ROLE OF LIVESTOCK IN CIRCULAR AGRICULTURAL SYSTEMS: TRANSFORMING WASTE INTO VALUABLE RESOURCES

Project Reference No.: 48S_MBA_0088

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Keywords:

Rural Development, Resources and Environmental Management, Transforming Waste into Valuable Resources

Introduction:

A Circular Agricultural System is a sustainable farming model that aims to minimize waste, close nutrient loops and make the most efficient use of resources; such as water, energy and nutrients - through RRR (reuse, recycling and recycle). Unlike the traditional linear model of agriculture (where resources are used once and waste is discarded), circular agriculture focuses on reintegrating by-products and waste back into the system to create added value. It minimise natural ecosystems, where nothing goes to waste and everything has a purpose in maintaining balance. Circular agricultural systems are about closing the loop-turning what would traditionally be seen as waste into valuable inputs, while reducing the environmental footprint of food production.

In circular agricultural systems, livestock serve as a vital link in closing nutrient and energy loops, helping to transform waste into valuable resources. Rather than being seen solely as producers of meat, milk and eggs, livestock are integrated into the farm ecosystem to enhance sustainability, reduce environmental impact and maximize the use of all available resources.

To address the growing global pressures on food, fibre and energy, sustainable and resilient agricultural systems are more vital than ever. Circular agriculture offers a solution by closing resource loops, minimizing waste, and maximizing the value of all inputs. Within this approach, livestock are essential, serving not only as sources of meat, milk, and eggs but also as crucial drivers of nutrient recycling, waste management and ecosystem improvement.

This introduction part explores how livestock can be harnessed as a vital link in circular agriculture transforming waste into resources, supporting biodiversity and contributing to climate-smart farming practices. By reimagining their role beyond traditional production, this study plans to uncover livestock's potential to drive the transition toward more sustainable and circular food systems.

Objectives:

1. To assess the potential of livestock in converting agricultural and organic waste into valuable resources, such as manure and compost.
2. To analyze the role of livestock in nutrient recycling and its influence on reducing the need for synthetic fertilizers.
3. To study the challenges and barriers faced by farmers in implementing circular agricultural practices involving livestock waste management.
4. To investigate the role of livestock in reducing food waste by converting by-products into high-value animal feed

Methodology:

This study was employed qualitative research methods to achieve a comprehensive understanding of the role of livestock in circular agricultural systems. The methodology was involved fieldwork and interview with people involved in conversion of cow dung into commercial resources. Peer-reviewed journal articles, books, government reports and other academic sources were analyzed to understand previous findings and identify gaps in the literature. The survey was done with selected farmers and Goshala (Ranganatha Goudiya Matha Goshala, Rashtrotthana Goshala, Shri Ghati Subramanya, Om Gaushala in Yelahanka etc.) who were actually converting waste into valuable resources, livestock into their farming

systems. This research methodology provided a comprehensive, multidimensional view of livestock's role in circular agricultural systems, focusing on both practical and theoretical aspects.

Result and Discussion:

Objective 01; Potential of livestock in converting agricultural and organic waste into valuable resources, such as manure and compost

A healthy cow weighs 3 to 3.5 quintals. When harvested, it offers about 70 to 50 of meat. Like, the money earned from the export of meat is Rs 3,500 and around 1,500 to Rs 2,000 for cow's blood. Then for 30-35 kilos of bones, they are priced at Rs 1,000 to Rs 1,200. Earn. Overall, by killing a cow the exporters may earn 7,000.

In the international market, the price of an organic fertilizer is 6 rupees (which is really very low), a cow brings a revenue of Rs 1,800 to 2,000 every day. (33 kilos of cow dung produces 330 kilos of organic fertilizer, isn't it? 330 x 6 rupees). More than that, these cows have no Sunday leave! According to this calculation, from a cow one year, that is, in 365 days, 1800 x 365 = 6,57,000. This is just the income from the cow. With a cow, it comes to an income of more than 1 crore 31 lakhs 40 thousand rupees, as it lives for about 20 years. A cow gives 2 or 2.25 litres of urine every day. Ayurvedic medicines made from cow urine can fully cure 48 types of diseases, including diabetes, tuberculosis, arthritis, all joint diseases, bone -related diseases and many others. (The sage has elaborately described all the benefits of the cow's urine in their code).

