



FOOD RECYCLING: STRATEGIES FOR FOOD WASTE REDUCTION

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Abstract:

Food waste has taken on disquieting proportions worldwide in all steps of the food production and supply chain. Processing can be done to reduce losses of perishables like fruits & vegetables. Preparation & preservation of fruits in the form of jams, spreads, jellies, crushes, and squashes can be done. Vegetables can be frozen or dried to increase their shelf life. Similarly, animal foods can also be treated to increase their shelf life. Liquid milk can be dried or concentrated for future use. Grains, nuts & oilseeds can be stored properly to avoid deterioration & subsequent throwing them away. One can use these preserved & processed foods in the times of high price or food scarcity or seasonal unavailability. Technologies for the collection, sorting/grading, stabilization and productive use of food waste, by-products and packaging material need improvement or development. There needs to optimize the performance of the whole food system, including packaging, catering and consumers, and achieve a secure and sustainable food supply, also for the poor. Food waste can be recycled into useful resources like compost. Food donations can be encouraged & non-perishable as well as unspoiled perishable foods can be donated to food banks, soup kitchens, pantries & shelters. Reducing food waste has economic, environmental and social benefits.

Keywords: food waste, food production, perishables, recycling.

Introduction:

One-third of all the food produced on earth is discarded equaling 1.3 billion tons of wasted food annually (Gustavsson, J. et al., 2011). Although food waste is rich in nutrients and energy, the vast majority of this discard is also not recycled, partially because conventional methods for processing food materials are neither efficient nor sustainable. As resources on the planet become increasingly limited, there is a pressing need for the development of new technologies to efficiently reclaim food waste products, turning them into valuable incentivized commodities rather than financial and environmental burdens to society (<https://dornsife.usc.edu/wrigley/research-blacksoldierfly>). Food waste is a





contentious issue at times where hunger amongst the poor is still prevalent, and also vulnerable persons increasingly have to fear for food insecurity due to frequent food price peaks and adverse economic tidings.

Globally food supply chain losses account for one quarter of freshwater and one-fifth of cropland and fertilizer use (Kummu, M. et al., 2012). Food waste can also be framed as an issue of resource extraction and consumption. Hall, K. D. et al. (2009) studied the increase of food waste and its impacts by conducting their own calculations of the amount of energy content wasted in natural resources when food is not consumed. They focused on the growth of food waste over time and the losses in freshwater and fossil fuels, which in turn contribute to global climate change.

While people give attention to recycled inorganic wastes such as plastics, glass and metals; kitchen waste & food waste which are rich in organic material and possesses more than 90% of biodegradability can also be easily recycled into compost (Veeken, M. & Hamelers, M. 1999). Composting of kitchen waste can be an effective method to reduce waste in landfills while helping conserve the environment. Kitchen waste & food waste are produced everyday and everywhere from the farm, post-harvest, processing, transporting, wholesaling, retailing and the consumers as well as from processed and also from unprocessed foods from human consumption (Fang, M. et al., 2001; Ishii, K. & Takii, S., 2003; Cekmecelioglu, D. et al., 2005; Stabnikova, O. et al., 2005; Cayuela, M. et al., 2006; Chang, J. & Hsu, T., 2008).

In India, nearly 30% of the country's fruits and vegetables are lost due to lack of cold-storage facilities, and more than 30% of the grain supplied through the public distribution system is lost as well. Worldwide, food waste has increased rapidly. Food waste is an issue in all of the major economies in the world (Venkat, K., 2011). Evidence from the Food and Agriculture Organization (FAO) also suggests that close to one third of the edible parts of food produced for human consumption is lost or wasted globally, equivalent to around 1.3 billion tons per year, and that the size of food losses and waste varies greatly by type of food, country or region and the stage in the food supply chain (Gustavsson, J. et al., 2011). Specifically, worldwide food





losses and waste per year are estimated at around 30% for cereals, 40 to 50% for root crops, fruit and vegetables, 20% for oil seeds, meat and dairy and 30% for fish. Compared to other types of food; fruits, vegetables, roots and tubers suffer from relatively high losses and waste throughout the supply chain (Parfitt, J. et al., 2011 & Rutten, M. 2013).

Food waste has taken on disquieting proportions worldwide in all steps of the food production and supply chain. Technologies for the collection, sorting/grading, stabilization and productive use of food waste, by-products and packaging materials need improvement or development. There needs to optimize the performance of the whole food system, including packaging, catering and consumers, and achieve a secure and sustainable food supply, also for the poor (ec.europa.eu/research/participants/portal/.../2112-waste-2-2014.html). Food waste is slowly gaining momentum as a critical issue, particularly in cities where its volume and impacts are more pronounced than in less densely populated areas. Eliminating global food waste would not only save these vital resources, but provide enough food to feed billions of people.

Food Waste Recycling:

Food waste generated by disease, spoilage, restaurant plate waste and plant and animal material produced during processing are not suitable for human consumption. These are better suited to composting. Other waste can be recovered to be consumed. Examples of waste that can be recovered for consumption are: edible crops remaining in fields after harvest, blemished food, surplus perishable food from restaurants or caterers and surplus packaged foods from retail food outlets.

