Centurion
UNIVERSITY
Shaping Lives...
Empowering Communities...

A CRUSADE TO ZERO FOOD WASTE AND WEALTH CREATION

An Action-Learning-Research Project of
Centurion University of Technology & Management, India

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I. Summary

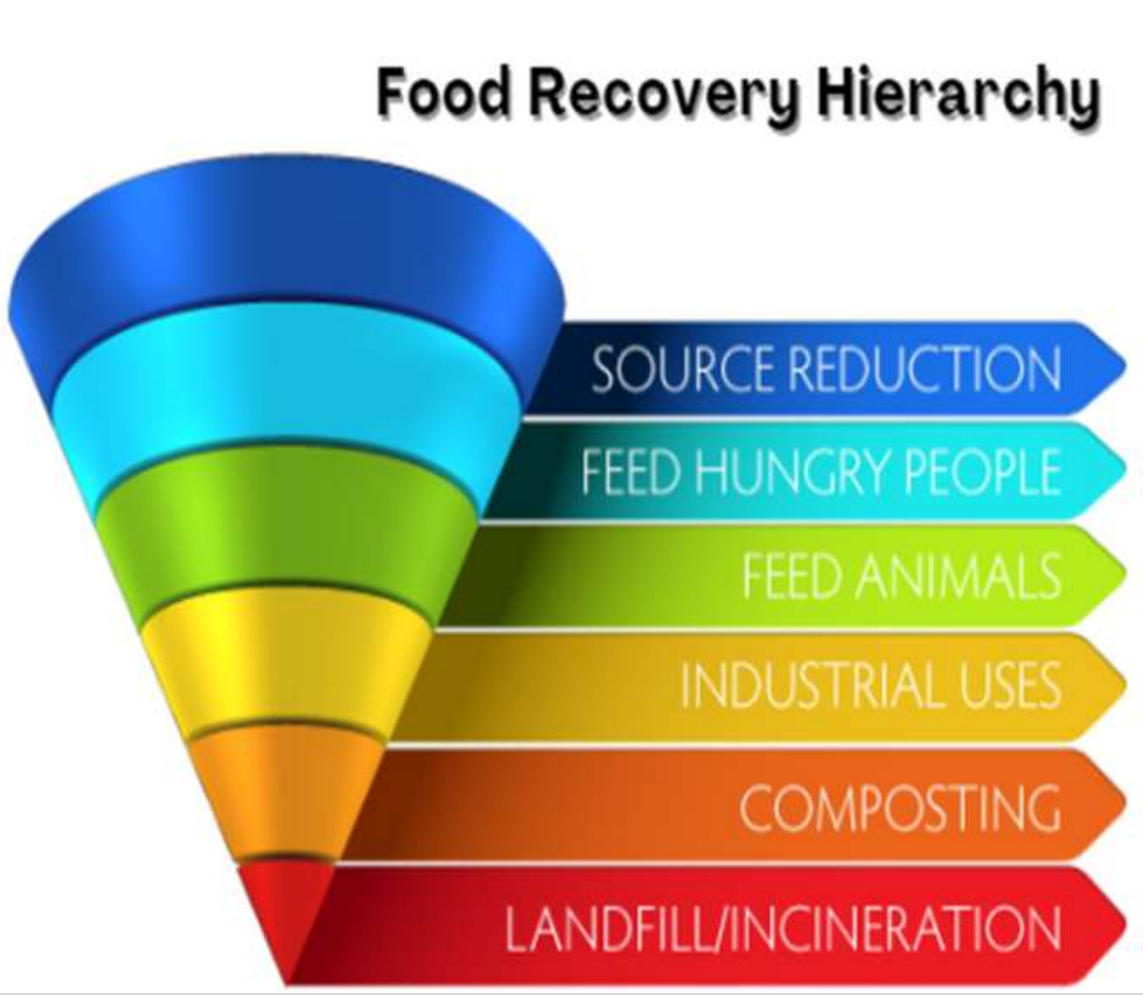
Centurion University's dedication to 'Zero-Waste' principles has led to substantial waste reduction, benefiting both the environment and economics. Through student education, the University has minimized food wastage, fostering a culture of mindful consumption. This proactive strategy not only curtails waste but also cultivates responsibility.

Innovatively, Centurion University repurposes excess food by feeding animals in and around the campus. The University's advanced bio-composting process further underscores its commitment. This method transforms food waste into valuable compost through meticulous management. These efforts creatively address waste reduction while contributing positively to the community.

Beyond environmental impact, Centurion University's waste reduction initiatives have economic advantages. Projects like the nursery and greenhouse enhance sustainability and promote organic cultivation. In essence, the University's approach intertwines conscientious consumption, creative waste repurposing and innovative composting, embodying a holistic commitment to 'Zero-Waste' principles and sustainable practices.

