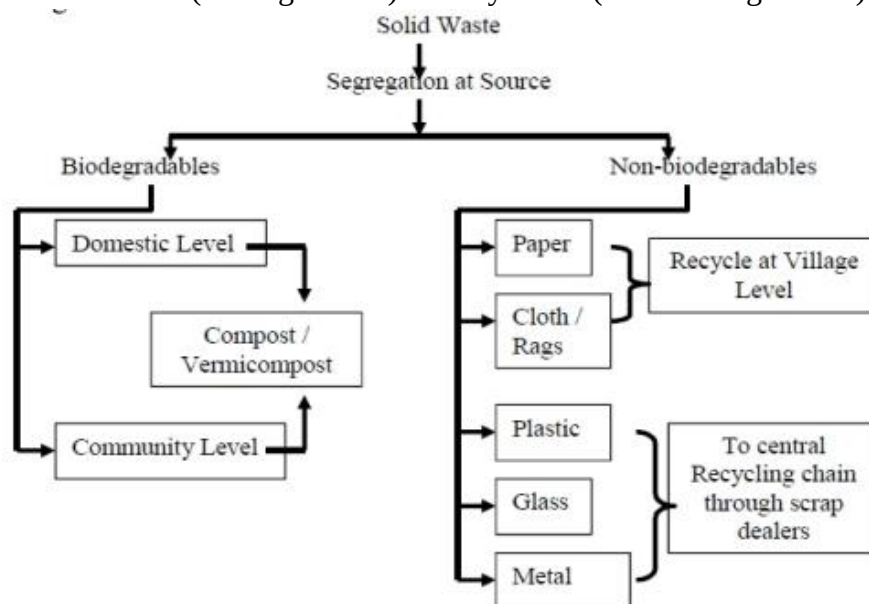


Figure 1- An Ideal Solid Waste Management at a glance

Source: waste management initiatives in India for human wellbeing, 2015.

India produces 277 million tonnes of municipal solid waste every year, according to a 2016 estimate. That's more than 80% of the 334 million tonnes of waste generated across South Asia and about 13% of the global waste generated every.

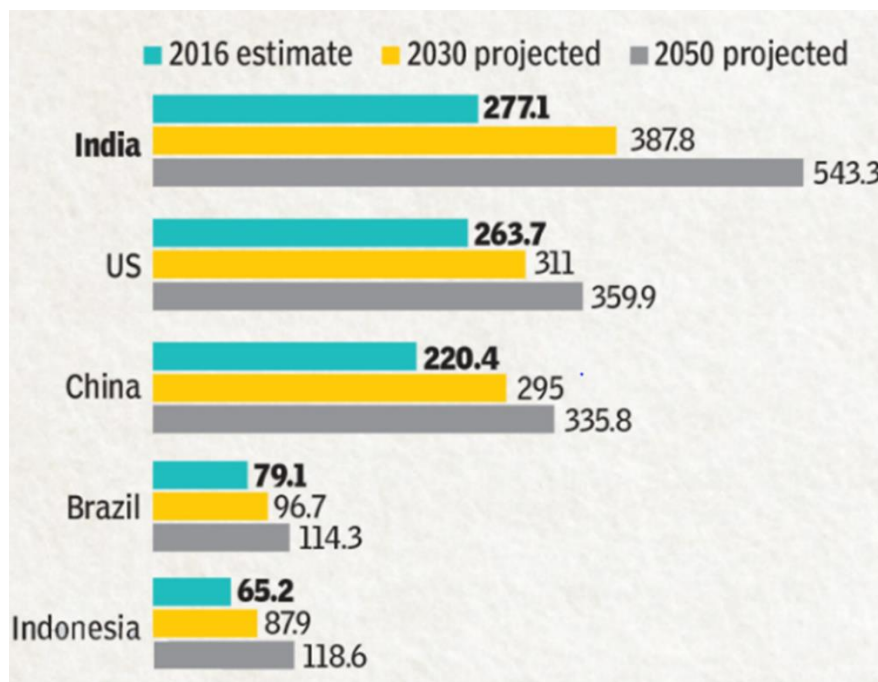


Figure 2: Top 5 municipal solid waste generators annually (in million tons)

Source: Times news, Mar 4, 2020,

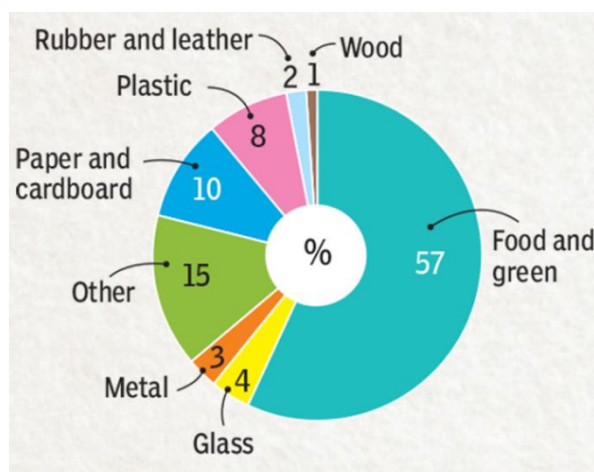


figure3: Composition of waste in south Asia

Source: Times news, Mar 4, 2020,

In low and middle-income countries, food and green waste comprise more than 50% of waste. In the South Asia region specifically, about 57% of all municipal solid waste is made up of food waste. In high income countries, the amount of organic waste is comparable in absolute terms, but because of larger amounts of package waste and other non- organic waste,

the fraction of food waste is about 32%. Improper disposal of food waste increases CO₂ emissions.

What can be called waste?

Waste (or **wastes**) are unwanted or unusable materials. Waste is any substance which is discarded after primary use, or is worthless, defective and of no use.

Example of waste:

- municipal solid waste
- household trash/refuse
- hazardous waste,
- wastewater such as sewage,
- which contains bodily wastes
- feces and urine and surface runoff
- radioactive waste, and others

Why to manage waste??

Between 2000 and 2025 the waste composition of Indian garbage will undergo the following changes

- ☐ Organic Waste will go up from 40 percent to 60 percent
- ☐ Plastic will rise from 4% to 6%
- ☐ Metal will escalate from 1% to 4%
- ☐ Glass will increase from 2% to 3%
- ☐ Paper will climb from 5% to 15%
- 998 million tonnes (MT) of agricultural waste - worldwide
- ministry of new and renewable energy: waste can generate more than 18,000 MW of power every year apart from generating green fertilizer
- 350 MT of agricultural waste- India

Objectives of the seminar

- ☐ To know the concept of Agro waste and its forms
- ☐ To study on the food loss and waste and its management
- ☐ Agricultural waste in APMCs and its management
- ☐ To review the case studies on converting Agricultural waste to wealth.

Waste to Wealth

“Waste to wealth” is an artificial construct-the waste is only in the eye of the beholder that imagines waste-when actually the all farming output has inherent value. There is a need to end the perception of waste from farms and instead to view every unit of output as an opportunity to generate value.

- To address the environmental problem by changing the traditional view of waste as an end product to be disposed of.

- Raising of environmental awareness and turn it into potential value has seen as a big dispute for the world.
- Innovative waste conversion processes can create micro entrepreneurship fortuity on an enormous scale.

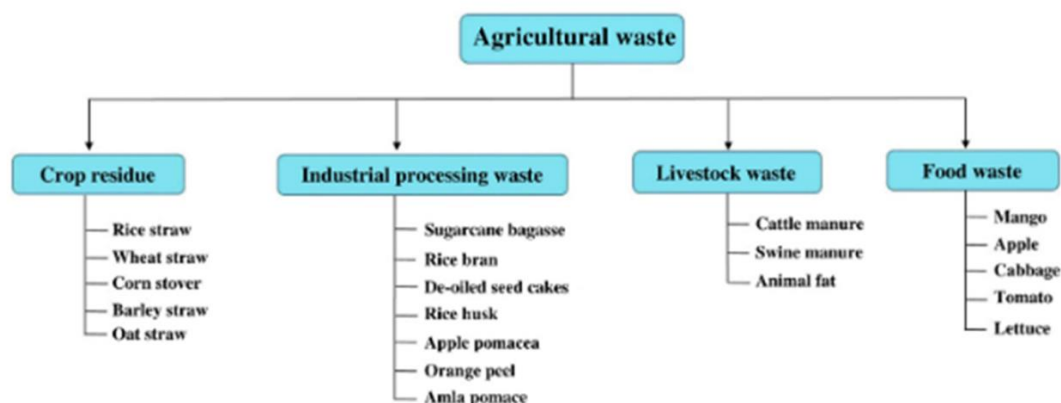


Figure 4: classification of Agricultural waste

Agro-waste are non-product outputs of production and processing of Agricultural products contain material that can benefit man whose economic values are less than the cost of collection, transportation, and processing for beneficial use. Agricultural wastes can be in the form of solid, liquid or slurries depending on the nature of agricultural activities.

Their composition will depend on the system and type of agricultural activities and they can be in the form of liquids, slurries, or solids Agricultural waste otherwise called agro-waste is comprised of animal waste (manure, animal carcasses), food processing waste (only 20% of maize is canned and 80% is waste), crop waste (corn stalks, sugarcane bagasse, drops and culls from fruits and vegetables, pruning's) and hazardous and toxic agricultural waste (pesticides, insecticides and herbicides, etc).

Agricultural waste generation:

Wastes from the irrational application of intensive farming methods and the abuse of chemicals used in cultivation. Remarkably affecting rural environment in particular and the global environmental in general.

From Cultivation activities

- Creation of hazardous wastes (pesticides fungicides)
- Plant Protection Department (PPD) :1.8% of the chemicals remain in their packaging- food poisoning, unsafe food hygiene
- These waste have the potential to cause unpredictable environmental consequences such as food poisoning, unsafe food hygiene and contaminated farmland due to their potentially lasting and toxic chemicals

From Aquaculture

- Led to an increase in the use of feeds for improved production
- In a properly managed farm, approx. 30% of the feed used will become solid waste

From livestock production

- Include solid waste such as manure and organic materials in the slaughterhouse.
- Air pollutants such as H_2S and CH_4 ; and odours.
- Generate greenhouse gases and cause negative effects on the fertility of the soil and causing water pollution.

