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Assessing Farmers' Perceptions on The Use of on-Farm Produced Feeds for Broiler Production in Mbarara City, South-Western Uganda

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Abstract:

This study assessed farmers' perceptions on the use of on-farm produced feeds for broiler production in Mbarara City, South-Western Uganda using a descriptive cross-sectional survey design. Data were collected from 201 broiler farmers categorized into on-farm feed users, commercial feed users, and mixed users using interviewer-administered questionnaires and observation checklists, and analyzed using SPSS version 25 through descriptive statistics and Chi-square tests. Findings revealed that most respondents were middle-aged (36–45 years), male (73.1%), and fairly educated, with secondary and tertiary education being dominant. Farmers using on-farm feeds exhibited more positive perceptions, strongly agreeing that such feeds are reliable, improve broiler growth, enhance control over feed quality, and reduce dependence on commercial feeds. Chi-square results showed significant associations between feed type and perceptions of reliability ($p = 0.000$), profitability ($p = 0.002$), cost-effectiveness ($p = 0.005$), and record keeping practices ($p = 0.001$), while training needs were not significantly different across groups ($p = 0.130$). Cost analysis indicated that on-farm feeds were cheaper (mean 1,350 UGX/kg) than commercial feeds (about 3,000 UGX/kg), leading to higher profitability among on-farm feed users who recorded higher gross profits (UGX 1,200,000 per cycle) and net profit per bird (UGX 2,500). The study concludes that on-farm feed production enhances cost efficiency, profitability, and farmer autonomy, while adoption is strongly influenced by education, extension access, and experience, though constrained by limited technical skills and feed quality concerns. It recommends strengthening farmer training, extension services, cooperative structures, and digital advisory systems to improve adoption and sustainability of on-farm feed production in broiler farming.

Introduction

The poultry industry is one of the fastest-growing livestock subsectors globally and plays a significant role in addressing the increasing demand for animal-source protein resulting from population growth and urbanization (FAO, 2021). Broiler production, in particular, has expanded rapidly due to its short production cycle and high feed conversion efficiency. However, feed remains the most expensive input in poultry production, accounting for approximately 60–70% of total production costs (Ravindran, 2013). The rising costs and periodic shortages of commercial feeds have compelled many farmers to seek alternative feeding strategies, including the production of feeds on their farms. On-farm feed production enables farmers to utilize locally available feed ingredients, improve feed accessibility, and reduce dependence on commercial feed manufacturers whose products are often affected by market price fluctuations and supply chain constraints (Chadd, 2019; Lemme et al., 2020).

In many developing countries, on-farm feed production has emerged as an effective strategy for enhancing poultry productivity while reducing production costs. Countries such as Brazil, India, and China have successfully integrated crop and livestock production systems, enabling poultry farmers to utilize agricultural by-products

such as maize bran, rice bran, cassava residues, and oilseed cakes in feed formulation (Makkar, 2016; Ravindran, 2013). These practices contribute to the development of circular agricultural economies by converting crop residues into valuable livestock feed resources while reducing environmental waste (FAO, 2021). Furthermore, research has shown that properly formulated on-farm feeds can provide nutrient levels comparable to commercial feeds and support satisfactory broiler growth performance and feed efficiency (Lemme et al., 2020).

Across Africa, the poultry sector serves as an important source of income, employment, and household nutrition, particularly among smallholder farmers (Kleyn & Chrystal, 2008). Nevertheless, poultry producers continue to face challenges associated with the high cost and inconsistent availability of commercial feeds, which negatively affect productivity and profitability (Mottet & Tempio, 2017). As a result, the use of on-farm produced feeds has gained popularity in countries such as Nigeria, Ghana, and Ethiopia, where farmers rely on locally available ingredients including maize, cassava peels, sunflower cake, and fish by-products to formulate poultry diets (Abu et al., 2020; Makkar, 2016). In East Africa, studies have demonstrated that when appropriately formulated, on-farm feeds can support broiler growth rates and feed conversion efficiencies comparable to those achieved with commercial feeds, although challenges related to technical knowledge, quality control, and access to feed-processing equipment remain significant (Bett et al., 2019; Ochieng et al., 2021).

In Uganda, poultry farming contributes significantly to agricultural growth, food security, and household livelihoods. However, the profitability of broiler production is increasingly threatened by escalating feed costs, particularly for essential feed ingredients such as maize and soybean meal (MAAIF, 2021; UBOS, 2022). To address this challenge, some poultry farmers have adopted on-farm feed production using locally available raw materials such as maize bran, fishmeal, soybean meal, and sunflower cake (Mwesigwa et al., 2020). The Government of Uganda, through agricultural extension services and development programs, has emphasized the promotion of feed formulation skills and efficient utilization of local feed resources to reduce production costs and improve poultry productivity (MAAIF, 2021). These efforts are intended to strengthen feed self-sufficiency and enhance the resilience of poultry enterprises against fluctuations in commercial feed markets.