II. The Context: Food Waste, An Evil That Needs to Be Contained and Eliminated

With the global interest growing in achieving the SDGs, efforts towards food waste prevention have intensified, highlighting a hierarchy for alternative options. It is vital to reduce food loss and waste to achieve 'Zero Hunger World' as per the Sustainable Development Goals (SDGs), with special reference to SDG2 – End Hunger and SDG12 – Ensure Sustainable Consumption and Production Patterns.



1. The Action: Taking the Concept One Step Ahead

1.1. The Principle of Zero Waste

The 'Zero-Waste' principle consists of a set of clear-cut measures focused on prevention of waste through redesigning the life cycle of the resource to ensure reuse until the optimum level of consumption is achieved. The aim here to reach the point where no food waste reaches the landfills, incinerators, or oceans.

1.2. The Process

At any given time, there are 1200+ students residing and eating on the Campus, generating approximately 600 kg of food waste per day. Centurion University worked diligently through each of the steps of the Prevention of Food Waste Hierarchy Pyramid:

- **Reduction of food waste at source:** The students were consistently made aware and counselled to reduce food wastage by serving only as much as they would eat.
- **Donate food to hungry people:** at any given time, there are 500 daily-wage workers on the Campus engaged in construction and other works.
- **Feed the animals:** Centurion University has an enthusiastic Animal Club run by the students, who use the food waste to feed the stray animals (dogs, cats, cows) inside the Campus and in close surroundings on daily basis.

Most of the waste cooked food is collected and mixed in large drums to form a mass of homogenous slurry, which is fed to the pigs bred in piggeries close to the Campus.

- **Industrial uses:** the food waste in the Campus is not suitable for anaerobic digestion for energy recovery, hence, this step for recycling and reusing food waste has not been used.

- **Composting through bio-intervention:** using a bio-composting machine has been installed with a capacity of producing 130 kg of ready-to-use soil nutrient compost per day. The process is simple: the liquid food waste and anything that is not edible by animals is mixed in 12.5:1 ratio (food waste to sawdust) to produce the highest level of natural compost, ready to be used for cultivation. The production process using the BIO COMPOSTING MACHINE is continuous where the food waste is mixed with sawdust and a typical bio-culture (catalyst). This mix is then fed into the composter through the following steps:

    - **Segregation:** plastics and other non-biodegradables are separated from the food waste.

    - **Cutting to size:** The approximate size of food that can be loaded should be no larger than 1.5 inch.

    - **Draining:** The organic waste in placed in a perforated vessel for about four hours to remove excess moisture before it is fed into the Composter.

- **Adding Sawdust:** Sawdust is added to the organic waste in 10% to 30% proportion depending on moisture level at the outlet. The percentage of sawdust is adjusted to the moisture content of organic waste. For example, if the food waste contains more curry gravy, sambhar, dal, etc. more sawdust would be required to eliminate the moisture.

- **Adding Compost Bio Culture:** A catalyst bio-culture is added to the mix in proportion of 0.1% (of feeding capacity).

- **Going to the checklist:** Once everything is added in the composter, the following checklist is run through:

  - The door to the inlet is shut tightly, ensuring that nothing obstructs it.
  - The composter is put on "AUTO" mode.
  - The collection bin is placed at outlet end of the composter machine, where the compost is automatically collected.
  - The collection bin is again checked, and any un-composed organic material are segregated from the compost, which is then reloaded.

- Collecting the compost – The quality of the compost is checked. It should be moist, not wet. If the output is wet, it is again mixed with sawdust and reloaded into the composting machine for a rerun.

- **Zero Food Waste goes to landfill/ incineration:** The above process absorbs all the food waste produced in the Campus, all 622 kg of it, and nothing ends up thrown.

The Chemical Process of Composting Explained

The process that composts organic waste is either aerobic or anaerobic. While the aerobic process uses oxygen, the anaerobic one occurs in the absence of oxygen.