II. An Agricultural Waste Management System (AWMS)

Planned system in which all necessary components are installed and managed to control and use by-products of agricultural production in a manner that sustains or enhances the quality of air, water, soil, plant, and animal resources

Why AWMS?

- An unhandled waste can pollute surface and groundwater and contribute to air pollution.
- Can contribute in a significant way to farm operations.
- Helps to maintain a healthy environment for farm animals and can reduce the need for commercial fertilizers.

Open dumping accounts for about 33% of waste globally. It's especially common in south Asia where almost all cities in the region practice some open dumping, according to the report. In India, 77% of waste is disposed of in open dumps, 18% is composted and just 5 % is recycled.

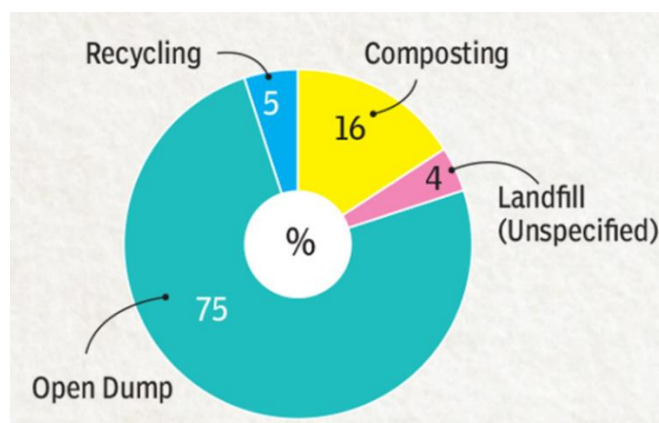


Figure 5: Waste disposal in south Asia

Source: Times news, Mar 4, 2020,

Waste minimization efficiency is stated to be better achieved applying 3Rs in a hierarchical order- Reduce, Reuse and Recycle



The aim of the waste minimizing hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste

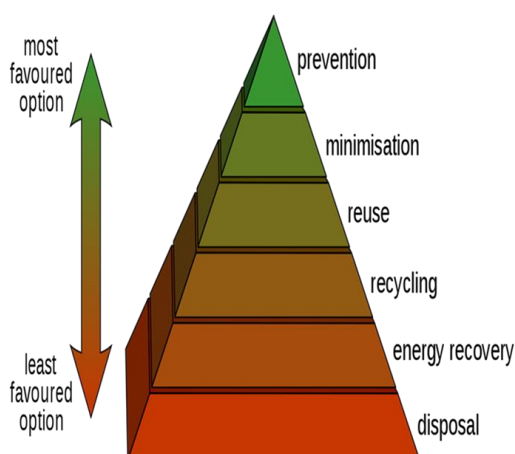


Figure6: The 3Rs Hierarchy

Management of agricultural waste can be possible by applying the following functions:

Production, collection, storage, treatment, transfer and utilization

1. Production encompasses the function of the amount and nature of agricultural waste generated by an agricultural enterprise.
2. Collection refers the initial capture and gathering of the waste from the point of origin or deposition to a collection point.
3. Storage refers the temporary containment of the waste that gives the manager control over the scheduling and timing of the system functions.
4. Treatment is conducted to reduce the pollution potential of the waste, including physical, biological, and chemical treatment.
5. Transfer function involves the movement and transportation of the waste from the collection point to the storage facility, to the treatment facility, and to the utilization site.
6. Utilization includes recycling reclaimable agro waste and reviving nonerasable waste products into the environment.

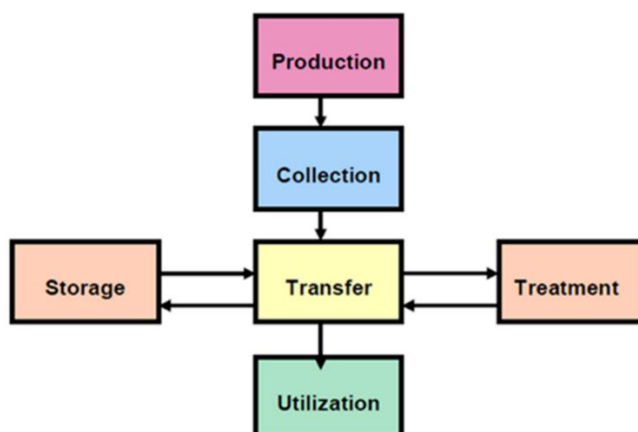


Figure7: basic functions in waste management

❑ POULTRY WASTE MANAGEMENT SYSTEMS

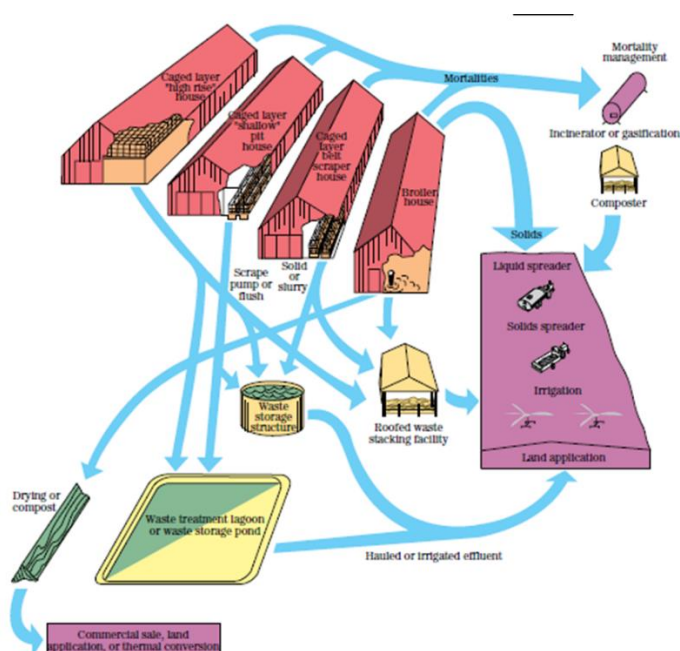


Figure 8: poultry Waste handling options

Source: 210–VI–AWMFH, Amend. 47, December 2011

Production: waste generates- manure and dead poultry. litter, wash-flush water, and wasted feed.

Collection: manure that drops below the cage collects in **deep stacks**. Removed using either a **shallow pit located beneath the cages** for flushing or scraping or belt scrapers positioned directly beneath the cages.

Transfer: based on TS content of the waste. Liquid waste can be transferred in pipes, gutters, or tank wagons, and dried litter can be scraped, loaded, and hauled as a solid.

Storage: manure from layer kept reasonably dry: stored in a roofed facility. If it is wet, it should be stored in a structural tank or an earthen storage pond

Treatment: Liquid manure placed into an anaerobic digester to produce methane gas.

Utilization: Poultry waste are directly applied to land. Used for the production of methane gas, thermally converted as a fuel source. reused as bedding.

❑ SIMPLE- ZERO WASTE AGRICULTURE SYSTEM

Zero waste agriculture is a type of sustainable agriculture which optimizes use of the five natural kingdoms, i.e. plants, animals, bacteria, fungi and algae, to produce biodiverse-food, energy and nutrients in a synergistic integrated cycle of profit making processes where the waste of each process becomes the feedstock for another process.

Zero Waste is a philosophy that encourages the redesign of resource life cycles so that all products are reused. The goal is for no trash to be sent to landfills, incinerators, or the ocean.

The process recommended is one similar to the way that resources are reused in nature

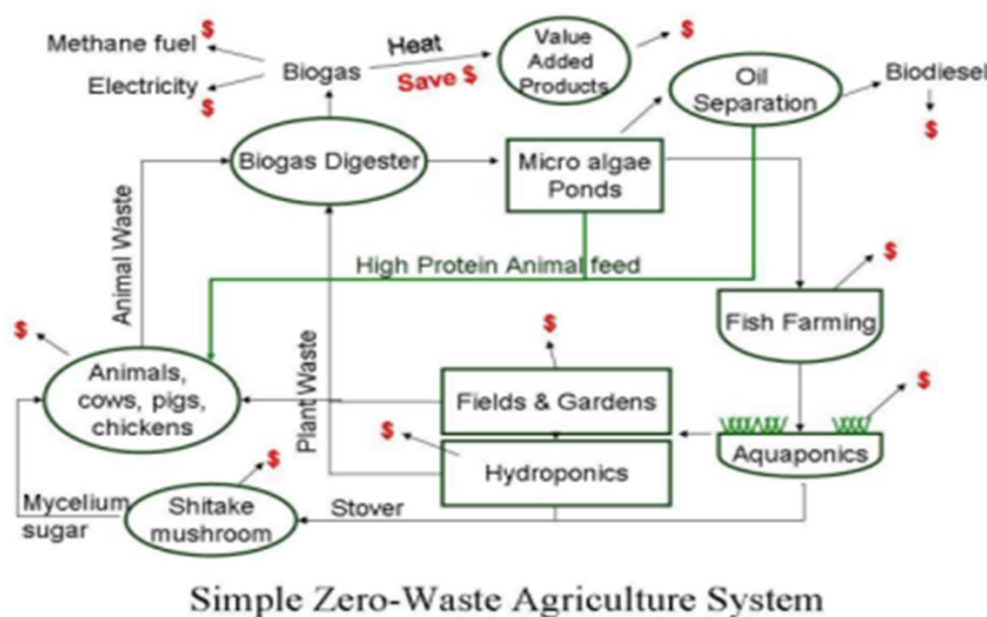


Figure 9: Zero waste agriculture system

TREATMENT PROCESS

- 1. Composting:** Composting is a method in which organic matter present in agricultural waste is decomposed by aerobically/anaerobically through a biochemical process and converted into humus.

Three step operation:

1. Preparation of agricultural waste
2. Decomposition

3. Product preparation & marketing

2. **Recycling:** Process to change waste into new products

- Prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage.
- Reduce air pollution from incineration and water pollution from land filling
- Lower greenhouse gas emissions
- Key component of modern waste reduction and is the third component of the "Reduce, Reuse, Recycle"



Figure 10: Management of Recycling agro-wastes

- 3. Incineration:** Incineration is a modern and most hygienic method of disposal of dry refuse. It is widely used in western countries, like, USA, UK, etc. and in INDIA this it is gradually popular especially for large cities. The method consists of burning the dry refuse in incinerator.

