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A TECHNO-ECONOMIC ANALYSIS OF COMPOSTING DEAD BIRDS USING LOW COST CARBON MATERIALS

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Abstract: The safe disposal of dead birds is a major challenge in poultry farming. This study assessed the techno-economic feasibility of composting dead birds using cage layer manure (CLM) and low cost carbon sources like coir pith waste and dried sugarcane tops. Five treatment combinations were tested in compost bins under controlled conditions. Results showed that composting with dead birds was economically viable, with production costs ranging from ₹0.83 to ₹0.85 per kg and reasonable profit margins. While CLM alone yielded higher profits, composting carcasses added value through improved waste management and biosecurity. The method offers a low cost, sustainable solution for carcass disposal in poultry farms.

Keywords: Dead bird composting, Cage layer manure, Coir pith waste, Poultry waste management.

Introduction

Poultry production has experienced significant intensification in recent years, resulting in larger production units with higher bird densities. While this enhances productivity, it also generates considerable volumes of organic waste, including manure (excreta), litter or bedding material, waste feed, feathers, broken eggs and most critically, dead birds. The safe and sustainable disposal of such waste is essential to mitigate risks associated with environmental pollution and disease transmission, thus ensuring farm level biosecurity (Casey *et al.,* 2006).

Among the various waste components, the disposal of dead birds presents a persistent challenge for poultry growers due to its volume, potential for disease spread and the need for biosecure handling. Traditional disposal methods such as incineration, burial or rendering are either cost-intensive, environmentally unsustainable or not readily accessible in rural or resource limited settings (Kalbasi *et al.,* 2005). As a result, the poultry industry is increasingly exploring more sustainable and economically feasible alternatives for carcass disposal.

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Composting has emerged as a promising method for managing dead bird waste in an environmentally sound and cost effective manner. It is a natural biological decomposition process that occurs under aerobic and thermophilic conditions (Mukhtar *et al.,* 2004). This process not only ensures hygienic disposal but also results in nutrient rich compost, which can be used as organic fertilizer, thereby generating value added products for the farm.

The economics of composting are significantly influenced by the choice of carbon sources required to balance the high nitrogen content of carcasses. Commonly used materials such as poultry litter (McCaskey, 1994), sawdust (Keener and Elwell, 2003), sorghum hay and paddy straw (Sivakumar *et al.,* 2007) have proven effective. However, their inconsistent availability and rising costs pose limitations to large scale or long term adoption. To overcome these economic and logistical constraints, the use of locally available, low cost carbonaceous materials is being explored. In this context, materials such as coir pith waste (a by-product of the coconut industry) and sugarcane tops (an agricultural residue) offer a viable alternative due to their abundance, low cost and carbon rich composition. Additionally, the incorporation of cage layer manure (CLM) a readily available on farm resource further reduces the dependency on external inputs, enhancing the economic feasibility of the composting process.

This study investigates the viability and cost effectiveness of dead bird composting using CLM in combination with coir pith waste and sugarcane tops. By focusing on low cost and locally available materials, this approach aims to develop a sustainable and scalable waste management model that not only addresses environmental concerns but also provides economic benefits to poultry farmers.

Materials and Methods

Study area and Climate

The dead bird composting experiment was conducted at the Livestock Farm complex, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India. The location lies in the northwestern agro-climatic zone of Tamil Nadu, at 11˚09′42.1″ N latitude and 78˚09′39.7″ E longitude, with an altitude of 192 meters above mean sea level (MSL). The region experiences a semi-arid tropical climate with maximum temperatures ranging from 31°C to 39°C, minimum temperatures from 13°C to 24°C and an average annual rainfall of 908.5 ± 6.19 mm.

Mini Composter

A mini compost bin of dimensions 4 feet × 4 feet × 4 feet was constructed using country wood planks. Each side of the bin was made with 4 inch wide wooden planks, spaced 2 inches apart to allow for sufficient aeration, following the methods described by Donald *et al.* (1996) and Sivakumar *et al.* (2007). A total of ten compost bins were prepared and arranged in two rows under a tile roofed shed to protect the contents from rainfall and direct sunlight.