Mbarara City, located in South-Western Uganda, has experienced substantial growth in commercial poultry farming due to increasing urban demand for poultry meat and eggs (Mbarara DLG, 2022). The area benefits from access to a variety of feed resources, including maize, sunflower products, and fish-processing by-products, which provide opportunities for on-farm feed formulation (Nabbanja et al., 2021). Despite these advantages, adoption of on-farm feed production remains relatively low, largely due to concerns regarding feed quality, nutritional adequacy, formulation knowledge, and access to appropriate feed-processing technologies (Kabagambe et al., 2023). Farmers' perceptions regarding the effectiveness, affordability, and reliability of on-farm produced feeds are therefore likely to influence their adoption and utilization. Understanding these perceptions is essential for informing extension interventions, policy development, and capacity-building initiatives aimed at promoting sustainable and cost-effective broiler production systems in Mbarara City and Uganda at large.

Study area

The study was conducted in Mbarara City, located in South-Western Uganda at approximately 0°36′ South latitude and 30°39′ East longitude (0.600°S, 30.650°E). Mbarara City lies about 270 km southwest of Kampala, the capital city of Uganda, along the major Kampala–Kabale highway. Mbarara City is divided into six boroughs: Kakoba, Kamukuzi, Nyamitanga, Biharwe, Kakiika, and Nyakayojo. It was granted city status in 2020, previously being a municipality. The city is surrounded by districts like Sheema, Ntungamo, Ibanda, Kiruhura, Buhweju, and Isingiro. The city, characterized by a favorable tropical climate and bimodal rainfall, is a vital agricultural hub in Uganda, particularly for poultry farming. Rapid growth in broiler production is attributed to rising urban demand and accessible feed resources like maize bran and fish by-products. The study focused on Mbarara City due to its advancing poultry sector and the challenge of high commercial feed costs.

Study design, target population and sampling frame

The study employed a descriptive cross-sectional survey design to assess farmers' perceptions regarding the use of on-farm produced feeds for broiler production in Mbarara City, South-Western Uganda. According to Creswell and Creswell (2018), a descriptive cross-sectional design enables researchers to collect data from a target population at a single point in time, making it suitable for examining prevailing attitudes, perceptions, and practices. The design was appropriate for this study because it facilitated the collection of both quantitative and qualitative data from broiler farmers using different feeding systems, namely commercial feeds, on-farm produced feeds, and a combination of both. The design also enabled the researcher to compare perceptions and feeding practices across farmer categories and generate findings that reflect the current status of feed utilization among broiler farmers in Mbarara City.

The target population comprised all registered broiler farmers in Mbarara City. According to the Community Development Officer (CDO) Office Report (2024), Mbarara City had 1,024 registered poultry farmers engaged in various poultry enterprises, of whom 420 were actively involved in broiler production. These 420 broiler farmers constituted the study population because they were directly involved in decisions regarding feed selection and utilization. The population was categorized into three groups: farmers using only commercial feeds, farmers using only on-farm produced feeds, and farmers using both commercial and on-farm produced feeds. The sampling frame was developed using records obtained from the City Community Development Officer, local farmers' associations such as the Mbarara District Farmers Association (MBADIFA), extension workers, veterinary officers, feed suppliers, and live-bird traders. Additional respondents were identified through snowball sampling and farm visits to verify broiler production activities and feeding practices. Using the Krejcie and Morgan (1970) sample size determination table, a sample of 201 broiler farmers was selected from the population of 420 farmers. The sample was proportionately divided into three categories comprising 67 farmers using on-farm produced feeds, 67 farmers using commercial feeds, and 67 farmers using a combination of both feeding systems.

Data collection methods and instruments

Data were collected using interviewer-administered structured questionnaires and observation checklists. The interviewer-administered questionnaire was used to obtain quantitative information on farmers' socio-economic characteristics, perceptions regarding on-farm produced feeds, feed utilization practices, and factors influencing feed choice. The researcher personally administered the questionnaire to enhance understanding of the questions, improve response rates, and accommodate respondents with varying literacy levels. Observation checklists were used during farm visits to document feed preparation methods, storage facilities, feeding practices, equipment availability, hygiene conditions, and other observable aspects related to feed management. The use of observation complemented questionnaire responses and enabled verification of information provided by respondents.

Data processing and analysis

After data collection, questionnaires were checked for completeness, accuracy, and consistency before coding and entry into Statistical Package for Social Sciences (SPSS) version 25 for analysis. Quantitative data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations, to summarize respondents' characteristics and perceptions. Cross-tabulations and chi-square tests were used to examine associations between feed utilization categories and selected farmer characteristics. Qualitative data obtained through observations were analyzed thematically by identifying recurring patterns and themes related to feed production and management practices. The findings from both quantitative and qualitative analyses were integrated to provide a comprehensive understanding of farmers' perceptions and utilization of on-farm produced feeds for broiler production in Mbarara City.

Results

Demographic characteristics of respondents

Demographic characteristics of broiler farmers, such as age, gender, education, experience, household size, and farm scale, significantly influence their perceptions and decision-making regarding agricultural innovations like on-farm feed production. These factors affect how farmers access information, interpret technical knowledge, and respond to changes in feed technologies and market conditions.