IMPACT ON ENVIRONMENT

waste from cultivation activities

- After using pesticides, most of the bottles and packages holding these pesticides are thrown into fields or ponds.
- According to an estimate made by the Plant Protection Department (PPD), about 1.8% of the chemicals remain in their packaging.
- These wastes have the potential to cause unpredictable environmental consequences such as food poisoning, unsafe food hygiene and contaminated farmland due to their potentially lasting and toxic chemicals.
- Modern agricultural practices require the use of large amount of fertilizers, pesticides and other soil additives.
- Some of these along with waste are washed off lands through irrigation, rainfall, drainage and leaching into the rivers and streams where they can seriously disturb the aquatic ecosystem

- Depletion of dissolved oxygen caused by phosphate induced algal growth leads to death of fish and other aquatic biota. In presence of phosphates, nitrates too bring about an exaggerate growth of vegetation.

Nitrate pollution

- accumulation of nitrates in water
- drunk by cattle or humans
- combines with the hemoglobin to form methaemoglobin, which interferes with the oxygen-carrying capacity of the blood, producing a serious disease known as BLUE BABY SYNDROME

crop residues

- Give shelter to various pathogens, fungi, bacteria which causes infectious diseases
- If not properly managed they can catch fire and damage residential area and cause air pollution
- Decrease the soil productivity by inhibiting the microbial activity

livestock waste

- Air pollution includes odours emerging from cages resulting from the digestion process of livestock wastes
- untreated and non-reusable waste source can generate greenhouse gases while also having negative effects on the fertility of the soil and causing water pollution.
- germs and substances can spread diseases to humans and cause many negative effects on the environment.

SOME OF THE AGRICULTURAL WASTE WHICH CAN BE CONVERTED INTO WEALTH

1. BIOCHAR from Agricultural Waste Material

Developer: Division of Agricultural Engineering

Biochar is a carbon rich material produced by incomplete combustion of biological materials in the absence of oxygen or with limited amount of oxygen. Agricultural waste and weed biomass can also be used to produce biochar. It is reported by the research scholar that biochar stores carbon in the soil for hundreds to thousands of years and thus, the level of greenhouse gases like CO₂ and CH₄ can be reduced significantly from the atmosphere. In order to make biochar from biomass (*Ageratum conyzoides*, *Lantana camera*, *Gynurasp.*, *Setaria sp.*, *Avenafatua*, Maize stalk and Pine needle) material continuous biochar production machine or modified portable metallic kiln was used.

Features:

- ❖ Biochar are produced from the agricultural waste (maize stalk, pine needle) and weed by using pyrolysis method.
- ❖ Agricultural biomass can be converted into biochar within two hours
- ❖ Improve soil fertility and crop yield.
- ❖ Increased fertilizer use efficiency.
- ❖ Improve water retention, aeration and soil tilth.
- ❖ Higher cation exchange capacity and less nutrient runoff.
- ❖ Application of biochar improved soil pH by 0.26 to 0.30 units within two months

2. Preparation of Handmade Paper from Jute Waste

Developer: S N Chattopadhyay, ICAR-NINFET, Kolkata

Development of a technology of making handmade paper from jute fibre especially jute residue will open up a new area where substantial quantity of thrown away jute waste can be used for making handmade paper of good commercial value. A new avenue of utilization of jute wastes is opened up, which would otherwise be burnt by farmers or thrown away creating disposal problem.

Features:

- ❖ handmade paper from jute fiber made from jute residue of thrown away jute waste
- ❖ Most of the properties are same as normal handmade paper, but have diversified uses of it such as in Files, Folders, Greetings Card, Shopping bags, Visiting Card, Posters, writing grade paper, paper boards, file covers, greeting card etc.
- ❖ Handmade paper products conserve resources and generate less pollution.
- ❖ Producing handmade paper uses much less total energy than producing virgin paper

3. Soil less Planting Media using Sugar Industry Residue

Developer: F. Pushparaj Anjelo and Shinoj Subramannian, KVK, Ernakulam

The press mud, a residual product in Sugar Industry that is available abundantly at the rate of 2 percent of the cane crushed, has physical properties similar to soil and provides good anchorage to plant roots. The press mud once composted provides essential nutrients to plants. Hence a soil less planting media is formulated using composted and powdered press mud. This soil less planting media comprises of 50 per cent composted press mud, 25 per cent coir pith and 25 percent powdered dry cow dung. Acidity of the mixture is neutralized by adding dolomite and further enriched with Neem cake and biocontrol agents. The soil less planting media is regularly produced by the ICAR ICAR-Krishi Vigyan Kendra (Ernakulam), packed, branded and marketed in 10 kg bags at ICAR-CMFRI sales counter.

Features

- ❖ The press mud, a residual product in Sugar Industry that is available abundantly at the **rate of 2 percent of the cane** crushed
- ❖ Better moisture retention and less frequent irrigation requirement.
- ❖ Better root anchorage and reduced plant lodging.
- ❖ Enhanced nutrient value and no need of basal manure dose.
- ❖ Can be re-used for more than 3 plantings.
- ❖ Commercial scale planting media production from press mud is a promising enterprise for youngsters while ensuring nutritionally rich planting solution to urban farmers

4. Foliar Spray from Fish Waste

Developer: A.A. Zynudheen and Binsi Pillai, ICAR-CIFT, Kochi

Foliar spray is a fish waste-derived liquid product that contains peptides and amino acids. The product is prepared by hydrolysing the protein in fish waste utilizing acid or enzyme. An alternate method is by fermentation using bacteria.

Features:

- ❖ Stable product under room temperature.
- ❖ Can be directly applied after dilution on a wide variety of plants.
- ❖ It can be fortified with the deficient components if required

- ❖ Enhances the productivity of the plants immediately and possess pest repellent properties.
- ❖ High demand for the product and is gainful employment with a high return of margin.

5. Eco-friendly and sustainable wastewater treatment for safe reuse in agriculture

Developer: Ravinder Kaur, Water Technology Centre, ICAR-IARI, New Delhi

It is a novel, environment-friendly and economically remunerative sewage treatment technology based on the selected hyper accumulative emergent wetland plants and the native microorganism interactions. This technology is taken under the Government of India's flagship Swachhhta Action Program (SAP). It has also been selected as a Good practice example under the "Safe Use of Wastewater in Agriculture" initiative of the United Nations and as an innovation in Indian Agriculture by the National Skills Foundation of India. The technology bagged the prestigious civilian SKOCH (Platinum) Award under the Transformational Innovation Category in 2017.

Features:

- ❖ The technology has zero energy, zero-chemical and zero-skilled man power demand and it take care of multi-pollutant and pathogen loads, along with salt – remediation
- ❖ Compared to conventional wastewater treatment technologies it requires about **80-85% lower capital expenditure** demand, and extremely low.
- ❖ the technology is at least 1500 times more sustainable and causes at least 33 times lesser environmental stress.
- ❖ This technology has the capacity to add a good value to land (metal & pathogen free) reuse in aquaculture/ agriculture

6. Biomass based Decentralized Electricity Generation System Biomass

Developer: AK Dubey, Sandip Gangil, CR Mehta and KC Pandey, ICAR-CIAE, Bhopal

The Biomaterial is powdered and briquetted before feeding to downdraft gasifiers. The gasifier generates the producer gas which after conditioning is sent to gas engine for generation of electricity.

Features:

- ❖ Economic gain to farmers producing crop residues.
- ❖ Development of **Agro residues market** giving opportunity for traders and labours. Leading to employment generation.
- ❖ From 1.5 kg biomass 1 unit of electricity can be produced and the cost of electricity is nearly 7-8 Rs per kWh