Selection of Ingredients

The composting materials used in the study included dead birds and cage layer manure (CLM), which were obtained from nearby commercial poultry farms. Two low cost carbonaceous materials were also used: coir pith waste, collected from a local coir industry and dried sugarcane tops, sourced from farmers fields in the surrounding areas. All materials were manually inspected to remove any non-degradable contaminants and prepared appropriately for composting. The composting mixtures were formulated to maintain a standardized carbon to nitrogen (C:N) ratio of 20:1 and the moisture content was maintained between 50 – 60 percent, which is considered optimal for efficient thermophilic aerobic composting.

Composting Procedure

Each compost bin was filled in sequential layers, starting with cage layer manure, followed by dead birds and then the selected carbonaceous material (either coir pith waste or dried sugarcane tops). Water was added to achieve the required moisture content. This layering continued until the bin was filled. The composting process was carried out under aerobic conditions.

Treatment Groups

The study consisted of five treatment groups, as detailed below:

T_1 – Dead birds + Cage layer manure + Coir pith waste + Water

T_2 – Dead birds + Cage layer manure + Dried sugarcane top + Water

T_3 – Cage layer manure + Coir pith waste + Water

T_4 – Cage layer manure + Dried sugarcane top + Water

T_5 – Cage layer manure alone (Control)

Each treatment was replicated equally and all bins were managed under identical environmental conditions.

Cost of Production Assumptions

The cost of compost production was calculated based on the following assumptions:

- Wooden compost bin cost: ₹450.00 per bin
- Concrete slab cost: ₹575.00 per bin
- Labour charges (for loading, remixing, and unloading): ₹40.00 per bin per composting cycle

- CLM and dead birds: obtained free of cost
- Carbon sources (coir pith waste and sugarcane tops): obtained free of cost
- Interest on fixed investment: calculated at 10 per cent
- Depreciation: 5 percent for concrete slab, percent for wooden bins
- Fertilizer value of compost: estimated based on the prevailing market price of organic fertilizer (per kg)
- Although the bins were used only once in the current study, in practical farm conditions, bins are typically reused for multiple composting cycles, thus reducing the per cycle cost over time.

Statistical analysis

The data thus collected were statistically analyzed as per the methods suggested by Snedecor and CoChran (1869).

Results

The recurring expenditure involved in the compost production process was ₹169.10 across all treatments. The cost of finished compost per kilogram, calculated based on manure value, was ₹0.85 for T_1, ₹0.83 for T_2, ₹0.86 for T_3, ₹0.92 for T_4 and ₹1.08 for T_5. The profit per kilogram of compost produced was estimated as ₹0.34 for T_1, ₹0.32 for T_2, ₹0.30 for T_3, ₹0.38 for T_4, and ₹0.74 for T_5.

Discussion

The economic analysis indicates that the value of the finished compost ranged from ₹0.83 to ₹1.08 per kilogram across the treatments. Profit margins were relatively consistent among treatments T_1, T_2, T_3, and T_4, with values ranging from ₹0.30 to ₹0.38 per kilogram. This uniformity is attributed to the standardized initial carbon-to-nitrogen ratio and uniform filling of compost bins across these treatments. In contrast, treatment T_5, which consisted solely of cage layer manure (CLM), exhibited a higher profit margin of ₹0.74 per kilogram. This increased profitability is primarily due to the large quantity of a single ingredient (CLM) that was obtained free of cost, reducing input expenses significantly.

These findings align with those reported by Sivakumar (2006), who documented profit margins ranging between ₹0.39 and ₹0.46 per kilogram of dead bird compost. Beyond the direct economic benefits, composting of dead birds and poultry waste offers additional advantages such as environmental protection, improved waste management, odor and fly control, and reduction in storage volume. These factors collectively enhance the feasibility and sustainability of composting as an alternative method for poultry waste disposal.

Conclusion

Composting dead birds using CLM and low cost carbon materials is an effective, economical and eco-friendly disposal method. It ensures hygienic waste management while producing valuable organic fertilizer. This technique is well-suited for small and medium poultry farms, particularly in rural areas lacking access to conventional carcass disposal facilities.

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