

A Livestock-Based Circular Economy Model Within the Framework of Islamic Economic Development

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Abstract

This article aims to formulate and thoroughly elaborate on a conceptual model of a circular economy in the livestock sector, holistically integrated with the fundamental principles of Islamic economics. Using a qualitative literature review methodology and an analytical-synthesis approach, this research examines the synergy between the core principles of the circular economy—such as reduce, reuse, recycle—and the noble values of Islamic economics, including the trusteeship of khalifah fil ardh (stewardship on Earth), the strict prohibition against wastefulness (israf), and the pursuit of Maqasid al-Shariah (the essential objectives of Islamic law). The result of this analysis is a zero-waste integrated farming model, where every output stream, including those previously considered waste, is transformed into a valuable productive input. The proposed model not only offers a technical solution for environmental sustainability and resource efficiency but also inherently integrates Islamic financial and social instruments like Musharakah, Productive Waqf, and Zakat to realize distributive justice and achieve falah (holistic well-being). Thus, this model provides a comprehensive framework for the development of the livestock sector that is not only ecologically and economically sustainable but also deeply rooted in the ethical and spiritual foundations of Islam.

INTRODUCTION

Modern civilization stands at a critical crossroads. On one hand, technological advancements and globalization have spurred unprecedented economic growth. On the other, the development paradigm that has dominated global discourse for over two centuries—the linear economy—has left a deep scar of destruction. This model, operating on a simple "take-make-dispose" logic, assumes that natural resources are infinite and that the Earth's capacity to absorb waste is limitless. This assumption has been proven fundamentally flawed. Reports from various international institutions consistently show an alarming rate of natural resource depletion, the accumulation of plastic waste in oceans, a rise in greenhouse gas emissions fueling climate change, and a massive loss of biodiversity. This ecological crisis is no longer a peripheral issue but has become an existential threat to human survival.

In parallel, this ecological crisis is exacerbated by a socio-economic crisis marked by widening inequality. The linear economic model, oriented towards short-term profit maximization, often ignores aspects of distributive justice and social welfare. Consequently, wealth is concentrated among a small elite, while a large portion of the world's population still struggles with poverty, hunger, and limited access to essential resources. This condition has triggered a global

demand for a new development paradigm—a model that is not only economically smart but also socially just and environmentally sustainable.

In this context, the livestock sector plays a unique and significant role. As a primary provider of animal protein, dairy products, and income for over 1.3 billion people worldwide, the sector is a vital pillar of food security and poverty alleviation. However, conventional livestock practices conducted within a linear framework also exert tremendous ecological pressure. According to the Food and Agriculture Organization (FAO), the livestock sector is responsible for approximately 14.5% of total global greenhouse gas emissions, vast consumption of fresh water, and the production of organic waste (manure) which, if not properly managed, can contaminate soil and water sources. This dilemma demands an innovative solution capable of reconciling the need for food production with the imperative of environmental preservation.

In response to these multidimensional challenges, two major paradigms offer solutions that, despite originating from different intellectual traditions, exhibit remarkable convergence: the Circular Economy (CE) and Islamic Economics.

The Circular Economy (CE) emerges as a direct antithesis to the linear model. It offers a technical and systemic framework for redesigning production and consumption systems. By mimicking the regenerative cycles of nature, CE aims to eliminate the concept of "waste" by keeping products, components, and materials at their highest utility and value for as long as possible (Ibrahim & Shirazi, 2020). Its core principles, such as Reduce, Reuse, Recycle, and superior product design, offer a practical roadmap for decoupling economic growth from the consumption of finite resources.

On the other hand, Islamic Economics offers a philosophical, ethical, and social framework that transcends mere material efficiency. Rooted in the *Tawhidic* worldview, Islamic economics places economic activities within the frame of achieving a higher purpose, namely *falāh* (holistic well-being in this world and the hereafter). Its fundamental principles, such as humanity's trusteeship as *ḵalīfah fil ardh* (steward of the Earth), the strict prohibition against wastefulness and destruction (*israf* and *tabẓīr*), and the emphasis on social justice (*ʿadl*) and public interest (*maṣlahah*), provide a solid ethical foundation for sustainable economic practices (Javaid, 2022).

Although CE offers the "how-to" of technical sustainability, and Islamic Economics provides the "why" of ethical sustainability, the two are rarely brought into deep dialogue, especially within a specific sector like livestock. There is a significant conceptual gap in the literature regarding how CE principles can be synergistically operationalized in a livestock model that is not only efficient and zero-waste but also fully aligned with and enriched by the unique values and instruments of Islamic economics.