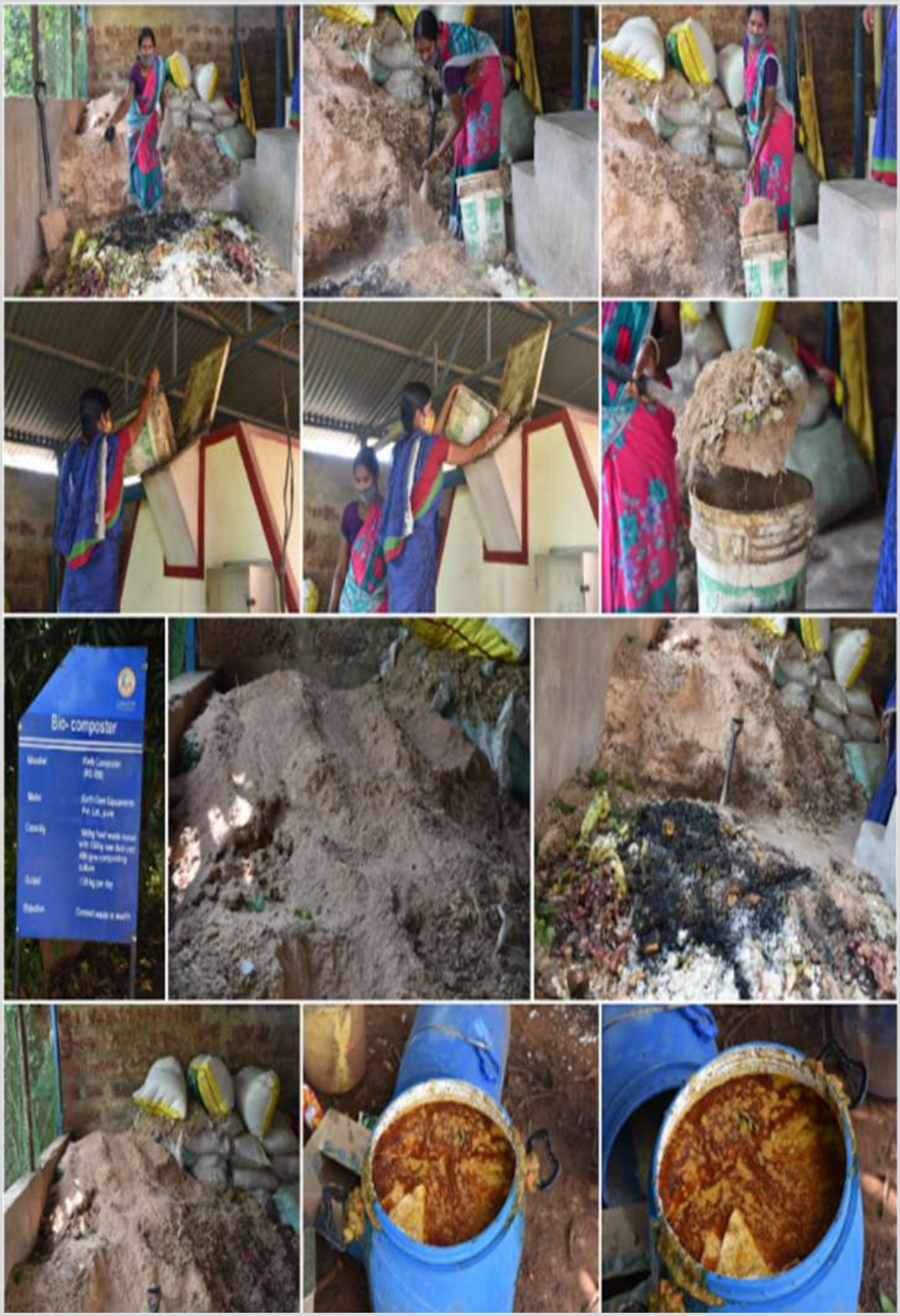
The composter machine used at Centurion University is an incubator for composting bacteria aerobically. TO accelerate the composting process, the bacteria are encouraged to grow rapidly in this aerobic process using food, water, air, and a mixture of organic waste.

The composting bacteria consume carbon and water giving out carbon dioxide (CO_2) and water vapor, which gradually reduces the quantity of carbon in composting mass to have the C:N ratio rise to 20:1. Carbon and nitrogen in gas form can be used as building blocks for bacteria.

The generation of CO2 from carbon is an exothermic process, the heat of which is preserved in Composter with the help of insulation. The temperature of the composting mass, which would increase up to 45 degrees Celsius, kills most of the harmful bacteria from the organic waste, and accelerates the composting process.

Compostable Material		Non-Compostable Material	
	Vegetable Waste		Coconut shell
	Food Waste		Plastic bags, and bottles
	Spoilt Vegetables		Glass
	Fruit skins and Spoilt fruits		Metal
	Raw and cooked meat		Dog and cat droppings (Animal waste)
	Eggshells		Napkins or sanitary waste
	Bread and bakery products		Pharmaceuticals
	Dry garden waste		Cosmetics

