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Piloting Broiler Chicken and Organic Manure Circular Farming Model in Kagadi District, Uganda

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ABSTRACT

This study piloted an integrated circular farming model that combines broiler chicken production with organic manure development at a purposively selected household in Ruswiga Village, Kagadi District, Uganda. A hybrid poultry house was constructed using semi-permanent and permanent materials to balance cost efficiency and durability. Over a period of 12 months, seven broiler brands were reared and assessed for growth, mortality, disease resistance, yield, and economic returns. Royalchick consistently outperformed other brands, achieving the highest growth (up to 2.0 kg/bird), and greatest profitability (UGX 2,000,000), while Ugachick recorded the weakest performance. Poultry droppings were composted into an organic manure prototype with a standardized nutrient composition (1.5-2.0% N, 1.0-1.5% P_2O_5, 1.0-1.5% K_2O) and enhanced organic matter content. Field trials demonstrated high yield improvements in maize (300 kg/manure plot vs. 200 kg/ control plot), cassava (180 kg/manure plot vs. 100 kg/control plot), and beans (95 kg/manure plot vs. 56 kg/control plot), alongside improved soil fertility indicators. While the study results suggest improved economic viability of Royalchick and field manure-linked crop yields, statistical testing was not performed to confirm whether the observed differences were significant. To strengthen adoption, the project introduced unified branding under Sachrifam, marketed as Sachrifam Delicious Chicken and Sachrifam Organic Manure. Stakeholder engagement and farmer linkages ensured steady raw material flows and community ownership. The results propose that poultry-manure circular farming enhances productivity, soil fertility, and income generation, while branding and scale up strategies position Sachrifam as a sustainable enterprise capable of meeting local and regional demand.

Keywords: Broiler chicken; Organic manure; Circular farming; Sustainable agriculture; Kagadi District

1. INTRODUCTION

Uganda's farming systems face persistent challenges of soil fertility decline, limited access to synthetic fertilizers, and increasing demand for poultry products. Conventional reliance on chemical fertilizers has proven unsustainable due to high production costs, environmental degradation, and negative externalities such as soil acidification and waterway eutrophication (Mabicka Obame et al., 2026). In response, organic alternatives such as poultry manure are gaining recognition as cost-effective inputs that improve soil structure, nutrient cycling, and crop productivity while reducing greenhouse gas emissions (Mabicka Obame et al., 2026). Circular farming models, which integrate livestock and crop production, offer a promising pathway to sustainable agriculture. By recycling poultry waste into organic manure, farmers can close nutrient loops, reduce dependency on external inputs, and enhance resilience against climate variability. Studies in Uganda and other tropical regions have demonstrated that chicken-pig-fish models can improve productivity, reduce costs, and promote environmental safety when waste is appropriately treated and valorized (Kabugo, 2025).

Poultry manure commercialization has also been identified as a viable income-generating strategy, providing farmers with dual benefits of poultry product sales and organic fertilizer distribution (Yeboah et al, 2026). This aligns with broader goals of sustainable agribusiness growth, food security, and climate-smart agriculture. However, adoption remains limited among smallholder farmers due to knowledge gaps, infrastructural constraints, and lack of demonstration models.

Against this background, the project piloted a broiler chicken-organic manure circular farming model in Kagadi District, Uganda. The initiative sought to construct a mixed-structure poultry facility, rear and monitor performance of broiler chicken lots over 12 months, develop and test an organic manure prototype, and scale up production within the district. By linking poultry and crop enterprises, the project aimed to demonstrate the feasibility of circular farming as a scalable solution for rural livelihoods, soil fertility restoration, and sustainable agricultural development.

2. METHODOLOGY

2.1. STUDY DESIGN AND LOCATION

The study employed a field-based pilot design in a purposively selected household located in Ruswiga village, Nyamiti ward, Kagadi District, Uganda. This household was selected because it had adequate land, water supply and was strategically located for project implementation. A hybrid poultry house was constructed, seven broiler chicken brands were reared, and poultry droppings were composted into an organic manure prototype. The manure was tested on maize, beans, and cassava using comparative plots (100 × 100 feet), with treatment plots receiving manure and controls left untreated. Performance indicators including growth, mortality, yield, disease resistance, and soil fertility were systematically monitored. The study followed the poultry and crop trials monthly for 12 months, from 30th July 2025 to 30th July 2026, providing evidence on the effectiveness of the integrated poultry-manure circular farming model.