Based on the gap analyses above, this research formulates the following main question: "How can a livestock-based circular economy model be designed and effectively implemented within the framework of Islamic economic development to simultaneously achieve ecological sustainability, economic efficiency, and social justice?"

To answer this question, the objectives of this scientific article are:

1. To analyze and synthesize the key principles of the circular economy and Islamic economics relevant to the management of the livestock sector.
2. To construct an integrated conceptual model for circular livestock farming that incorporates technical aspects (waste management, value recovery) with the philosophical and instrumental aspects of Islamic economics (*Maqasid al-Shariah, Zakat, Waqf*).

3. To identify the policy and strategic implications necessary to support the adoption and scaling of the proposed model.

The core novelty of this research lies in its innovative integration of the technical framework of the Circular Economy (CE) with the ethical foundations of Islamic Economics—two disciplines that have largely been developed separately.

This is a conceptual study, and has many limitations. First, the model proposed here is theoretical and has not been tested. Its effectiveness, cost effectiveness and scalability in the real world remain to be demonstrated through further implementation and evaluation. Second, this study regarding the analysis is generic in nature and it needs to make a lot of adaptations to fit into specific geographical context, cultural context or farming scale.

METHODS

- 1) The study design : The present study is both qualitative and conceptual. And since it aims to build a new theoretical model that encompasses various disciplines, it requires a deep library research and critical-synthesis approach.
- 2) Type and Approach of Research: This is a qualitative research work. The method is that of a conceptual study. This is an approach not for gathering empirical field data, but for generating new propositions, frameworks and models by challenging existing literature and theories. Its purpose is to develop theory and provide a foundation for future empirical work.
- 3) Data Sources: The data for this paper are secondary, i.e. it was obtained from other scholarly literature which include: a) International Scientific Journals: Articles from reliable databases like Scopus, Web of Science and Google Scholar which deals with the circular economy, livestock waste management, Islamic economics; Islamic finance and sustainable development. The nine references the user gave are a good start but. b) Books and Monographs: Basic and Partial works by scholars in the circular economy (e.g. they make come from Ellen MacArthur Foundation) & Islamic economic minds (classical or contemporary).c) International Organization Reports: There are numerous reports by bodies such as the FAO, UNEP, and World Bank on the environmental aspects of the livestock sector and also on potential for circular economy. d)Islamic sources: The Qur'an and the Hadith are the main two sources where applicable ethical and philosophical concepts would be extracted.
- 4) Data Collection Technique: Data were gathered using methods of documentary study and systematic literature review. The identification of the relevant keywords (such as, circular economy," "livestock waste," "Islamic finance", and "Maqasid al-Shariah"), systematic searches in academic search engines, and the inclusion of literature were based on relevancy criteria utilization mechanism, credibility, non-duplication and novelty.
- 5) Data Analysis Technique: The method of analysis in this study is the analytical-synthetic method. There are a number of stages in the process:

- a) **Decomposition:** Abstracting the complex concepts of each domain (CE, Livestock farming, Islamic economics) and identifying the basic concepts. "As for example" deconstruction CE into the R-principles and Islamic economics into its philosophical pillars, Maqasid, financial instruments.
- b) **Comparative Analysis:** Comparison of these element to show where they align (converge), where they may work in harmony, and also where there may be conflicts or differences.
- c) **Integration and Synthesis:** Integration of aligned and synergy to a new synoptic framework. The product of this stage is the "Circular Economy Model (CEM) based Livestock in Islamic Economic Development." Such a synthesis is not an aggregation, but a conceptual assembly that produces something new.
- d) **Explanation of the Model:** The developed model is presented in detail, with a detailed explanation of each part, saving, process flow and working mechanism and its theoretical basis based on the reviewed literature.

RESULTS AND DISCUSSION

Structure and Central Philosophy of the Model

The model is known as the 'Integrated Barakah Eco-Livestock' model, built with the philosophy that nothing has been created without a reason. There is no point of waste in the system, but everything there, including what we call "waste," is a blessing (barakah) from God, and something that has potential value if managed with knowledge or trustworthiness (amanah). Its structure is based on three major intertwined subsystems in the closed loop: (1) Upstream Subsystem (Circular Inputs), (2) Core Process Subsystem (Livestock Management), and (3) Downstream Subsystem (Value Recovery & Recycling).