A healthy cow produces 10 kilos of dung and 3 liters of urine every day. 33 kilos of fertilizer can be produced from a cow dung we call it organic fertilizer. Even IRC scientists examined and proven that the cow's dung -based fertilizer was the best organic fertilizer. Scientists concluded that this organic fertilizer provides 18 microbes for soil. They confirmed that these microorganisms include manganese, phosphate, potassium, calcium, iron, cobalt, silicon and other nutrients. There are only 3 minerals in chemical fertilizers.

Objective 02; role of livestock in nutrient recycling and its influence on reducing the need for synthetic fertilizers.

The price of a liter of cow is Rs 500 in the Indian market. In the international market, this rate is even higher. Cow's urine is also given a patent in the USA. Cow's urine has 3 patents. The US government imports cow's urine from India and prepares medicines for cancer and diabetes.

The export rate to USA is currently around Rs 1,200 and Rs 1,300 per liter. According to that calculation, the income from the cow's urine is Rs 3,000 every day, the annual income is Rs 3,000 x 365 = 10,95,000, and the income from the cow's 20 -year -old is only 3000 x 365 x 20 = 2,19,00,000 (in words, 2 crore 19 lakhs). Millions of income from cow's urine. This same cow dung produces the gas called 'methane'. We can use it to cook it in our kitchen. We can also drive our two -wheelers and our cars from this gas. 17 crore cows in the country save about 1 lakh 32 thousand crores. If our entire transport is based on methane, we don't have to import petrol or diesel from Arab countries. We don't have to spend our foreign exchange. Our rupee is strengthened internationally. This is just possible with cows.

Objective 04; role of livestock in reducing food waste by converting by-products into high-value animal products, Various cow dung products across multiple categories, including their uses, benefits, and relevance in today's world:

1. **Cow Dung Cakes (Upla/Kanda);** it used traditionally in homes for cooking or heating. Also used in havan (fire rituals). Its market price now around ₹140 per dozen. It is also a renewable, low-cost, natural mosquito repellent when burnt.

2. **Cow Dung Logs;** Logs made by compressing dung in molds. These uplas are used as fuel and manure. Indian people prefer traditional product for cremation e.g. wooden logs and dried cow dung logs. Also, cremation using cow dung logs costs less as compared to fire wood or electricity or LPG gas. It price point is around ₹7 to ₹9 per kg.

3. **Cow Dung Diyas (Lamps);** Small lamps made from a dung-clay mix, Used in religious festivals like Diwali. Its market price now around ₹100 per dozen.

4. **Cow Dung Incense Sticks (Agarbatti);** Dung mixed with herbs and natural oils. Believed to have antibacterial properties. Its market price now around ₹240 per 250 grams.

5. **Cow Dung Paint ("Gau Paint");** using cow dung paint may help deter pests such as flies and mosquitoes, contributing to a healthier indoor environment. Cultural Heritage: For some, using cow dung paint is a way to connect with cultural heritage and traditional building practices. 1 Litre Prakritik Paint Cow Dung Distemper Paint at ₹ 122/litre.

6. **Cow Dung Idols;** Especially during Ganesh Chaturthi and Navratri. Fully biodegradable, returning to the earth without polluting water bodies. Market price of each idols ₹200 per idol.

7. **Agricultural Products;** Organic Manure, Vermicompost, Biopesticides etc.

8. **Wellness & Skincare Products;** Cow Dung Soap, Toothpowder etc.

Objective 03; challenges and barriers faced by farmers in implementing circular agricultural practices involving livestock waste management.

The potential of cow-based circular practices is vast—ranging from improving soil health, reducing reliance on synthetic chemicals, lowering carbon emissions, and providing alternative energy sources. Yet, despite the proven benefits, the widespread adoption of such practices faces multiple challenges such as;

1. Lack of Awareness & Knowledge
2. High Initial Investment & Financial Constraints
3. Infrastructure and Technology Gaps
4. Market Access & Commercialization Issues
5. Limited Scientific Validation & Research Support
6. Labour and Time Constraints
7. Lack of Cooperatives & Community-Based Models

CONCLUSION

This study explores the economic viability, environmental significance, and future scope of cow dung and urine-based products within a circular agricultural model. It

also examines the challenges faced by farmers in implementing livestock waste management practices and offers recommendations to overcome them. By harnessing the full potential of livestock resources, particularly cow waste, we can move closer to building resilient, sustainable, and self-reliant agricultural ecosystems.