2.2. CONSTRUCTION OF A POULTRY FACILITY

Semi-permanent materials such as timber, poles and sand were sourced locally from the community, while permanent hardware items including iron sheets, iron bars, nails, wire mesh, cement and were procured from a certified supplier in Muhoro Town Council. Under the supervision of an experienced builder, a mixed-structure poultry house, was constructed, comprising of both a semi-permanent room and a permanent room. This design was deliberately adopted to balance cost-efficiency and long-term sustainability, ensuring the viability of the pilot project while leveraging community resources and professional standards.

2.3. FIELD MAPPING AND SELECTION OF BROILER CHICKEN BRANDS

With guidance from an experienced farmer, the project team conducted field visits to several farms to gain practical insights into routine poultry operations. In addition, the team toured multiple poultry shops across Kagadi district to collect market information and systematically map the available broiler chicken brands. Following careful analysis of the field data, the project adopted a multi-brand approach, incorporating different broiler types to enable effective monitoring and comparative assessment of their performance. This strategy ensured both practical learning and evidence-based evaluation of brand suitability within the district context to familiarize with routine poultry business and operations.

2.4. REARING AND PERFORMANCE MONITORING OF BROILER CHICKEN LOTS

Prior to chick placement, the poultry house rooms were thoroughly cleaned and disinfected to ensure optimal biosecurity standards. Orders for the selected broiler brands were placed two weeks in advance to facilitate efficient logistics and transportation. Between 30th July 2025 and 30th July 2026, seven distinct brand lots, each comprising 309 chicks, were reared under controlled conditions. Performance monitoring was conducted on a monthly basis, focusing on key indicators including growth patterns, mortality rates, yield output, disease resistance, and economic returns. Mortality rates were based on the number of birds that died, divided by the total number of birds in a brand lot, multiplied by 100. Yield output was based on the number of birds or amount of chicken meat in kilograms obtained in a brand lot and were sold to the market.

Disease resistance was assessed based on the chicken health data which was recorded on the routine health monitoring logos. This systematic approach enabled comprehensive evaluation of brand performance and provided evidence-based insights into productivity and sustainability within the poultry enterprise.

2.5. PRODUCTION OF ORGANIC MANURE PROTOTYPE AND FIELD CROP TRIALS

Poultry droppings were systematically collected from the broiler units and subjected to controlled composting to ensure pathogen reduction and nutrient stabilization. The composted material was then formulated into an organic manure prototype with standardized nutrient composition.

Local standardization was achieved through simple, practical methods: samples were collected from different batches and dried to reduce moisture variability; nitrogen (N) was estimated using Kjeldahl digestion, phosphorus (P) through spectrophotometry, and potassium (K) via flame photometry. Organic matter and pH were checked using loss on ignition and pH strips, while bulk density and moisture content were measured by weighing and oven drying. Results were averaged across batches and compared to known nutrient ranges to establish a consistent nutrient profile (NPK, organic matter, pH) for reliable application rates.

To assess its agronomic effectiveness, the organic manure prototype derived from composted poultry droppings was applied to maize, beans, and cassava crops under controlled field trial conditions. Household land was randomly established and stratified into six comparative plots, each measuring 100 by 100 feet. Three treatment plots received manure application when maize, beans and cassava were being planted. The remaining three control plots were not treated with manure and the planted crops were managed using conventional practices. Throughout the growing season, crop performance was systematically monitored, focusing on yield outcomes, plant vigor, and soil fertility indicators. This approach provided a clear basis for evaluating the impact of the manure prototype on crop productivity and soil health.

2.6. PROTOTYPE BRANDING AND SCALING STRATEGY

To achieve the branding and scale up results, three integrated steps were employed; Establishing a unified brand identity under the name Sachrifam for both poultry and organic manure products, conducting stakeholder meetings, farmer training sessions, and community engagement forums to drive awareness and adoption, and building strategic linkages with maize farmers for feed supply and poultry farmers for manure inputs.

