



Prospects of Coconut Waste Management for Sustainable Development in Patna

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Abstract

Patna, the capital of Bihar is facing a significant upsurge in the burden of solid municipal waste in recent times. Coconut forms a heavy component of municipal solid waste. As residents of the town are becoming more health conscious and opt for natural beverages like coconut water over chemical-laden soft drinks, the demand for coconut and coconut water and its consumption is increasing continuously. The increasing consumption of coconut has increased the heaps of solid municipal waste in Patna. However, if coconut waste is managed systematically and scientifically it has the potential to produce cocopeat, coco pith, coco manure and biodegradable packaging material, etc. simultaneously, reducing the burden of landfill sites. There is increasing demand for cocopeat and coco pith for terrace gardens nurseries and other plantation activities in the town. Coconut waste has significant economic and environmental potential. There are abundant economic opportunities in coconut waste management with environmental protection which are untapped in the city. The paper is based on primary and secondary data. This research paper analyses the prospects of managing coconut waste for sustainable development in Patna.

Keywords: Coco manure, Coconut, Cocopeat, Coco pith, Municipal Solid Waste Management.

1. Introduction

Patna, one of the most populous cities of the State with a huge population of 1,683,200 as per the census of 2011, is well known as a major agricultural hub. During the last two decades, Patna has registered sustained economic growth. The city has shown trends of growth with the development of the fast-moving consumer goods industry, growth in the service sector, and reverse migration. (Bihar Economic Survey, 2022-23). Rising trends in the density of the population of the town, economic growth of the city, rise in per capita income of the people, and increasing consumerism have led to the problem of increasing municipal solid waste generation in Patna. (Kumari, Kalpana 2024) Increasing waste generation is a serious issue, if it is not managed properly, it creates a serious threat to the health of human beings and the environment. The present study attempts to analyse the status of waste

generation and municipal solid waste management in the town. It attempts to examine the existing waste collection system with a special focus on coconut waste management. The paper analyses the prospects and opportunities in the area of coconut-waste management. The role of households and municipal corporations in Coconut Waste Management is discussed. Based on the study made in Patna, suggestions are recommended for the betterment of the existing system.[1-4]

2. Literature Review

Indian Coconut Journal (2023) emphasizes that the coconut tree is mentioned as Kalpavriksha, God's gifted tree of heaven. According to the literary shreds of evidence depicted in the epic Ramayana, coconuts were present in India during that period. It further reports that coconut water was given intravenously to patients during the Second World War due to a

shortage of regular saline water. Kumari, Kalpana (2024) has discussed the problem of increasing waste at the landfill site of Patna. It creates a very unhygienic environment for the people living in the nearby area. But the remarkable aspect of this waste is that a major component of this solid waste is organic. If efforts are made, then this biodegradable waste can be converted into black gold, i.e., organic manure, Bhakar et.al. (2023) have discussed the use of cocopeat and vermicompost as in soilless growing media in cultivation and they have further analysed the importance of the application of cocopeat in areas where there is a shortage of water, the fertility of the land is low, the area which is suffering from soil salinity and other ecological problems. Its special features, such as water resistance and enhanced aeration, help increase agricultural yield. Cocopeat can be used in drylands as a water conservant. Prakash et al (Journal of Medicinal Plants Studies, 2021) have discussed the importance of the by-product of coconut husk, coir pith. The porosity of coco pith is very high and has a very high moisture-holding capacity which makes it very useful for soil amendment. After composting coco pith becomes very useful for increasing agriculture productivity. Ministry of Micro, Small & Medium Enterprises, Govt. of India, (2016) has highlighted the significance of coconut waste and its eco-friendly applications. The report describes that for a longer period, coir pith was treated as a waste product after extraction of coconut shell from the kernel. But in recent years' coco pith has been utilised in

horticulture practices for organic farming. It helps increase the income of the farmers. Maurya, R.K. (2011) has evaluated the use of cocopeat as an organic rooting media in guava production. It was found that cocopeat was a good rooting medium in the air layering of guava.

3. Methods

The research is based on primary and secondary data. A random sampling method was used in the field survey. A direct interview of street vendors dealing in the sale of tender coconuts was conducted. Government reports and studies related to biodegradable solid waste management were reviewed. [5-6]

4. Analysis of Current Solid Waste Management Practices in Patna

The solid waste management system is not systematic, scientific, and sound in the city of Patna. Waste Generation in Patna Municipal Areas- At present, around 1000-1200 Tonnes Per Day (TPD) of waste is generated every day; per capita generation is approx.450 gm to 600 gm per day. It was 1010 TPD in 2011. It has been estimated that in coming years, the quantity of waste generated will increase with the increase in the city's population and economic growth. (Census Report, 2011 & UD&H Dept.) The status of waste generation in Patna is depicted in the following table Table 1 shows Waste Generation in Patna Municipal Area, Table 2 shows Composition of Solid Waste

Table 1 Waste Generation in Patna Municipal Area

| Year | 2011 | 2016 | 2021 (estimated) | 2026 (estimated) | 2031 (estimated) | 2036 (estimated) |
|---------------------------|----------|----------|---------------------|---------------------|---------------------|---------------------|
| Waste Generation in Patna | 1010 TPD | 1277 TPD | 1514 TPD | 1836 TPD | 2299 TPD | 2570 TPD |

Table 2 Composition of Solid Waste

| Composition of Solid Waste | Vegetable and Putrescible fractions | Combustible Fractions | Non-Combustible Fractions |
|----------------------------|-------------------------------------|-----------------------|---------------------------|
| | 49% | 12.5% | 38.5% |