III. FOOD LOSS AND WASTE

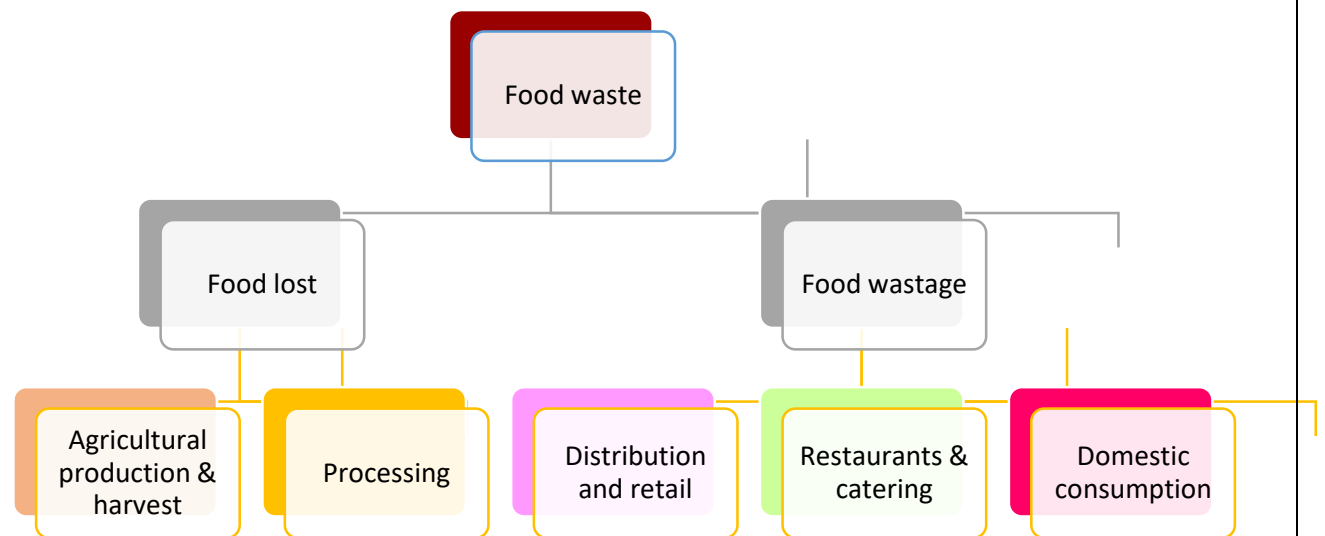


Figure 11: Broad classification of food waste

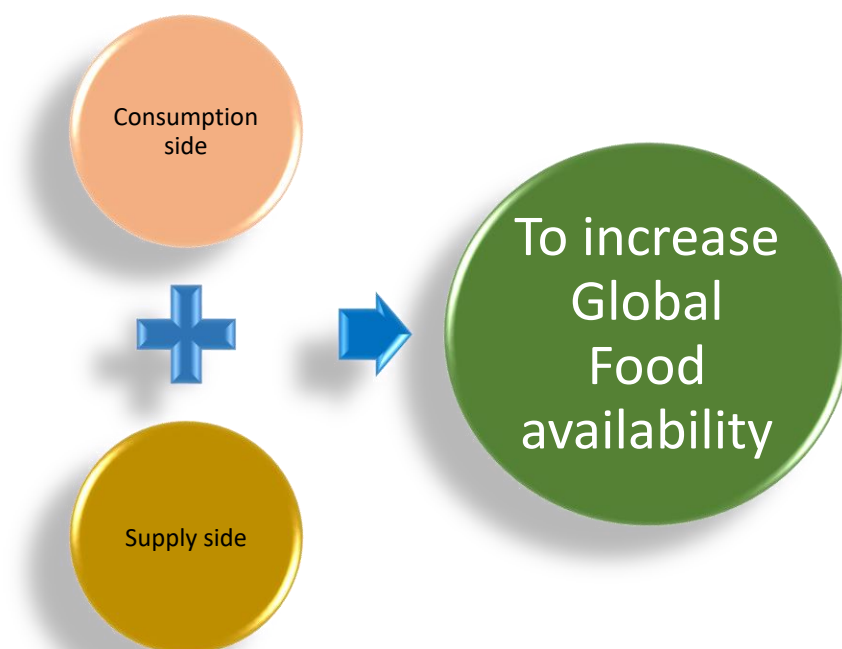
According to the United Nations Development Programme, up to 40% of the food produced in India is wasted. About 21 million tonnes of wheat are wasted in India and 50% of all food across the world meets the same fate and never reaches the needy. In fact, according to the agriculture ministry, INR 50,000 crores worth of food produced is wasted every year in the country.

Why is food wastage a problem?

- 1) 25% of fresh water used to produce food is ultimately wasted, even as millions of people still don't have access to drinking water.
- 2) The number of hungry people in India has increased by 65 million more than the population of France. According to a survey by Bhook (an organization working towards reducing hunger) in 2013, 20 crore Indians sleep hungry on any given night.
- 3) Acres of land are deforested to grow food. Approximately 45% of India's land is degraded primarily due to deforestation, unsustainable agricultural practices, and excessive groundwater extraction to meet the food demand.
- 4) 300 million barrels of oil are used to produce food that is ultimately wasted.

The Waste Resources Action Programme (WRAP) offers a definition of food waste, distinguishing between

- a) Avoidable
- b) Possibly avoidable
- c) Unavoidable



1. Consumption side: Reduce food waste, eat what we can, shifting diet and reduce loss.

2. Supply side: Increase production, reduce yield gap, sustainable intensive cultivation etc.

Table 1: Total food loss in different regions of the world (million tonnes)

Year	Africa	Americas	Asia	Australia & New Zealand	Europe	Oceania	World
2000	26.70	75.72	81.14	0.25	18.60	0.28	202.44
2001	27.77	42.96	83.68	0.24	17.90	0.28	172.59
2002	29.40	22.32	86.24	0.23	16.03	0.26	154.24
2003	31.33	20.94	87.44	0.24	16.52	0.28	156.51
2004	32.96	22.33	87.64	0.24	17.76	0.28	160.96
2005	33.58	20.46	89.83	0.24	18.43	0.28	162.57
2006	35.62	22.27	91.55	0.23	16.86	0.27	166.57
2007	35.12	29.40	99.16	0.24	17.92	0.28	181.87
2008	36.98	62.01	102.63	0.25	17.35	0.29	219.27
2009	36.79	64.92	102.91	0.25	18.11	0.29	223.03
2010	40.69	71.51	108.45	0.25	16.60	0.30	237.54
2011	44.28	154.41	119.22	0.25	18.27	0.30	336.49
2012	44.89	73.76	112.99	0.28	17.86	0.34	249.83
2013	48.36	76.51	117.49	0.26	18.23	0.32	260.90

Source: data from FAO.

In order to estimate the total food loss across different regions of the world, the data was collected from FAO stat. The data was collected from the year 2000 to 2013. It is evident from the Table 1 that, the total food loss in world during the year 2013 was found to be 260.90 million tonnes. Roughly one third of the edible parts of food produced for human consumption gets lost or wasted globally, which is about 260.90 million tonne per year (2013). Food is wasted throughout the stages of food supply chain (FSC). In medium and high income countries food is wasted to a greater extent meaning that food is thrown away even if it is suitable for human consumption.

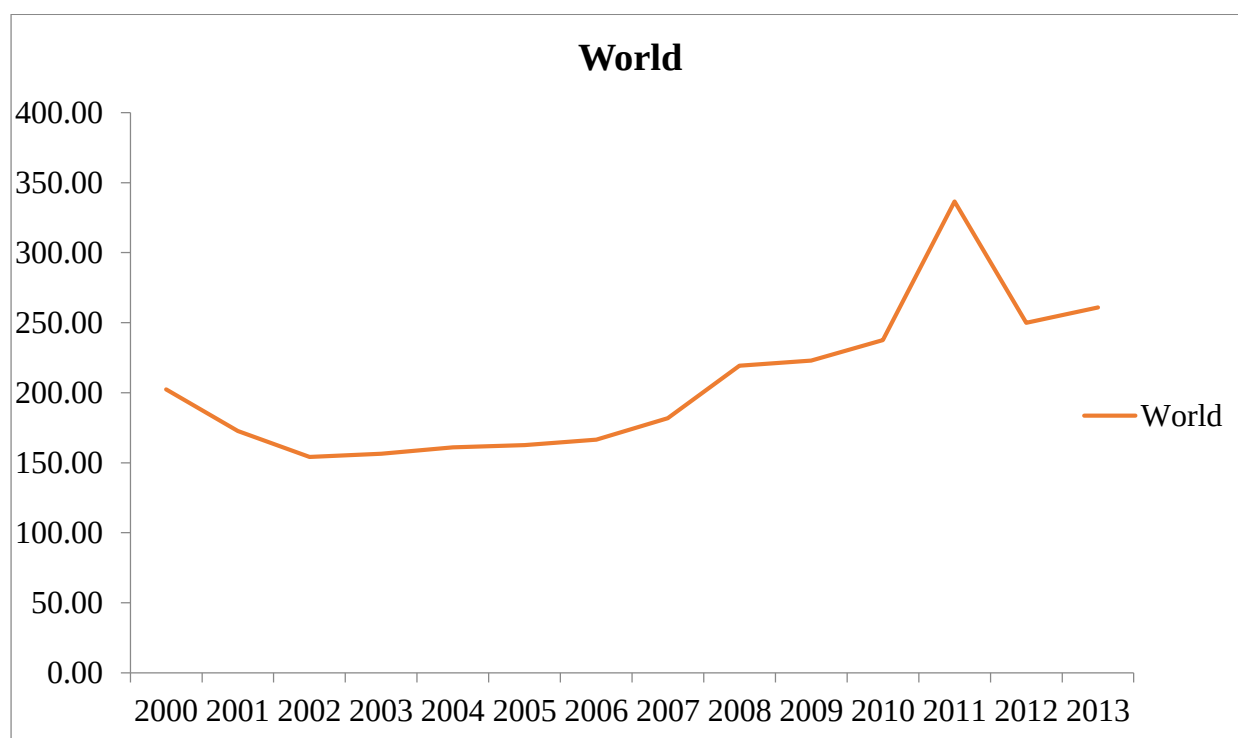


Fig. 12: Total food loss in world

Source: data from FAO.

Table 2: Estimated food loss and waste at each stage of food supply chain of Asian region (per cent)

Crops	Production stage	Post harvest handling and storage stage	Processing and packaging stage	Retailing stage	Consumption stage
Cereals	6	7	3.5	2	3
Roots & tubers	6	19	10	11	3
Oilseeds & pulses	7	12	8	2	1
Fruits & Vegetables	15	9	25	10	7
Meat	5.1	0.3	5	7	4
Fish & Seafood	8.2	6	9	15	2
Milk	3.5	6	2	10	1

It is evident from Table 2 that, about during the agricultural production about six per cent of cereals are lost. The loss during agricultural production may be because of the factors like lack of proper maintenance of the crops, pest and disease attack, lack of efficient use of resources.

The extent of food loss during harvest, post-harvest and storage operations of Asian region is shown in table 2, which is more loss is seen in cereals, roots & tubers and oilseeds & pulses, this is due to lack of proper storage, transportation and infrastructure facilities in developing countries. The loss during harvest operation is more because of inefficient harvesting measures.

Food loss during the processing and packaging stage are presented in Table 2. The extent of food loss is also high in fruits ie,. About 25 percent. This is due to the fact that, developing counties lack adequate processing and packaging facilities.

The food loss during retailing stage is also indicated, more percent loss can be seen in meat, fish & seafood and milk products at this stage.

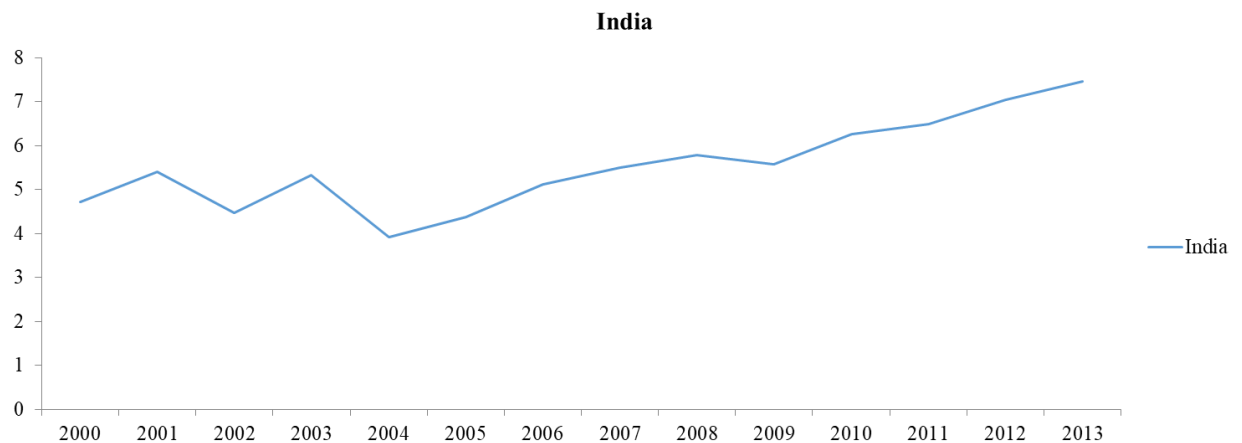


Fig. 13: Total food loss in India from 2000 to 2013.