The cow, often revered in Indian tradition and valued globally for its contributions, emerges as a powerful asset—not just spiritually or culturally, but economically and environmentally as well. While the one-time monetary gain from cow slaughter yields approximately ₹7,000 through meat, bones, and blood, the long-term, sustainable income from a live cow is exponentially higher. Daily, a healthy cow can generate income through its dung, urine, and by-products, potentially amounting to over ₹1.3 crore in its lifetime—just from organic fertilizer and cow urine-based products. Cow dung alone contributes significantly through eco-friendly alternatives like dung cakes, logs, lamps, incense sticks, idols, organic paint, and natural fertilizers. Each of these items holds both economic value and environmental benefit. Cow dung-based fertilizers enrich the soil with over 18 vital nutrients and beneficial microbes—far exceeding the value provided by chemical fertilizers. Moreover, biogas extracted from dung reduces our dependency on fossil fuels, offering a clean and renewable energy source. Cow urine, once overlooked, is now recognized for its Ayurvedic medicinal properties and even patented in international markets like the USA, where it's used to treat diseases such as diabetes and cancer. Its global market value, fetching up to ₹1,200–1,300 per liter, presents a massive export opportunity. When compared holistically, the economic, ecological, medicinal, and cultural benefits of preserving and utilizing live cows far outweigh the short-term profits of slaughter. Investing in cow-based sustainable industries not only strengthens rural economies but also supports environmental conservation and public health. With 17 crore cows in India alone, the country holds an untapped potential to revolutionize its agriculture, healthcare, and energy sectors—entirely rooted in its ancient wisdom and natural resources.

In essence, a live cow is not just an animal—it is a self-sustaining, eco-economic powerhouse that can drive both local livelihoods and national growth for decades.

Simulation of the Study

The study aimed to evaluate the practical, economic, and environmental feasibility of implementing a cow-based circular agricultural model. Selected 03 cow sheds unit was selected for a 10-day observation period. The focus was on recording and utilizing cow dung and urine for multiple sustainable purposes including fertilizer production, biogas generation, and the creation of eco-friendly products. The environmental benefits observed included improved soil fertility from organic manure, reduced use of chemical fertilizers and pesticides, and a notable reduction in greenhouse gas emissions through biogas utilization. However, it also revealed challenges such as the need for better processing equipment, market access for eco-products, and training for farmers. Despite these limitations, the simulation validated that a circular agriculture model centred on cows can be economically rewarding and ecologically beneficial animals.

Project Outcomes and Learning's:

1. Development of a Scalable Circular Agriculture Model: A functional model integrating livestock waste with farming, biogas generation, and value-added product creation was successfully designed. The model promotes zero-waste farming by recycling all cow-based outputs for productive use.

2. Boost in Organic Farming Potential; Cow dung compost, biopesticides and cow urine tonics were shown to improve soil fertility and crop health without harming the ecosystem. Adoption of such inputs reduces the need for chemical fertilizers and pesticides, lowering cultivation costs.

3. Creation of Rural Employment Opportunities; Manufacturing of dung-based products (e.g., diyas, agarbattis, organic paint) can provide livelihood options for rural women and youth. Encouraged the concept of self-reliant rural entrepreneurship through low-investment, high-demand eco-products.

4. Policy Support Can Accelerate Growth; Supportive policies, financial incentives, and streamlined subsidies are necessary to help farmers adopt and sustain circular practices.

Future Scope:

The future scope of this project includes:

1. Export-Oriented Business Models
2. Organic Farming Revolution
3. Sustainable Rural Economy Development
4. Green Energy Solutions

Filed survey Pictures;


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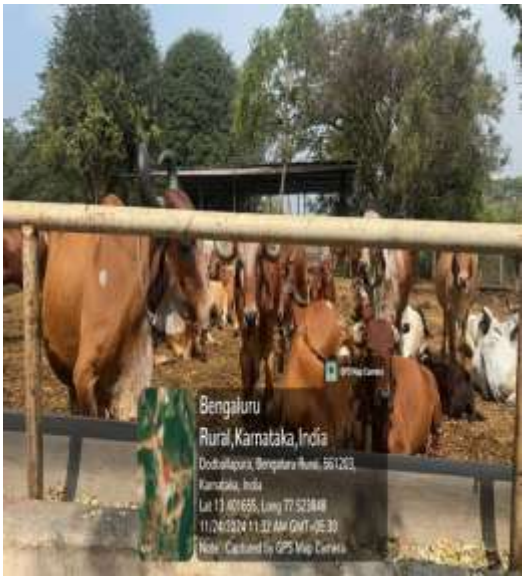
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