**Figure 1 Heaps of Waste at Ramachak Bairia
Landfill Site in Patna**
Source <https://www.bhaskar.com>

5. Result & Discussion

It can be seen from Table 2 that a major portion of waste generated in Patna comprises biodegradable matter. If it is processed scientifically and systematically, there are abundant opportunities in this biodegradable solid waste of the city. The systematic and scientific treatment of biodegradable waste will help add value to the economy with environmental protection. This research paper focuses on coconut waste as a component of biodegradable and recyclable waste, which can be treated properly and systematically and can do wonders in the field of waste management. [7-8]



**Figure 2 Opportunities in Coconut Waste
Management in Patna Tender Coconut**

The coconut, *Cocos nucifera*, L., is often referred to as God's gifted Tree of Heaven, Kalpavriksha, Tree of Life, and Nature's Super Market. It holds cultural,

social, and religious significance in certain societies, where it features in their mythologies, songs, and oral traditions. The coconut also has ceremonial importance and has acquired religious significance from the birth to the death of a person in South Asian cultures, where it is used in Hindu rituals. In Sanskrit, it is called kalpavriksha, meaning "the tree which provides all the necessities of life." Coco peat, also called coco pith, is the residual substance post-fiber extraction from the outer coconut husk. It serves as a natural medium for the growth and flowering of plants. As coco coir is enriched with trichoderma fungi, it safeguards roots and supports their development. Its impeccable air-to-water balance renders overwatering nearly impossible, creating an ideal habitat for plant roots. This versatile medium caters to diverse planting needs, ensuring robust growth and nurturing plants in an environment that promotes vitality. Earlier, coir pith was considered a waste product of the extraction process and was dumped outside of coir fibre mills, causing huge environmental pollution issues. But since the last two decades, the utility of coco pith has been realized. Due to rising fertilizer prices and environmental concerns associated with the use of coco pith and coco coir, recent years have witnessed growing interest in utilizing coir pith as a method of practicing organic farming in the field of horticulture and floriculture.

6. Coir Pith

Coir pith is a by-product of coir processing factories. The coconuts are separated into two main parts -- kernel and husk. The kernel is used as food or another kind of product like coconut oil. After fibre mills, separate coconut husk is used to extract fibre. In this process of fibre extraction, around one-third of the product is yielded as fibre, whereas two-thirds of it becomes coir waste. Coconut fibres are closely packed with non-fibrous light weight and fluffy material, which is termed as coir pith or coir dust. It constitutes around 50-70 percent of the coconut husk. The spongy material that binds the coir fibre in the coconut husk is coir pith. Coco peat, derived from processed coir pith, closely resembles sphagnum peat and shares many of its characteristics, making it a popular alternative in horticulture. With the rise of

commercial horticulture and the declining availability of sphagnum peat, coco peat has gained international recognition as a valuable soil amendment and a key component in soilless growing media. It is widely used in plant propagation, tissue culture, hydroponics, greenhouse cultivation, soil conditioning, and lawn establishment. [9]

6.1. Usages of Coir Pith

- Organic manure
- Particle Board
- Mulching effect as it can retain the moisture and soil conditioning
- Checks the erosion
- Textile industries
- Cultivation of Mushroom
- Potting material for seedling growth
- Biogas production
- Wetting agent
- Activated carbon



Figure 3 Coir Pith



Figure 4 Coir Pith Blocks



Figure 5 As a Base for Home / Vertical / Roof Garden



Figure 5 Demonstration of Vertical Garden at CCRI

Despite its benefits and abundant availability, coir pith remains underutilized, leading to significant waste accumulation near coir processing units. This poses environmental risks, such as disposal challenges, fire hazards, and groundwater contamination due to the release of phenolic compounds. Its high carbon-to-nitrogen ratio (112:1) and lignin content result in slow degradation, limiting its direct use as organic manure. Composting coir pith offers a sustainable solution to these waste management issues, enhancing its utility in agriculture. [10-11]

7. Major findings

- It was found that the street vendors are depositing the consumed tender coconuts directly into the waste collection bin/van.
- Most of the street vendors were not aware that coconuts could be recycled in the form of cocopeat or coco pith.
- There was a lack of awareness among the consumers that coconut can be reused as cocopeat for growing plants.
- There is a lack of awareness among consumers as well as sellers of coconut that it takes a very long time to decompose.

8. Policy Recommendations

- In the field of coconut waste management, Municipal Corporation of Patna has a great role to play.
- They can establish coconut-waste processing units in the town, where used coconuts can be recycled.

- They can take the initiative to collect the consumed tender coconut from the street vendors to the processing plant.
- The recycled products like cocopeat or coco coir from the processing units can be distributed to nurseries and government institutions for use in the pots for planting materials.
- Promotion to Start-Ups in Coconut Waste Management The government should provide incentives to promote start-ups in the field of coconut waste management. Seed Capital and tax holidays can be provided.
- At the University level, incubators should be created in consultation with the Professors.
- There is a need to create awareness among citizens that coconut waste can be reused in terms of coco pith or cocopeat for terrace farming of using as a medium for potting plants.

Conclusion

It can be inferred from the above research article that there is a problem of increasing waste generation in the city. It can be reduced with the scientific and systematic treatment of waste. Consumed coconuts, which are adding to the size of heaps of waste in Patna, can be converted into opportunities for employment generation and organic farming. It will also help in reducing the amount of soil in horticulture and floricultural practices. It will help create employment opportunities as well as add value to the State Domestic Product with environment protection, leading a step towards green economy.

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