Source: data from FAO.

NEED FOR REDUCING FOOD WASTAGE

- Very important for consumer welfare
- Increases food availability for consumptive use
- Food security
- Very important for reducing the environmental footprint of agriculture
- To avoid loss of other resources

CAUSES OF FOOD WASTAGE:

- Premature harvesting
- Retail
- Consumption
- Excess production
- Lack of communication and cooperation between farmers

CONSEQUENCES OF FOOD WASTAGE

- Emission of greenhouse gases
- Wastage of resources
- Emission of toxic gases when wasted food is buried in landfills
- Unnecessary expenditures of fresh water
- Loss of Soil fertility

NUMEROUS OTHER CAUSES OF FOOD LOSSES AND WASTE

In industrialized countries

The largest proportion of waste occurs at the **final stages of the food supply chain**

- household consumption and restaurants
- food service establishments

In developing countries

The most significant losses are at the **first part of the food supply chain**, primarily due to limits in the cultivation, harvesting,

- preserving techniques,
- due to a lack of adequate transportation
- storage infrastructures.

Table 3: Preventive measures for food loss and food waste:

Sl.No.	Causes	Measures
1.	Poor storage facilities, packaging and lack of infrastructure cause postharvest food losses in developing countries	Investment in infrastructure, packaging and transportation
2.	Unsafe food is not fit for human consumption and therefore is wasted.	Develop knowledge and capacity of food chain operators to apply safe food handling practices.
3.	Lack of processing facilities causes high food losses in developing countries	Improve investment climate for agro-industry Develop contract farming linkages between processors and farmer
4.	Large quantities on display and a wide range of products in supply lead to food waste in industrialized countries. Inadequate market systems cause high food losses in developing countries	Marketing cooperatives and improved market facilities
5.	The small and medium scale food industry in developing countries has no access to good quality packaging materials and technology	Pre packing and contract packing.

FOOD WASTAGE IN BANGALORE CITY MEASURES FOR MITIGATION

Narayana Gowda, K., Shivanna, H., Mandanna, P. K., Umesh, K. B., Venkatareddy, T. N., Neena Joshi, Ananda, T. N., Suresh, S. V., Balakrishna, J.

In world 1/3 of food is wasted every year according to the survey conducted by FAO. In recent days, food wastage has been increasing in grand marriages, parties, religious offerings and other social gatherings.

Every man will be served with 641 gm of food and out of 641 gm, 112 gm was wasted per head. In total 9515 tons of food is wasted per year from 531 marriage halls in Bengaluru

Table 1: Average quantity of food served and wasted (grams).

Food items	Quantity served	Quantity wasted
Rice and other cereals	148	28
Vegetables & pulses	303	50
Sweets, milk products & others	190	34
Total	641	112
Percent quantity wasted		17.48

Table 1 indicates the average quantity of food served and wasted in grams, vegetables and pulses are the food items which is served more (303 gm) and also quantity wasted is also more (50gm).

Table 2: Estimated quantity served and food wasted in marriage halls

No. of registered marriage halls in Bangalore	531
Average marriage days per year (2 days per marriage)	$531 \times 80 \times 2 = 84960$
Average no. of people attending a marriage	1000
Total number of food servings	84960000
Total quantity of food served (tons)	54,460
Total quantity of food wasted (tons)	9,515
Average food intake by Indians (grams)	350
No. of people could have been served from quantity wasted (Lakhs)	272

Table 3: Percent and value of food wasted from different serving methods

Details	Marriage halls			
	large	Medium	Small	Average
Buffet				
Rice and other cereals (%)	35	20	20	
Vegetables & pulses (%)	25	15	15	
Sweets & others (%)	15	10	10	
Average (%)	25	15	15	18
Value of food wasted (Rs.)	34			
Served				
Rice and other cereals (%)	35	30	20	
Vegetables & pulses (%)	25	20	15	
Sweets & others (%)	15	10	10	
Average (%)	25	20	15	20
Total value of food wasted (Rs. Crore)	305.86			

In marriage halls, usually food is served in two ways i.e. buffet or self-service system and batch system. In big marriage halls self-service system is followed by 75 per cent, in medium halls by 50 per cent and 5 per cent in small marriage halls.

On the basis of type of serving food in marriage halls, the per cent food waste in big marriage halls accounts for 18 per cent with cost of Rs. 34 in self-service system and 20 per cent with cost of Rs. 38 in batch system of food serving. In total 305.86 crore rupees is wasted by both the system (Table 3).

TECHNOLOGY TO CONVERT FOOD WASTE TO WEALTH

1. FOOD WASTE INTO PLANT FOOD

Kowloon Hospital, Hong Kong | 2016

Hospital Food Waste (around 400-500 kg per day; mostly rice, vegetables and fruit peels)

Fermentation (With the help of enzymes, and within 24 hours)

Clear, Transparent Liquid (FERTILIZER)

Benefits

- 20% decreased requirement of fertilizer
- More than 90% of the waste is handled
- Proven health benefits for plants

2. FOOD WASTE AS FUEL FOR BIOGAS PLANT

NIT – T | 2016

The National Institute of Technology, Trichy (NIT-T), has set up a biogas plant, NISARGRUNA, to produce bio-gas out of food waste, in collaboration with Bhabha Atomic Research Centre (BARC) Mumbai.

NIT-T, is the first institution in the state which has signed an MOU for jointly establishing the DAE Technologies Display and Dissemination Facility (DTDDF) center at NIT-T and promoting various technologies developed by BARC. The collaboration is taken up at three levels, academic, research and outreach. A biogas plant is established as a pilot project in one of the institute's hostel messes where food waste is utilized as the feed and the resulting biogas is supplied to hostels for cooking. NIT-T students are being encouraged to undergo research on these technologies.

The project will be used to demonstrate the benefits of the biogas plant to the villages and towns. This biogas facility will be set up in five villages adopted by NIT-T under Unnat Bharat Abhiyan scheme of Prime Minister. Director in-charge of NIT-T G Kannabiran said the total cost of the project is Rs.42,20,000. Which is funded by the BARC and NIT-T has agreed to manage and provide all support to this project including space and two skilled manpower for five years.

Measures in various countries to curb food wastage

Food loss and waste is an area in the food and agriculture sector where adaptations to climate change are important. Food loss and waste generates about 8 per cent of global greenhouse gas emissions. A recent study predicts that emissions associated with food waste could increase further. Hence, the message for World Food Day, observed on October 16, was that “Climate is changing. Food and agriculture must too”.

1. France

In France food loss is noticed around 300 pounds per person per year. It reflects a crisis in food production and consumption systems

Fighting Food Waste: Proposals for a Public Policy”

- ☐ 2013 National pact against food waste goal of cutting food waste at least half by 2025
- ☐ offered a rich set of ideas for prevention, recovery and recycling
- ☐ has a unanimous legislation requiring **super markets** to either give unsold food to charity or send it to farmers to use as feed or as fertilizer.

2. Canada

- ☐ food rescue organizations like Second Harvest to get unspoiled food from retailers, manufacturers, restaurants and caterers to charities, delivering ingredients for over 22,000 meals daily.
- ☐ Use of nanotechnology by application of hexanal, a natural plant extract that prevents fruit spoilage.
- ☐ Flash food is essentially the discount food rack on your cell phone and it's a means for grocery stores, restaurants, food vendors, being able to resell their surplus food before they're going to throw it out.

3. Swiss

- ☐ The restaurant Giovanni Tafuro,
- ☐ The lunchtime eat-as-much-as-you-like buffet costs 12 francs
- ☐ but on food-wasting customers, the eatery adds five francs into their bill

- ❑ the idea is to discourage people from wasting food.

Source: International Business Times, 12th May, 2014.

4. Italy

- ❑ the bill that approval on August, 2016.
- ❑ offers incentives to businesses who donate food to charities and starting new programmes to reduce food waste in schools, hospitals and other public canteens inorder to cut upto one million tonnes of food wastes a year

Source: The Telegraph, 4th August 2016

5. India

- ❑ PM Modis Mega Food Parks to Help Curb Food Wastage
- ❑ 42 'mega food parks' across the country to give a push to the processing industry.
- ❑ The idea behind these is to provide adequate and appropriate storage facilities as well processing food, to preserve it and elongate its shelf-life.
- ❑ Source: NDTV, 3rd June, 2015

Karnataka Government Former Food Minister U. T. Kadher said that, wasting food is a crime and made it compulsory that, all marriage halls should be equipped with a refrigerator so that, the food that is wasted can be stored in refrigerator and later it can be served for the needy people. the transportation cost to distribute the excess or left-over food should be borne by the person organizing the programme.