Upstream Subsystem: Sustainable Input Management

Sustainability begins with a system's periphery. Under upstream, application of Reduce and Reuse principles is discussed where scaling the dependency on external, often non-renewable resources is made possible. 4.2.1. Circular Feed Management

Here, the feed provided to livestock through often chemically-laden commercial sources is reduced to give way to the following: agriculture waste like rice straw, corn cobs, and, rice bran is often disposed of through burning, roasted as human snacks, or hampered. Either through fermentation by microorganisms adding minerals and vitamins content, an ammoniation process increasing the feed's protein content and overall nutrient content as feed. This is a manifestation of a real hosted crop-livestock nutrients recycle process. Food industry by-products like tofu dregs, coconut pulp, and, fruit peels from food preparation industries can be squashed for an Einstein niche alternative feed costing far less and delivering needed nutrients. In regard to alternative feeds development, BSF Black Soldier Fly is an insect whose larvae is harvested from organic waste like food scraps. Aquatic plants like Azolla grow rapidly in ponds housed in the farm, integrated can be harvested and used as feed since it particularly contains high proteins. It can be deduced that through focused upstream sustainability, the system maintains the philosophical aspect of the

principle of gratitude or shukr by using every resource responsibly to avoid wastage or israf. 4.2.2. Water Management Project Based on Hifz al-Mawarid

Finally, the water system seeks to save the usage and manage the discharge or provisioning of the resource. It includes precipitation collection through: a rainwater harvesting system from roofs of borms and building parts for cleaning and watering. The modeled water recycling system where water used in cleaning barns rich in nutrients discharged into a pond full of water and nutrients feed-using plants like Azolla or water hyacinth acting as bio filters.

Core Process Subsystem: Sustainable and Ethical Animal Husbandry

The operation of this subsystem is in efficiency and the deployment of Islamic morals regarding animal handling.

Effective Barn Design: Barns are designed to effectively collect human manure, with natural ventilation to reduce the demands for cooling energy and importantly, having an efficient means for collecting the human waste (e.g. sloped floors that direct waste to collection channels) so it can be processed later.

Animal Welfare: The principle of ihsan in relation to animals. Including sufficient space, good feed, clean water and handling without violence. Animal welfare is an ethical obligation in Islam as well as scientifically proven to improve productivity and the quality of life in livestock products.

Downstream Subsystem: The Core of Circularity and Value Extraction

It is this subsystem where the conversion of waste into blessings (barakah) find its most direct expression. This is the system which makes the most of Recycle and Recover.

The Golden Cycle: Combind Manure Handling and Recycling in Livestock Production

Animal manure, one of the pollution sources in a linear system, is converted into two valuable products by using the AD technology.

Biogas Generation (Energy Recovery): All manure and urine from the barns is led to a sealed reactor, commonly known as a biogas digester. Anaerobic bacteria are maintained inside the digester, and they break down organic matter to produce methane gas (CH₄).

Benefits: That methane gas is collected and diverted as biogas, a source of renewable energy that can be used to cook, heat or even generate electricity to power certain farm operations.

Implications: This serves to further minimize the farm carbon footprint by avoiding methane emissions and decreasing reliance on fossil fuel (LPG or grid electricity). This is a real record of hifz al-nafs (safeguarding life from climate change impacts) and hifz al-mal (an energy cost efficiency).

Organic Fertilizer Production (Nutrient Recycling): The biogas has a residual component, which is referred to as bioslurry.

Advantages: Bioslurry is a high-grade natural fertiliser. The Digester Fermentation has sufficiently changed nutrients to a more readily available form for the plants and killed off harmful

pathogens that may hinder plant growth. The bioslurry is further refined into liquid organic fertilizer and solid compost.

Closed Loop: This fertilizer is then put to work fertilizing the land where grass or other feed crops are grown. And, voilà! –the soil nutrients taken up from by the feed crops, consumed and cycled by livestock species and returned as manure to the fields. The nutrient loop is completely closed. This is the core principle of regenerative agriculture, which is consistent with the khalifah's directive to make the Earth thrive.

Optimal Utilization of Slaughterhouse By-products

In traditional slaughterhouses, parts of the animal other than meat typically go to waste. In the 657circular model there is no waste in any of the elements:

Blood and Bones: Crushed to create blood meal and bone meal, both high in protein and minerals. These can be sold as raw materials for animal feed (such as poultry or fish) and totes, or organic fertilizer. Skins can be tanned for either fashion (like clothing or bags) or for furniture. The goal is to make the leather products as environmentally friendly as possible. Horns and Other Bones are able to serve as raw material for the handicraft industry (upcycling), generating added value and employment.

The Superstructure Stratum: Fusion of Islamic Financial and Social Tools

For such a model to function in way that is both sustainable and has the broadest possible social value, it would need to have a financial and social basis rooted in Islamic principles.