3. RESULTS

3.1. POULTRY HOUSE CONSTRUCTION

The hybrid poultry house structure was a well-integrated design that combines both semi-permanent and permanent sections under one continuous low-cost corrugated iron roof. The entire building was constructed using red bricks, giving it a durable yet locally sourced appearance. The semi-permanent room, located on the left side, features wooden support poles and wire mesh walls that allow for natural ventilation and visibility. Its back and side walls were made of red bricks, while the front section was enclosed with black wire mesh. The entrance was fitted with a grey wooden door that has a black wire mesh panel on the upper part, ensuring airflow and light penetration. Inside, the floor is compacted earth, and the space accommodates feeders, drinkers, and broilers comfortably (Figure 1).

The permanent room, positioned on the right side, was built entirely with red brick masonry, providing strength and long-term stability. It has two wide rectangular windows covered with black wire mesh to enhance ventilation and maintain a healthy environment for the birds. The entrance door matches the semi-permanent section, painted grey with a mesh panel at the top. The floor was concreted, offering easy cleaning and improved hygiene. Both rooms were joined seamlessly, creating a unified structure that supports efficient poultry management (Figure 1).

Figure 1: *Layout of the hybrid poultry house*

3.2. PERFORMANCE OUTCOME OF THE BROILER CHICKEN LOTS

The assessment of broiler chicken lots revealed clear performance differences across brands. Royalchick consistently outperformed others, with lots 6 and 7 achieving the highest growth (1.9-2.0 kg/bird), lowest mortality (2.3%), strongest disease resistance, and highest economic returns (up to UGX 2,000,000). In contrast, Ugachick recorded the weakest results, with the lowest growth (1.5 kg/bird), lowest yield (441 kg), and lowest revenue (UGX 1,450,000). Kukuchick, Biyinzika, and Kenchic showed moderate performance with relatively good yields and revenues but did not match Royalchick's efficiency. Overall, the study highlights that high disease resistance and reduced mortality strongly correlate with better growth, yield, and profitability, positioning Royalchick as the most economically viable option (Table 1).

Table 1: *Monthly average performance of the broiler chicken lots*

Lot	Chick Brand (Number)	Growth Patterns (Average kg/bird)	Mortality Rates (%/Number)	Yield out Put (Kg)	Disease Resistance Level	Economic Output (UGX)
1	Royalchick (309)	1.8	12.9 (40)	484.2	High	1,500,000
2	Ugachick (309)	1.5	4.9 (15)	441	Moderate	1,450,000
3	Kukuchick (309)	1.6	3.2 (10)	478.4	Moderate	1,600,000
4	Biyinzika (309)	1.7	3.2 (10)	508.3	Moderate	1,750,000
5	Kenchic (309)	1.65	2.3 (7)	498.3	Moderate	1,600,000
6	Royalchick (309)	2.0	2.3 (7)	604	High	2,000,000
7	Royalchick (309)	1.9	2.3 (7)	573.8	High	1,950,000

3.3. COMPOSITION OF ORGANIC MANURE AND FIELD CROP TRIAL OUTCOME

The composted poultry droppings produced an organic manure prototype with a consistent nutrient profile. On average, it contained 1.5–2.0% Nitrogen (N), 1.0–1.5% Phosphorus (P_2O_5), and 1.0–1.5% Potassium (K_2O), along with an increase in organic matter content. This standardized composition ensures that the manure provides balanced nutrients for crops while also improving soil health.

The field trial results clearly demonstrate the positive impact of organic manure application on crop performance and soil fertility. Maize grown on manure-treated plots recorded the highest yield at 300 kg per plot, showing very vigorous growth and improved soil structure due to increased NPK availability. In contrast, control maize plots yielded only 200 kg per plot with moderate vigor, reflecting limited nutrient availability. Cassava also responded strongly to manure treatment, producing 180 kg per plot compared to 100 kg in the control, with enhanced nutrient cycling and stronger root development contributing to its vigorous growth (Table 2)

Beans showed a more modest improvement in vigor but still benefited from manure application, yielding 95 kg per plot compared to 56 kg in the control, alongside better nodulation and improved soil pH balance. Overall, the trial confirms that organic manure significantly boosts yields across all tested crops, enhances plant vigor especially in maize and cassava and improves key soil fertility indicators, making it a sustainable and effective soil management practice (Table 2).