Disposal of kitchen & food waste which contains about 80% of moisture to the landfills causes various problems like easy putrefaction, offensive odour and pollution of ground and surface water by leachate (Wang, Q. et al., 2001). Due to interruption of the carbon cycle by disposal of waste to landfills, organic kitchen waste requires proper composting system to reduce its uncontrolled degradation on disposal sites and subsequent greenhouse gases, odour and nutrient emissions (Luostarinen, S. & Rintala, J. 2007). In addition, kitchen waste may be wasted if it is just





dumped to landfills as it will break up naturally and never be used directly again, having its nutritious matter lost within the waste. Food waste can be recycled into useful resources (<http://www.foodwastenetwork.org.uk/content.html?contentid=12>).

Processes used to recycle food waste include-----

In-vessel Composting:

Composting is a familiar concept-with microbes, moisture and warmth, organic matter can break down naturally into nutrient-rich fertilizer. To make sure that all types of food waste can break down quickly and successfully, the organics recycling industries use in-vessel composting. This is essentially an enclosed compost heap with very well-controlled levels of microbes, moisture and warmth.

Food waste, often mixed with garden waste and used compostable packaging, is shredded to increase the surface area. It is held inside an enclosed composting vessel for around 2 to 4 weeks. During this time the conditions within the container are carefully controlled. Temperature is particularly important, as high temperatures are needed to ensure any pathogens in the decaying food are destroyed. The resultant material is matured in piles for several weeks before being screened for contaminants or larger pieces. The final result is nutrient-rich fertilizer which is a valuable can be used to improve soil and growing plants.

Anaerobic Digestion:

Anaerobic digestion uses microorganisms to break down food waste in the absence of oxygen. It is then heated up to kill pathogens (microorganisms carefully controlled). This process produces biogas, a mixture of methane and carbon dioxide which can be used to produce heat, electricity or transport fuels. It also creates nutrient-rich bio-fertilizer which can be used in farming as a natural fertilizer which improves soil & helps grow plants.

United States Department of Agriculture (USDA) suggests that food waste can be reduced by composting poultry as well as by dairy manure management (www.usda.gov/oce/foodwaste/resources/recycle.htm). Composting, a process that speeds up the natural decomposition of organic





materials, provides a recycling alternative to tossing food waste in the garbage. Using compost as a soil amendment has a variety of benefits. For example, compost enhances rainfall penetration, which reduces water runoff and soil erosion. This in turn reduces sediment, nutrients, and pesticide losses to streams by 75-95 percent. Compost also improves the soil and enhances beneficial microbes that help reduce plant diseases and pests.

Recycling food discards to other uses, including animal feed, composting, and energy generation, helps to keep food waste out of landfills (www.epa.gov/epawaste/conserve/composting). In addition, by recycling food waste, one can free up resources for other uses – and reap the benefits of fed animals, energy generation, and improved soil quality and carbon stocks (www.howtocompost.org/info/info_composting.asp).



USC Wrigley Institute's Food Waste Recycling Biotechnology Project (<https://dornsife.usc.edu/wrigley/research-blacksoldierfly/>) is exploring the use of new techniques for recycling food waste and compostable materials, using the natural life cycle of the black soldier fly. With populations distributed worldwide, black soldier flies are hardy and do not transmit disease or act as human pests. As they grow, fly larvae feed on solid and liquid decaying matter, helping to break down and "recycle" decomposing organic material in the process. The digested products exhibit lower acids and alcohols compared to standard fermentation products and can be used in a range of applications: solid products collected from the flies provide nutrient-rich compost, while the liquid products can be processed into fertilizer and chemicals such as melanin for use in novel biodegradable batteries. The larvae themselves may also be harvested and used for animal feedstock or biodiesel production.





Environmental Impact:

Reducing food waste is a major issue and not just about good food going to waste; wasting food costs a lot and has serious environmental implications too.

The amount of food people throw away is a waste of resources. One should think about all the energy, water and packaging used in food production, transportation and storage. This all goes to waste when people throw away perfectly good food. Cheese is a good example – feeding and milking the cows, cooling and transporting the milk, processing it in to cheese, packing it, getting it to the shops, keeping it at the right temperature all the time. If it then gets thrown away it will most likely end up in a landfill site, where, rather than harmlessly decomposing as many people think, it rots and actually releases methane, a powerful greenhouse gas.

Strategies to Reduce Food Waste:

The best thing that can happen to food is that it makes it to the plates of people and is enjoyed. Utilization of whole portion/s of the most of the food and drink purchased (especially perishables) rather than throwing it away which is beneficial both- financially and environmentally (Rutten, M. M., 2013). This will help reducing greenhouse gas emissions. Most of thrown food ends up in landfill sites where it rots and releases methane, a damaging green house gas. Throwing away food is also a huge waste of the energy, water and packaging used in its production, transportation and storage (<http://www.recyclenow.com/facts-figures/how-it-recycled/food-waste>).





One can opt for home composting which is a great way to stop waste ending up in landfill. One can also use a local food waste recycling collection service, to dispose of anything one can't eat, or compost at home. It can be recycled into a good quality soil improver or fertilizer and even generate electricity that can be fed back into the national grid.

Surplus food can be moved down the hierarchy of waste management and can be redistributed. As the Food and Agriculture Organization states---
-“There is a need to find good and beneficial use for safe food that is presently thrown away”. Food waste is forecasted to climb with population growth, demand for food, and increasing affluence. Food industries, retailers and consumers all need to be aware and act upon this issue. A few simple efficiency measures would not only be good for economic point of view, but have global benefits too.

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