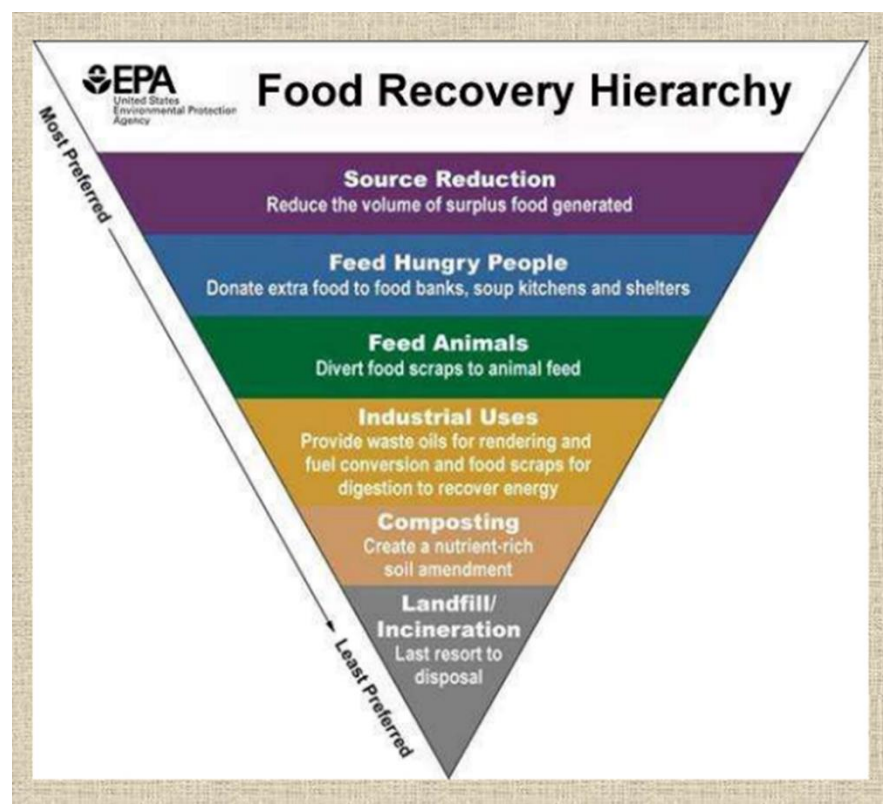


Figure 14: food recovery hierarchy

6 SCHEMES ADOPTED TO REDUCE FOOD WASTE, BENEFIT FARMERS

The government launched an all-encompassing programme ‘SAMPADA’ that aims to improve the economic aspect of the food processing sector.

1. MEGA FOOD PARKS

The scheme aims to link agricultural production to markets by using a cluster approach, implemented by an SPV. It supports the creation of infrastructure for setting up of modern food processing units in the park and connecting it with a well-established supply chain.¹ The scheme provides a capital grant of 50-75%, subject to a maximum of \$7.15 Mn per project.² Till March 2019, 42 such parks were under various stages of implementation.³

2. COLD CHAIN, VALUE ADDITION & PRESERVATION INFRA

The scheme aims to provide integrated cold chain and preservation infrastructure facilities along the entire supply chain of food processing.⁴ It covers Minimal Processing Centre having weighing, sorting, grading, packing, storage and quick freezing facilities. Grant-in-aid, up to a maximum of \$1.43 Mn, is provided for 35% - 50% storage infrastructure and transport infrastructure and 50-75% value addition and processing infrastructure.⁵ Until March 2019, 299 approved cold chain projects were under various stages of implementation.

3. CREATION OF FOOD PROCESSING & PRESERVATION CAPACITIES

The scheme aims to create and modernize processing and preservation capacities by increasing the level of processing and value addition, leading to a reduction in wastage.⁷ Under the scheme, a capital grant of 35-50%, subject to a maximum of \$0.71 Mn per project, is provided.⁸ Till December 2018, 134 projects were approved under this scheme.⁹

4. CREATION OF BACKWARD & FORWARD LINKAGES

The scheme aims to provide effective and seamless backward and forward integration in the processed food industry. Financial assistance is provided for setting up primary processing centers, collection centers and modern retail outlets. This is supplemented with connectivity through insulated or refrigerated transport.¹⁰ The scheme provides a capital grant of 35-50%, subject to a maximum of \$0.71 Mn per project.¹¹ Till December 2018, 70 projects were approved under this scheme.

5. FOOD SAFETY & QUALITY ASSURANCE INFRA

The scheme aims to make India’s food and agro-processing sector have a competitive edge in the market by creating infrastructure for safety and quality assurance services.¹³ Under this scheme, the government extends financial assistance¹⁴ of 50-70% for the cost of laboratory equipment and 25-33% for civil work and 50-75% reimbursement for HACCP/ ISO Standards/Food Safety/Quality Management Systems. Till November 2018, 76 Food Testing labs were instituted under the scheme.

6. AGRO PROCESSING CLUSTER

The scheme aims at cluster approach based development of modern infrastructure and common facilities to encourage a group of entrepreneurs to set up food processing units.¹⁶ The

scheme provides grants-in-aid of 35-50% of eligible project cost, up to a maximum of \$1.43 Mn per project.¹⁷ Till December 2018, 33 projects were approved under the scheme.

THREE LEVELS OF FOOD LOSS MANAGEMENT

Level 1: Micro level

- Changing shopping habits of food, through education
- focusing on providing information on safe food handling, proper food storage in households and understanding “best before” dates in order to prevent and reduce food waste.

Level 2: Meso level

- By facilitating coordination among food supply chain actors - farmers, handlers, processors and traders, in collaboration with the public and private sectors and civil society.

Level 3: Macro level

- Working in collaboration with governments and other international bodies to promote awareness and advocacy on the issues and to develop policies to reduce FLW, FAO focuses on consumers and changing their individual attitudes, behaviours, consumption.

The Role of Producer Organizations in Reducing Food Losses and Waste

FAO has been working closely with various forms of producer organizations

- Sustained dialogue with buyers
- Coordination of supply to the market
- Coordination of financial service provision to avoid
- premature harvesting
- Improved storage facilities, infrastructure and cold chains
- Capacity building in food standards
- Organizational innovations for low-cost value addition

IV. STATE OF APMCS IN INDIA

Solid waste management is one of the most basic essential services provided by municipal authorities in the country to keep urban centres clean. However, it is among the most poorly rendered services—the systems applied are unscientific, outdated and inefficient; population coverage is low; and the poor are marginalized. India produces **150 million** tonnes of fruits and vegetables and **50 million tonnes** of waste per annum

India's capacity of storing:

- 23.6 million mt in 5,386 cold storages
- 180 million mt per year of fruits, vegetables and perishables
- 80 per cent is used only for potatoes
- 25 to 30 per cent of fruits and vegetables and five to seven per cent of food grains in India get wasted is due to,
 - ❑ high demand and supply fluctuations,
 - ❑ lack of back end infrastructure,
 - ❑ Lack of post-harvest management, infrastructure and technology
 - ❑ leads to a high wastage of 30-40% in high value perishables commodities like fruits and vegetables of economic value of the food produced.

- ❑ Economically avoidable food losses have a direct and negative impact on the income of both farmers and consumers Food Processing Industry, Ministry of Commerce (Department of Industrial Policy and Promotion), Ministry of Agriculture, and National Agricultural Research System Asserted to encourage investment in the retail ‘back end’ to reduce post- harvest food waste/ loss.

HANDLING OF AGRICULTURAL WASTES IN APMCs

Table 1: Total Arrival versus total wastes generated: Food Grains

Name of the APMC	Total Arrival	Total Wastes Generated	Percent waste Generated
Najafgarh APMC (New grain market) New Delhi	911733	880	0.09%
Narela APMC (New grain Market) , New Delhi	6405104	-	-
Mumbai APMCs	1617798	1145	0.07%
Pune APMCs	421216	630	0.14%
Kanpur APMC	413632.4	413.6	0.09 %

Table 2: Total Arrival Vs Waste Generated at various cities APMCs: Fruits and vegetables

Name of the APMC	FRUITS		VEGETABLES	
	Total Arrival (in tons)	Percent waste Generated (in %)	Total Arrival (in tons)	Percent waste Generated (in %)
Jalandhar	13422	2.6	44974	3.15
Patna	47000	11.42	33660	8.18
Guwahati	22127.7	4.08	47558	13.3
Kolkata	51758	8.25	109730	12.6
Ahmedabad	-	-	195560	4.03
Pune	180580	3.61	127400	4.63
Delhi	135600	4.41	186680	4.0
Bangalore	132480	4.8	206970	3.24
Chennai	157212	5.66	433209.6	2.53
Mumbai	44900	3.41	197260	2.85
Kanpur	184490	3.88	159990	12.5

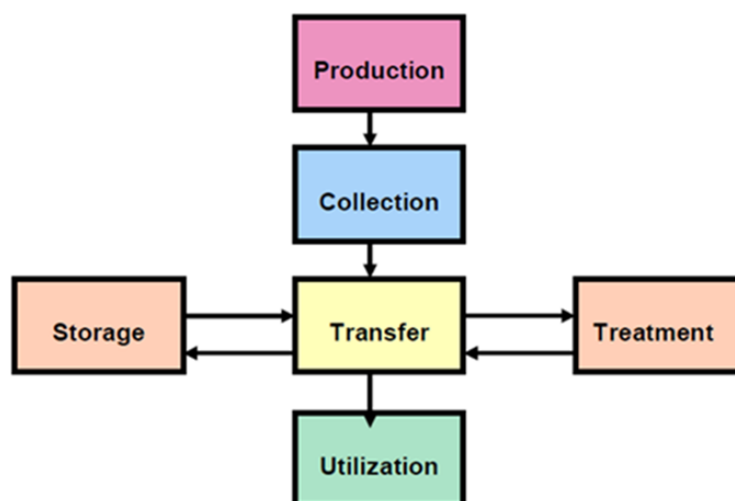
Source: NIAM Research Study, RESEARCH REPORT 2011-12

Table 3: Mode of Waste disposal

Waste disposal	Mumbai APMC	Pune APMC	Azadpur, New Delhi	Jalandhar APMC	Kanpur APMC
Garbage	18749 tons	194550 tons	36,500 to 45, 625 tons (100-125 tons daily as per data available)	4792 tons	Nil
Feed	Nil	Nil	Nil	Nil	Nil
Fuel	Nil	Nil	Nil	Nil	Nil
Compost	Nil	Nil	Nil	Nil	Nil
Earth filling	Nil	Nil	Nil	Nil	127443.6 tons
Recycling/Reuse	Nil	Nil	Nil	Nil	Nil
Others (pl specify)	Nil	Nil	Nil	Nil	Nil