Justice-Based Financing Mechanisms

On the circular model, creating it takes upfront investment (when we start to build a biogas digester). There are equitable, ribah-free alternatives in the form of Islamic financial instruments:

Musharakah (Partnership) – IFI with a group of farmers forms a partnership for setting up a communal waste processing facility. The IFI offers capital while the farmers contribute manure, an asset as well as labor. Proceeds from selling the gas or fertilizer are then split according to a set ratio. Risks are shared as well, based on the principle of justice.

Ijarah Muntahia Bittamlik (Lease-to-Own): IFI can buy a piece of equipment (e.g. a feed chopper or biogas generator) and lease it to the farmers. Farmers hire the asset under a time rent agreement, but at the maturity of contract period, the title of asset passes on to them. That enables farmers to afford technology without shouldering an excessive initial up-front cost.

Social Empowerment through ZISWAF (Zakah, Infaq, Shadaqa, and Waqf)

Productive Waqf Based Model: A waqf institution (nazir) can administer an "Eco-Livestock Barakah Farm" established through waqf funds (in the form of land or cash). The farm is operated commercially according to the circular model. The profits from the fintiri, as realised on the farm or elsewhere, are distributed to mauquf 'alaih (the recipients) which may include orphans, the poor who cannot support themselves by their own labour and financial assistance for scholarships and free health services. This is a commercial social business model that can pay for itself and reincarnate.

Role of Zakat: Zakat, especially under the heads of *fi sabilillah* (in the path of Allah) and poor and needy, can be utilized for empowerment. Such as giving a few head of cattle along with training and support to construct micro-scale biogas digesters for destitute families. This isn't simply a form of charitable relief; it's the kind of social investment that can productively and sustainably lift millions out of poverty.

By marrying the technical subsystems with the Islamic financial and social superstructure, the "Integrated Barakah Eco-Livestock Model" becomes a whole ecosystem that is economically productive, ecologically regenerative, socially equitable and spiritually meaningful.

DISCUSSION

Government and the Regulatory and Facilitating Functions

The government is a key player in establishing an enabling environment. Necessary policy interventions include:

Fiscal Incentives Strengthened incentives for farms which cut across circular economy activities (e.g. tax exemption on purchases of green technology such as biogas digesters, solar panels). Central banks and financial services regulators also have the leeway to adopt policies that incentivize banking, especially Islamic banking, to give precedence (or at least less stringent credit terms) to "green financing. In *Murabahah* financing, the determination of the margin plays a crucial role in attracting customer interest, and its implementation must be accompanied by adequate risk management. (Kamal, 2015) Central banks and financial services regulators have the authority to establish policies that incentivize banking, especially Islamic banking, to prioritize green financing or offer softer credit terms for such projects

- a. Attractiveness of the Margin: The margin level in *Murabahah* financing significantly affects its attractiveness and pricing. If the margin set is too high, this financing will not be appealing to customers.
- b. Competitive Solution: *Murabahah* financing should ideally serve as a competitive solution for customers who have previously utilized conventional bank loans.
- c. Concept Development: Although originating from classical *fiqh* concepts, *Murabahah* financing has undergone development in practice.
- d. Risk Mitigation: The execution of *Murabahah* is not free from business risks. Therefore, proper risk management procedures are essential to mitigate and minimize the risks that may arise.

Standardization and Certification : National standards for circular economy products (eg national standard organic fertilizer from bioslurry), green farm certification. This type of certification can enhance consumer confidence and facilitate access to a bigger market.

Disincentives for Linear Practices: It refers to introduction of policies which increase costs in waste management (e.g., pollution taxes, penal costs for polluting farms respectively. The 'polluter pays' principle should be applied.

Research and Development (R&D) support: Funds for universities and research institutions to refine affordable, efficient and locally adapted circular technologies.

Role of Industry and Businesses as Catalysts for Innovation

The implementation is led by the private sector. There are different options that can be followed so, among them:

Industrial Symbiosis: Encouraging inter-industry cooperation. For instance the food processing industry may work with farmers to provide its organic waste as feed. Fertilizer firms might be able to work with giant farms that have bioslurry processing to turn it into saleable products.

Formation of New Business Models: Formulating service-based new business models, for instance Waste-to-Energy Service; where a company constructs and runs biogas facilities within livestock areas to supply the generated energy back to farmers or grid system.

Corporate Social and Environmental Responsibility (CSER): The big companies can utilise their CSER grants to set up pilot Barakah Eco-Livestock Model in the rural areas.