Table 2: *Field crop outcome of the organic manure*

Crop Type	Yield Performance Kg/Plot)	Plant Vigor (Score 1-5)	Soil Fertility (Key Indicators)
Organic manure-treated crops			
Maize	*300*	*5 -Very vigorous*	*Increased NPK availability, better soil structure*
Cassava	*180*	*4-Vigorous*	*Enhanced nutrient cycling, improved root development*
Beans	*95*	*3-Moderate*	*Better nodulation, improved soil pH balance*
Non-manure treated (Control crops)			
Maize	*200*	*3-Moderate*	*Limited nutrient availability, weaker soil structure*
Cassava	*100*	*3-Moderate*	*Reduced nutrient cycling, weaker root development*
Beans	*56*	*3-Moderate*	*Poor nodulation, lower soil fertility*

3.4. BRANDED PRODUCTS AND SCALE UP

The project adopted Sachrifam as the official brand name for both poultry and organic manure products, marketed respectively as Sachrifam Delicious Chicken and Sachrifam Organic Manure (Figure 2). This unified branding approach strengthens product identity, enhances market visibility, and builds consumer trust across diverse value chains. To promote adoption of the integrated model, stakeholder meetings, community engagement forums, and farmer training sessions were conducted. These activities fostered awareness, knowledge transfer, and collective ownership of the initiative. Strategic community linkages were established with maize farmers, who supply grain for poultry feed, and with poultry farmers, who provide chicken litter for large-scale manure production. This collaborative network ensures a steady flow of raw materials, supports sustainable production, and positions Sachrifam as a scalable enterprise capable of meeting both local and regional demand for quality chicken and organic fertilizer.

Figure 2: *Branded prototypes of Sachrifam Delicious Chicken and Organic Manure*

4. DISCUSSION

The integration of poultry production with organic manure utilization demonstrated significant agronomic and economic benefits. The hybrid poultry house design provided a balance between cost efficiency and durability, combining semi-permanent and permanent structures under one roof. This approach aligns with findings by Oluyemi and Roberts (2000), who emphasized that proper housing and ventilation are critical for reducing mortality and enhancing broiler productivity.

The broiler performance outcomes revealed clear brand differences, with Royalchick outperforming other strains in growth, disease resistance, and profitability. These results are consistent with the work of Teguia and Beyene (2000), who noted that genetic variation among broiler strains strongly influences feed conversion efficiency and economic returns. The correlation between low mortality, high disease resistance, and profitability underscores the importance of breed selection in smallholder poultry enterprises.

The organic manure prototype showed a standardized nutrient composition (1.5–2.0% N, 1.0–1.5% P_2O_5, 1.0–1.5% K_2O), which significantly improved crop yields and soil fertility. Maize and cassava responded most strongly, while beans showed moderate gains. These findings support earlier studies by Akanbi et al. (2005), who demonstrated that poultry manure enhances nutrient cycling, improves soil structure, and boosts crop productivity compared to synthetic fertilizers. The improvement in nodulation and soil pH balance in beans also reflects the role of organic amendments in supporting legume symbiosis (Ayoola & Makinde, 2007).

Finally, the branding and scale up strategy under Sachrifam created a unified identity for both poultry and manure products, strengthening consumer trust and market visibility. The establishment of community linkages with maize and poultry farmers ensured steady raw material flows, supporting circular production. This mirrors evidence from Adekunle and Fatunbi (2012), who highlighted that integrated value chains and farmer networks are essential for scaling agribusiness innovations sustainably.

5. CONCLUSION

This study demonstrates that integrating poultry production with organic manure application offers a sustainable pathway for improving crop yields, soil fertility, and farmer incomes. The hybrid poultry housing system enhanced broiler performance, while the manure prototype provided balanced nutrients that significantly boosted maize and cassava productivity. The branding and scale up strategy under Sachrifam successfully unified product identity, strengthened market visibility, and established collaborative networks that guarantee resource sustainability. Future work should focus on optimizing manure application rates, expanding farmer training, and exploring regional market penetration to maximize impact.

DECLARATIONS

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Author Contributions: SM participated in developing the study protocol, overseeing project activities, project implementation, follow up and manuscript writing. BC participated in protocol writing, data analysis, logistics, administration, and manuscript writing.

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