Source: NIAM Research Study, RESEARCH REPORT 2011-12

AGRICULTURAL WASTE MANAGEMENT SYSTEM IN APMCs

**Figure1: Basic 6 functions**

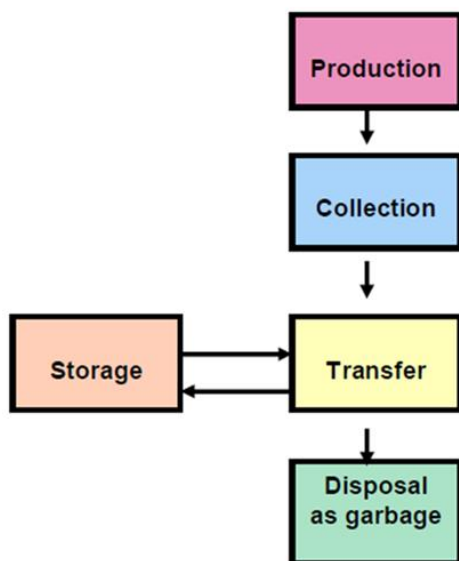


Figure2: Modified functions

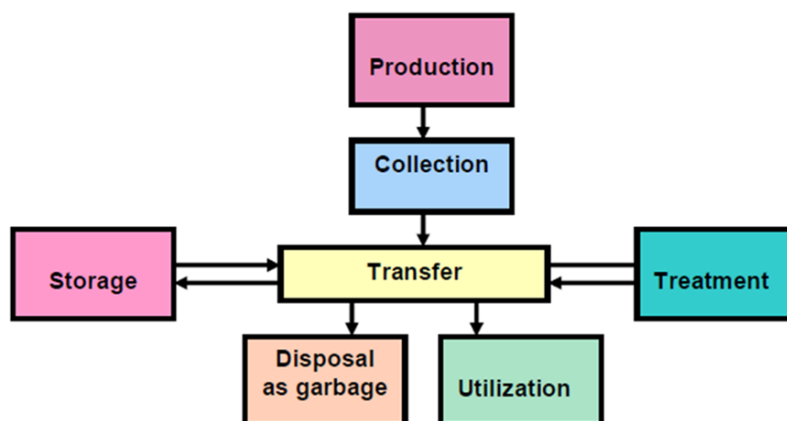
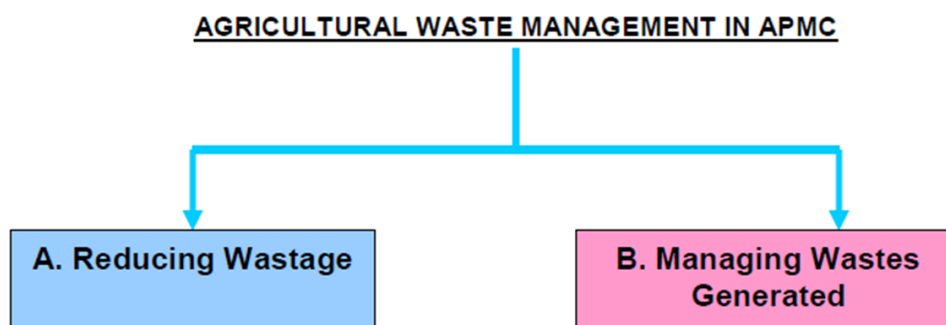


Figure 3: Presently initiated functions

PLANNING FOR WASTE MANAGEMENT IN APMCS



A. Reducing wastage

- Reducing arrival in APMC by way of Alternative Marketing
- Developing Proper Marketing Facilities
- Developing adequate cold storage facilities and Post-harvest management infrastructures

B. Managing wastes generated

- Sanitation and Hygiene
- Reusing the Agricultural Wastes: Setting up Fruit and Vegetable Compost Unit in APMC
- Biogas Preparation from Agricultural Wastes in APMC
- Power generation

Sustainable Solution for Vegetable Waste Generated at District Agriculture Produce Marketing Centre.

Shrikant D. Tayade, Anant B. Marathe , Vilas S. Sapkal , Rajiv S. Sapkal

2017

Area of study: Maharashtra APMCs

Bioprocessing, in an improved way of technology where vegetable waste materials is utilized to produce the economical or commercial viable products i.e. biofuel, biogas & manure and also with other applications as effective solution of waste management without damage to environment.

The waste vegetables are collected from vegetable markets, municipalities markets, from APMC centres.

Table 1. Comparison between traditional methods and innovative technology of waste utilization

Sr. No.	Compost formation from organic waste	Biogas produced from organic waste	Recent technology benefits
1	Spraying of water at regular interval for wetability and progress of reaction	Dilution with water for mixing and initiation of reaction	No need of water hence water saving
2	Soil is required to added for manure production	Gobar or wet dung is added to digester. (if required)	liquid extract directly supply to digester
3	Waste is added or buried in soil without any treatment	Incoming waste direct feed to plant without any treatment	It consist of shredding, compressing and mixing of waste
4	It causes soil contamination where it is processed and chances of generation of bacteria and fungi, weeds	Some slurry is again get wasted due to overflow of sludge from digester	Waste is fully utilized without harmful the environment with full discharge, non polluting
5	One product at a time i.e. compost	One product at a time i.e. biogas	Two or more products is obtained i.e. Biogas, manure
6	Releases odour	Releases odour	Completely odour free products
7	It takes 6 to 8 weeks for manure production	It takes 2 weeks for biogas production	Takes less time than traditional methods

V. CASE STUDIES

1. BHUSIRI: An instant organic manure maker

High Tech Agriculcum Private Limited established on july 2017

Managing Director: Dr. Nagaraj Hegde

- ☐ Can works right in the farmer's field.
- ☐ Bhusiri is associated with Bhumitra (soil and crop testing machine) in a sophisticated truck
- ☐ Produces bio-fertilizers using less time duration (20 minutes)
- ☐ Bhusiri machine is portable, can be detached and used in fields.
- ☐ It can take both dry and wet wastes, pre-treat it
- ☐ and grinds the litter and produce high quality manure/ fertilizers
- ☐ Capacity of bhusiri: 2 tons of manure/ hour

2. GPS Renewables: Bio urja

GPS Renewables is a Bangalore based enterprise that is solving the urban organic waste management problem in an economical and environmentally clean way.

Founder: Mainak Chakraborty and Sreekrishna Sankar

the company is working on a thumb rule of – Zero wastage.

- ☐ The company launched a pilot project named BioUrja in 2013.
- ☐ BioUrja was designed and engineered that it occupies only 30-50% area of traditional biogas plants.
- ☐ Also, it requires water only up to 20% of the feed volume compared to a other biogas plants.
- ☐ processes around 600 kgs of kitchen waste every single day.
- ☐ The company has now expanded beyond India into Bangladesh, Malaysia, and Sri Lanka

Source: article on from Waste to Wealth: These 5 Start-ups Are Showing India How to Manage Waste Effectively

VI. CONCLUSION

Agro-waste is a valuable resource to generate wealth. Creation of wealth from agro-waste is a beneficial tool to reduce environmental pollution, to promote food security, to increase fiscal growth, to improve crop cultivation etc. It is an urge of time to create awareness about to adopt 5 R principle. There is also an urge to set up centres of excellence in waste management. To reduce the carbon foot-print, it is advisable to generate less waste from initial stage of agro-product development. Along with concerning on primary agriculture cultivation, it is necessary to focus on secondary cultivation to generate more wealth from agro-waste. To formulate more wealth from agro-waste, establishments of small scale industries should be developed in rural and remote areas. Government should initiate more schemes and provides subsidy for farmers to encourage for adopting the process of agro-waste to wealth.

VII. DISCUSSION

1. Why is stubble burning is happening, what can be done to control stubble burning?

Because of large fields farmers think that is tedious job to collect all the stubble and utilize it for manure preparation. When a manure preparation unit is established individually or in joint venture they will definitely utilize it without wasting.

2. Any information on sewage water treatment in Karnataka or Bangalore

Bangalore has the highest number of apartments that treat sewage, most of which use at least some of the treated water for toilet-flushing and gardening. There are only a handful of tertiary treatment plants in the country that supply water to industries. One such plant is in Yelahanka, Bangalore, with capacity of 10 MLD (Million Litres per Day), operated by the Bangalore Water Supply and Sewerage Board (BWSSB). Currently, Bangalore generates 1400 MLD wastewater, as per BWSSB's conservative estimates. The city has total treatment capacity of 721 MLD, but only 520 MLD gets treated on average.

Most of Bangalore's wastewater flows downstream untreated. Many farmers use this water for irrigation because it often a more reliable source of water, especially during periods of scarcity. Untreated or partially treated domestic wastewater is also a source of nutrients. However, Bangalore's wastewater also contains industrial effluents and its use for irrigation while potentially beneficial, is potentially hazardous if not used properly. At present, the health and environmental risks of using wastewater in irrigation are largely unregulated, however, if these risks are managed, irrigation can ensure reuse of both water and nutrients.

3. Do you have any information on micro plastic and its management?

Micro plastic can be referred as synthetic organic polymer particles with a size smaller than 5 mm. Many published studies refer to micro plastics as plastic particles or debris which are less than 5 mm length, but there is no consensus about the lower limit.

The researchers added different types of microplastics into the soil: polyamide beads (a primary microplastic), polyester fibers (the most common type of secondary microplastic) and four different plastics in the form of fragmenta (another type of secondary microplastic).

4. Technologies or measures taken in India to convert waste to wealth

To commemorate *the 150th birth anniversary of Mahatma Gandhi*, the Office of the Principal Scientific Adviser (PSA) to the Government of India and Indian Institute of Technology Delhi (IIT Delhi) signed a Memorandum of Understanding for setting up *a Centre of Excellence for Waste to Wealth Technologies* for implementation of sustainable, scientific and technological solutions for waste management, through validation and deployment of available technologies for transformation of waste to wealth.

- The waste to wealth mission project has been approved under the recently constituted *Prime Minister's Science Technology and Innovation Advisory Council (PM-STIAC)*.