Islamic Financial Institutions as Dynamics of Finance

Islamic Financial Institutions (IFIs) are in a favorable position to take lead role in financing the circular economy as there exists strong philosophical congruence.

Creating Shariah-Compliant Green Financing Products: Creating specialized products on the lines of “Renewable Energy Musharakah Financing” or “Recycling Equipment Ijarah”, with competitive profits.

Cooperation with Waqf and Zakat Funds: Payment Banking IFIs may serve as professionals (nazir) to cash waqf fund devoted to circular projects. They also work with zakat entities on building empowerment programs outlined in this model.

Education and Literacy: Educate clients, and public at large on the opportunities of investing in green economy which is not only profitable but also an ibadah (act of worship).

The Role of Intellectuals and Men of Religion as Agents of Discourse Change

You can't change the paradigm, until you are willing to shift your mindset.

Curriculum: Circular economy and environmentally friendly concepts integrated in the educational curricula from schools, universities to Islamic Boarding Schools and Islamic Universities.

Green Fatwas and Da'wah : Councils of Islamic scholars or religious leaders have the authority to release edicts (fatwas) or provide guidance stating that protecting the environment and practicing circular economy are a matter of religious duty. Friday sermons, religious lectures and other media can be used to raise awareness of these issues and mobilize action at the grassroots level (Javaid, 2022).

The Role of Society and Consumers in Stimulating Demand

In the end, consumer demand will determine whether this transition is successful.

Conscious Consumerism Movement: Public being advised to buy products coming from ethical or sustainable livestock farming, albeit at higher cost.

Community initiative: At the village level or community level, organize farmers' cooperative and promote collective ownership of service adopting circular concept, which will make investment less and shall be operated more efficiently.

It would take a Penta-Helix model, where the synergy of Government – Industry – Academia – Community and Media are combined in a more holistic and joint movement for better development.

CONCLUSION

The conceptual study has been able to construct an Integrated Barakah Eco-Livestock 2 Model (IBECOL) as comprehensive framework for a livestock-based CE in the wing of Islamic economic development. The sustainability framework presented in this model responds to the double issue of sustainability through a synergy of technical path solutions related to the circular economy (CE) with ethical and spiritual principles from Islamic economics.

The primary conclusions of our study can be listed as the follows:

The basic values of the circular economy principles (anti-waste, resource efficiency and regeneration) and those of Islamic economy (trusteeship as khalifah, prohibition israf and realization Maqasid al-Shariah) have a strong philosophical meeting point. This consonance offers profound moral and spiritual legitimacy for the implementation of circular practices within Muslim communities.

The proposed model has problem-to-solution convertible ability. Livestock waste, the primary pollutant in linear systems, is transformed into productive resources by biogas cycle (energy) and organic fertilizer cycle (nutrient), resulting in a regenerative zero-waste system.

The incorporation with Islamic financial and social instruments (such as Musharakah, Productive Waqf, Zakat) also brings a social aspect to the model of this business. It allows for benefits of economic efficiency and environmental sustainability to be shared more equally across society so they are not just captured by large holders of capital, but experienced by the poor for a better communal life.

This model entails a holistic support ecosystem with cooperation between government, business, banks, universities, spiritual leaders and the broader society.

In other words, this model is not just a technical concept, but an ideal for development—a development that meets the needs of both body and soul, serves not only individual interests but also the common good, and takes account of both present and future welfare.

Recommendations for Future Research

According to the conclusions and limitations above, some future research directions can be suggested as below:

Case studies/pilot projects: Carry out empirical experimentation to apply the model at a limited scale (e.g., village level or Islamic school area) in order to gauge its quantitative impact on productivity, profitability, emission reduction and social welfare enhancement.

Economic Concept: Produce realistic business and financial case studies for a range of scales of operation to demonstrate to investors and finance institutions that circular livestock farming would be commercially successful.

Comparative Policy Research: Study successful policies that have been implemented in other countries to create a conducive environment for promoting circular economy in agricultural/livestock sectors and replicate to the Muslim-majority countries.

Modern Research of Fiqh: Motivate the specialists in Islamic jurisprudence for their further research on Shariah aspects particularly concerning circular economy including legal ownership over processed waste, Feedback schemes for zakat recycling and waqf models for environmental assets.

Sprint or marathon: the chug toward sustainability And at the end of the day, pursuing sustainable and ethical development is a long-term game. The model in this article is a first step, just an ijtihad to dream about the future; where our business activities not only create profit but also spread rahmatan lil 'alamin (mercy to all the worlds).

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