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Circular Management of Organic Waste in Low- and Middle-Income Countries

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Editorial

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Editorial

Existing waste management practices and its hierarchy prioritization determines the well-being and prosperity of people. Solid waste management is one of the biggest challenges for the world and is acute in low- and middle-income countries where 30-70% of the waste is not collected [1]. In these settings with increased population, haphazard urbanization and industrial development, waste production has also increased and growing economic crisis have worsened the situation. The authorities are following an un-ethical and inappropriate transport and disposal-oriented approach. The designated waste dumping sites are filled to their capacities and as per international standards most of them do not operate proper sanitary landfill facility leading to site overflowing and illegal dumping. Waste collection and transport alone constitute more than 70% of the total waste management costs, whereas land cost is also exceptionally high with an absolute ignorance towards human health and environmental costs [1].

Organic waste is one of the most unaddressed real-world issues whose management is critical for authorities and require urgent action. This biodegradable component is seriously threatening environmental and human health. In low-and middle-income settings, it takes over a major proportion of more than 50% of the municipal solid waste and can go as high as 80%. It mainly consists of kitchen and food waste from households, institutions, and commercial entities, fruit and vegetable markets, food supply chains, animal manures, slaughter-houses, aqua and agriculture [2]. Innovative and circular strategies are required in the ways we manage huge amounts of organic wastes.

Circular economic system can be defined as the one where no material is waste until it holds any economic use and value. The well-accepted concept of Circular Economy (CE) revolves around three basic principles as mimicked from natural loops/life cycle [3].

- Slowing resource loops: designing a product in a way that it becomes most useful.
- Narrowing resource flows: ability to reuse the useful aspect of any product.
- Closing resource loops: it is to design a product so that it can be used in new economic loops once its useful life expires as a certain product.

The linear model of take, make, use and waste needs to be replaced with the circular model in which the use of material and products must be extended to the maximum possible limit [3]. The material humans declare as organic waste is in fact organic matter which can truly be called 'natural' and not the waste. It has all the potential of producing new beneficial products if it becomes part of natural circular economy cycle. Instead, humans spend a lot of financial, human, and technological resources to discard all benefits and 'dispose' this material. It can be converted into natural nutrient which can then produce organic food and feed and can nourish a healthy food chain and supply system. Organic waste is yet an underutilized resource due to its perceived lower economic value by both waste management companies and society and is not considered worth of recycling [2].

Prioritizing the minimization, management, recycling and valorization of organic waste can definitely alleviate a huge burden from the waste management sector in the low- and middle-income settings including government and NGOs, private companies and public. This action will divert the problematic waste component from disposal sites, minimizes the pollution load, save huge waste management and land costs, protect soil and water resources contamination and improve the overall health and well-being of the society. Such

an initiative is the need of hour for the regions especially for islands where land is scarce and landfill sites are already filled to their capacities. It is also important for the industries and commercial entities to set aside space for on-site food waste segregation and treatment systems and include them in their designs at the developing stage.

Resource circularity can be ensured by implementing proper waste segregation in the proximity of source especially at the household or community level and then managing it right there with a suitable waste collection plan which is known as 'decentralized waste management approach' [2]. Once waste is dumped in mixed form nothing much can be done because sorting at disposals sites is labor extensive, time consuming and require expensive machinery. This allows utilization of each waste component to its full potential that could be repaired, reused, recycled, remanufactured, and refurbished, making it sustainable and a valuable component of economy with maximized functionality.

There are many organic waste recycling and treatment methods that convert waste into new products with a potential value both near the source or disposal. The commonly practiced options include direct animal feeding, land application, aerobic compositing, vermi-composting and anaerobic digestion [4]. Another emerging and very promising organic waste valorization method of this generation is Black Soldier Fly Larvae (BSFL) technology [2,4,5]. It constitutes an army of fast growing and resilient insects that voraciously attack and feed on a large variety of organic wastes with food waste as one of their favorite dishes. Its application is gaining much popularity due to the strong economic, social and environmental benefits, high degree of waste reductions, reproduction rates and large biomass conversions. The tiny little champions (larvae) reduce, treat and bio-convert the organic wastes into high quality economically valuable products for both animals and plants. Larvae eat and consume waste, grow from few mm to 2 cm in length, gain weight and make up a body mass of almost 45% protein and 35% fats in just two weeks [4,5]. These adult fattened larvae can then be used as an organic protein-rich animal feed that can be fed to poultry, fish, birds and pets. The process results in 100% waste reduction, as more than 80% of the waste is reduced by weight and volume, the remaining 10-20% is the left-over of the digestion process known as residue or frass which holds soil fertilizing properties [4]. Negligible carbon foot print, no leachate production, significant pathogenic reduction and ensuring food security are other key properties. Circular management of organic waste in low- and middle-income settings can be ensured by the application of a suitable circular method and approach that meets the local conditions i.e. socio-economic, legal, institutional, and weather of that region.

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