- The partnership will provide an effective ***platform for stakeholders to bring together integrated approaches for effective recycle, reuse and resource recovery of waste.***
- ***The immediate objective*** is to implement technologies that are available with various national and international academia's, industries, research laboratories and other agencies by way of setting up pilot projects on-site effectively and successfully, and demonstrating the proof of concept of the technology under Indian condition.
- This will be carried out by creating ***a strong collaborating network*** between IIT Delhi, and other national and international stakeholders through the aegis of the office of the PSA.
- ***The long-term goal*** is to create circular economic models for waste management, by leveraging big data analytics and frontier technologies to streamline waste in India.
- The overall outcomes would involve treating waste and generating different forms of energy, thereby making India a waste free nation, with zero greenhouse gas emission and no health hazard.
- Under the initiative, ***a waste to wealth programme management centre*** will also be set up at IIT Delhi.
- ***The office of the PSA acts as a 'think-tank' and 'action-tank'*** for science, technology and innovation activities. The office plays a catalytic and synergistic role to strongly connect government ministry, academia and industry, to evolve relevant policies, make recommendations for the relevant scientific departments and ministries, and implement scientific interventions in various sectors of national priority.

5. What is your view on agriculture and agriculture waste on carbon footprint?

The carbon footprint of a food product is the total amount of GHG emitted throughout its lifecycle, expressed in kilograms of CO₂ equivalents. GHG emissions of the production phase (including all agricultural inputs, machinery, livestock, soils) and successive phases (such as processing, transportation, preparation of food, waste disposal) are all included in this calculation. Thus, one kg of wheat, or one kg of beef, have different carbon footprints, since their life cycles are different, emitting specific types and varying amount of greenhouse gases.

6. Any techniques followed in UAS(B) to manage waste

University of agricultural sciences have biofuel unit, where it takes up works on conversting the green waste of some of the candidate plus trees of Pongamia, Neem, Jatropha, Mahua, Simarouba and other promising oil bearing trees with high seed yield and oil content. Nurseries of selected candidate trees were raised to provide elite planting material to farmers and institutions. Research activities were initiated in all relevant directions to meet the needs of effective implementation of programs. The Department of Forestry and Environmental Science, University of Agricultural Sciences, GKVK Bengaluru has developed strategies for a comprehensive plan for bio fuel program for the state

7. Waste processing plant in Bidadi Bangalore

In the waste-to-energy method of waste disposal, the waste is first incarcerated to be subsequently harvested for electricity to facilitate eventual distribution to the people.

Bengaluru's first plant is to be set up in Bidadi in Ramanagara district and is expected to have a capacity of around 11.5 MW. The plant will be a joint venture of both BBMP and the state-run Karnataka Power Corporation Limited (KPCL). The city's second plant is expected to be erected around Kannahalli in a year from now.

8. Differentiate food loss and food waste

Food loss" refers to food that spills, spoils, incurs an abnormal reduction in quality such as bruising or wilting, or otherwise gets lost before it reaches the consumer. Food loss typically takes place at the production, storage, processing, and distribution stages in the food value chain. It's usually the unintended result of an agricultural process or technical limitation in storage, infrastructure, packaging, and/or marketing.

"Food waste" refers to food that is of good quality and fit for consumption, but does not get consumed because it is discarded—either before or after it is left to spoil. Food waste typically, but not exclusively, takes place at the retail and consumption stages in the food value chain. It's usually the result of negligence or a conscious decision to throw food away. Although both food loss and waste happen all over the world, food loss tends to be more prevalent in developing countries, while food waste tends to be more prevalent in developed countries.

VIII. REFERENCES

- ANONYMOUS, 3rd June, 2015, PM Modi's Mega Food Parks to Help Curb Food wastage. NDTV.
- ANONYMOUS., 2012, Handling of Agricultural Wastes in APMCs. Research report., National institute of Agricultural Marketing, Jaipur, Rajasthan.
- JAMES KRIDER N., 2011, Agricultural Waste Management Systems., *Agricultural Waste Management Field Handbook*., 210(4).
- KIMOTHI, S P., SANJEEV PANWAR., AND ANJANI KHULBE., 2020, Creating Wealth from Agricultural Waste Creating Wealth from Agricultural Waste. Indian Council of Agricultural Research, New Delhi: 172
- NARAYANA GOWDA, K., SHIVANNA, H., MANDANNA, P K., UMESH, K B., VENKATAREDDY, T. N., NEENA JOSHI, ANANDA, T. N., SURESH, S. V. AND BALAKRISHNA, J., 2012, *Food wastage in Bangalore city measures for mitigation*. Univ. Agril. Sci., Bengaluru.
- OBI, F, O., UGWUISHIWU, B, O., AND NWAKAIRE, J, N., 2016, Agricultural Waste Concept, Generation, Utilization and Management. *Nigerian Journal of Technology*, 4 (35): 957-964.
- RAVEESH AGARWAL., MONA CHAUDHARY., AND JAYVEER SINGH., 2015, Waste Management Initiatives in India for Human Wellbeing. *European Scientific Journal*: 1857- 7431.
- SHEETAL BANGA, K M., AND SUNIL KUMAR., 2019, Agricultural Waste to Wealth. *Agriculture & food: e- newsletter*.,10 (1): 2581-8317.
- SHRIKANT TAYADE, D., ANANT MARATHE, B., VILAS SAPKAL, S., AND RAJIV SAPKAL, S., 2017, Sustainable Solution for Vegetable Waste Generated at District Agriculture Produce Marketing Centre. *International Advanced Research Journal in Science, Engineering and Technology*.,3(4): 2393-8021.

www.faostat.com

UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE
DEPARTMENT OF AGRICULTURAL EXTENSION
CoA, GKVK, BENGALURU-560 065

Name : KAVYASHREE C
Class : III Ph.D.
ID.No. : PALB 8027
 hall

Date : 19-12-2020
Time : 9:30 AM
Venue : Dr. Dwarkinath

Seminar III
Waste to Wealth: Converting Burden into Blessing
Synopsis

Agriculture, along with its allied sectors, is the largest source of livelihood in India, which is also a largest sector for waste generation (350 MT). Waste (or wastes) something which are unwanted or unusable materials which is discarded after primary use, or is worthless, defective and of no use. In same line agricultural waste are the non-product outputs of production and processing of agricultural products that may contain material that can benefit man but whose economic values are less than the cost of collection, transportation, and processing for beneficial use. Agricultural wastes can be in the form of solid, liquid or slurries depending on the nature of agricultural activities. It is important to view 'waste' as a valuable 'resource' that can be converted into a variety of useful products. This process of conversion of waste to a product that can be put to primary use can be viewed as a process of generating wealth. Hence the phrase 'Waste to Wealth'. 998 million tonnes (MT) of agricultural waste is generated worldwide. Out of all the waste generated from agriculture, food loss is the major loss which occurs right from farm to fork. The loss which occur after harvesting i.e., marketing and post-harvest loss is one of the sector need to be accounted. India produces 150 million tonnes of fruits and vegetables and 50 million tonnes of waste per annum. These waste can be witnessed in the Agriculture Produce Market Committee (APMCs) which were established by the government to streamline and regulate the sale and purchase of different types of agriculture and pisciculture produce from remote areas. Waste-to-wealth has been used as the concept to address the environmental problem by changing the traditional view of waste as an end product to be disposed of. Given the magnitude of waste generated, innovative waste conversion processes can create micro-entrepreneurship fortuity on an enormous scale. Increasing opportunities for this enterprise can have assorted advantages. With this back ground a present seminar has conceptualised with the following objectives:

1. To know the concept of agro waste and its forms
2. To study on the food loss and waste and its management
3. To focus on the agricultural waste and techniques adopted by APMCs
4. To review the case studies on converting waste to wealth in agricultural sector.

Agricultural waste:

Agricultural wastes are defined as the residues from the growing and processing of raw agricultural products such as fruits, vegetables, meat, poultry, dairy products, and crops.

Agricultural Waste Management System (AWMS):

Defined as planned system in which all necessary components are installed and managed to control and use byproducts of agricultural production in a manner that sustains or enhances the quality of air, water, soil, plant, and animal resources.

Food waste:

UN Food and Agriculture Organization (FAO) defined food waste which includes any healthy or edible substance that instead of being destined for human consumption is wasted, lost, degraded, or consumed by parasites at every stage of the food supply chain.

Agricultural waste can be converted into different forms which are beneficial to reduce pollution and to provide wealth. Some methods can be Conversion of Agricultural Waste, Agricultural Waste Management, Generation of Agricultural Waste from Food Processing Industries, Generation of Agricultural Waste from Poultry Houses and Slaughterhouses, Generation of Energy from Agro-Waste, Value Addition.

Review studies:

Gowda *et. al*, (2012) in their project on Food wastage in Bangalore city measures for mitigation reported that in total 9515 tons of food is wasted per year from 531 marriage halls accounting for total 305.86 crore rupees is wasted by buffet and batch system of service. About four per cent of food is wasted by per plate system. The total quantity of food wasted without serving is around 4735 tons which is worth of Rs.140.15 crore.

Shrikant Tayade *et.al*, (2017) in their study reported that in management of vegetable waste in APMC of Maharashtra are managed by utilizing technologies to deal with 'waste to wealth'. Among those technologies Bioprocessing, in an improved way, where vegetable waste materials are utilized to produce the economical or commercial viable products i.e. biofuel, biogas & manure and also with other applications as effective solution of waste management without damage to environment.

Conclusion

Agro-waste is a valuable resource to generate wealth. Creation of wealth from agro-waste is a beneficial tool to reduce environmental pollution, to promote food security, to increase fiscal growth, to improve crop cultivation. We Can think of broader solution to make it happen in that case prevention solution and recovery(recycling) solution can give more stress. Along with concerning on primary agriculture cultivation, it is necessary to focus on secondary cultivation to generate more wealth from agro-waste. To formulate more wealth from agro-waste, establishments of small scale industries should be developed in rural and remote areas. Government should initiate more schemes and provides subsidy for farmers to encourage for adopting the process of agro-waste to wealth

References

- NARAYANA GOWDA, K., SHIVANNA, H., MANDANNA, P. K., UMESH, K. B., VENKATAREDDY, T. N., NEENA JOSHI, ANANDA, T. N., SURESH, S. V. AND BALAKRISHNA, J., 2012, *Food wastage in Bangalore city measures for mitigation*. Univ. Agril. Sci., Bengaluru.
- SHRIKANT TAYADE, D., ANANT MARATHE, B., VILAS SAPKAL, S., AND RAJIV SAPKAL, S., 2017, Sustainable Solution for Vegetable Waste Generated at District Agriculture Produce Marketing Centre, *International Advanced Research Journal in Science, Engineering and Technology*,3(4): 2393-8021.