Food Waste Composting Process on Centurion University Campus			
Kwik Compost Machines Used		1. KC-200 (200 kg capacity) 2. KC-500 (500 kg capacity)	
Installation Date		1. KC – 200 on dated 30/12/2014 2. KC-500 on dated 31/10/2015	
Number of students who eat in the mess every day	Boys	4,505	
	Girls	8,062	
	Total	**12,567**	
Amount of food waste per day (average)	Boys	318 kg	
	Girls	182 kg	
	Total	**520 kg**	
Conversion process of waste food to compost		• Started with training from 03/12/2014 • Work started from 01/01/2015 of KC-200 • Work started from 01/11/2015 of KC-500	
How much compost is produced per day		1. KC-500 produces 1 kg compost per day 2. KC-200 produces 0.5 kg compost per day	
How much compost we created until date		1,722 kg	
Proportion (food waste to saw dust)		12.5:1	
Culture used per day		0.35 kg	1777:1 (Food waste: Culture)
Compost produced per day		130 kg per day	
Compost produced till date (01/01/2015 to 31/01/2020 – approximately)		150 tonnes	


Bio- composter


Cooked food waste
Vegetable peels, kitchen waste
Spoiled, expired food waste
Composted fertilizer

2. Energising and Rejuvenating Mother Earth

The Campus at Bhubaneswar was built in 2010, on 40 acres of Government of Odisha leased land, which was formerly used, for illegal sandstone quarrying. The whole of 40 acres lay barren and desolate without even a blade of grass on it. It was an arduous, uphill and painstaking task to create the green-covered Campus that stands today proud and vibrant with the widest variety of flora and fauna.

BEFORE	AFTER
	
	
	

Centurion University celebrated the achievement of its 'zero food waste' goal for the first time in ____ (year). With the production of the natural fertiliser through composting, the next step had almost directed itself – cultivation of food.

3. The Innovation: Upcycling Food Waste to Create Wealth

While the endeavour started with the basic goal of achieving 'zero food waste', achieving that milestone brought into focus a new horizon. The rich compost generated through bio-intervention begged to be put to further use, thus extending the circular economy kickstarted by the initial 'zero food waste' efforts. This is how the "Green Cover" project started in 2015. The organic fertiliser helped to create the much-needed soil for the Campus, for growing its green cover. Bit by bit the 40 acres of barren land were nurtured with this nutrient-rich soil and landscaped to create a most verdant and vibrant green cover that consists among others of:

a. Mango orchard consisting of more than 1,500+ mango trees
b. Perennial and seasonal lowering plants
c. Fruit trees, including coconut, jackfruit, lemon, orange, banana, papaya, java plum, water apples, custard apple, guava, tamarind, pomegranate, date, star fruit,
d. Exotic fruit trees/ shrubs/ creepers such as, dragon fruit, apple, passion fruit, coffee, olive, strawberries, watermelon,
e. Vegetables, including brinjal, broccoli, pumpkin, watercress, beans, okra, zucchini, parsley, leeks, yellow capsicum, red capsicum, red cabbage, beet, cucumber, onion, turmeric, carrot, garlic.
f. Medicinal plants, including tulsi, Ghusuripana, Vana Jasthimadhu, Madhumalati, Guluchi lata, Bisalya Karani etc.
g. Herbs and spices including fenugreek, bay leaf, cinnamon, pepper, thyme, rosemary, basil, coriander, dill, and so on.

4. The Economics

What started with food waste has come now in full cycle, creating wealth for the University in terms of organically grown fruits, vegetables, trees and flowering plants.

- **Nursery:** A cottage nursery has been established on the Campus that generates approximately INR 40,000/- from sale of saplings. Sale of fruits and vegetables a steady trickle of income, which is cycled back into making the Campus green and environmentally sustainable.

- **Greenhouse:** A greenhouse is set up for the study and cultivation of specific exotic plants – fruits, spices, and vegetables – with very encouraging results. The Campus boasts of an exclusively organic kitchen, where the food is cooked solely with the vegetables, spices, and herbs grown on the Campus.

- **Butterfly garden:** One other feather-in-the-cap is the creation of a 'Butterfly Garden' on the Campus with bright flowers and host plants (that feed caterpillars, to encourage breeding of butterflies). Today this beautiful experimental garden stands proud housing a wide variety of plants, insects, and small animals.

5. The Conclusion: This is only the beginning

Centurion University has been successful in bring food waste to zero on its Campus, and then moved the milestone a notch higher, to creating wealth from this process. The result is that today, in the course of less than 10 years, there are 40 acres covered with soul-satisfying greenery as far as the eye can see in any direction. In addition to the remarkable green cover, the University is growing organic food for its inmates and gradually expanding to commercial capacity.

The whole process has proved successful beyond measure. While we have been able to completely put an end to food waste, the transformation of the waste product to wealth has opened the gates to a world of opportunities for income generation and entrepreneurship. Indeed, this is only the beginning.