Age of Respondents

Age of respondents significantly impacts farmers' experience, decision-making, and adoption of agricultural innovations. Younger farmers are typically more receptive to new technologies and alternative feeding strategies, whereas older farmers tend to depend on traditional knowledge. Despite this reliance on established practices, older farmers may have valuable practical experience that enhances their capacity to evaluate feed quality and tackle production issues. Respondents were asked about their age and results from the responses were recorded in table

Table 1: Age of Respondents

Age Group (Years)	On-Farm	Commercial	Both commercial and on farm	Total
<25	5 (7.5%)	4 (6%)	6 (9%)	15 (7.5%)
25–35	20 (30%)	18 (27%)	19 (28%)	57 (28.5%)
36–45	25 (37%)	27 (40%)	23 (34%)	75 (37.3%)
>45	17 (25.5%)	18 (27%)	19 (28%)	54 (26.9%)

Source: Field data 2025

The majority of broiler farmers in Mbarara City fall within the 36–45 years age group**,** representing 37.3% of respondents. On-farm feed users had 25 farmers (37%) in this category, commercial feed users had 27 farmers (40%), and both commercial and on farm-feed users had 23 farmers (34%).

The 25–35 years group constituted 28.5% of the total respondents, while farmers over 45 years accounted for 26.9%, and those under 25 years were the smallest group (7.5%). This indicates that broiler farming is largely dominated by middle-aged adults**,** who are likely to have both the physical capacity and experience to manage poultry enterprises effectively.

Gender Distribution

Gender distribution highlights the ratio of male to female farmers in broiler production, affecting agricultural choices and resource access. Gender roles dictate responsibilities, with men typically managing financial resources and investment decisions, while women handle daily tasks like feeding and cleaning. These dynamics can shape views on on-farm feeds concerning cost, labor, and management ease. Respondents were asked about by gender and results from their responses were recorded in table 2

Table 2: Gender Distribution

Gender	On-Farm	Commercial	Both commercial and on farm	Total
Male	48 (71.6%)	50 (74.6%)	49 (73.1%)	147 (73.1%)
Female	19 (28.4%)	17 (25.4%)	18 (26.9%)	54 (26.9%)

Source: Field data 2025

The study revealed a male-dominated sector, with 73.1% of farmers being males and 26.9% females. Among on-farm feed users, 71.6% were male; commercial feed users comprised 74.6% male, and both commercial and on farm-feed users 73.1% male. This pattern suggests that while poultry farming in Mbarara City is primarily led by men, a notable proportion of women actively participate, reflecting potential for inclusive capacity-building programs targeted at female farmers.

Level of Education

Level of education reflects the highest formal schooling achieved by a farmer and significantly impacts decision-making in agricultural practices, such as broiler farming. It shapes a farmer's capacity to comprehend, interpret, and utilize technical information encompassing feed formulation, record keeping, disease management, and overall farm management. Respondents were asked about their level of education and results from their responses were recorded in table 3

Table 3: Level of Education

Education Level	On-Farm	Commercial	Both commercial and on farm	Total
No formal	2 (3%)	1 (1.5%)	1 (1.5%)	4 (2%)
Primary	10 (15%)	12 (18%)	11 (16%)	33 (16.4%)
Secondary	30 (45%)	28 (41.8%)	32 (47.8%)	90 (44.8%)
Tertiary	25 (37%)	26 (38.8%)	23 (34.3%)	74 (36.8%)

Source: Field data 2025

Most respondents had attained secondary or tertiary education. On-farm feed users had 45% with secondary education and 37% with tertiary; commercial feed users had 41.8% secondary and 38.8% tertiary; both commercial and on farm-feed users had 47.8% secondary and 34.3% tertiary.
Only a small fraction had no formal education (2% overall). This high education level among farmers likely enhances their ability to adopt innovative feed practices and manage production costs effectively.

Farmers' perceptions on feed use

Farmers' perceptions heavily impact their choices regarding feeding and the use of on-farm produced feeds in broiler production. Key factors influencing these perceptions include cost, availability, nutritional quality, ease of preparation, and bird performance. Positive perceptions correlate with lower production costs and better

ingredient control, while negative perceptions arise from concerns about quality consistency, formulation knowledge, time investment, and performance uncertainty compared to commercial feeds.

Table 4: Perceptions of on-farm feeds

Statement	On-Farm Mean	Commercial Mean	Both commercial and on farm Mean
On-farm feeds are reliable	4.1	3.2	3.8
Improve broiler growth	3.9	3.0	3.5
Control over quality	4.2	2.8	3.7
Reduce dependence on commercial feeds	4.5	3.0	3.9
Willingness to increase on-farm feed	4.3	3.1	3.8

Source: Field data 2025

The analysis of farmers' perceptions demonstrated that those using on-farm feeds consistently rated the benefits higher compared to commercial and mixed-feed users. On-farm feed users strongly agreed that self-produced feeds are more reliable, improve broiler growth, provide greater control over quality, reduce dependence on commercial suppliers, and expressed willingness to increase use in the future. For instance, the mean perception score for "on-farm feeds reduce dependence on commercial suppliers" was 4.5 for on-farm users, compared to 3.0 for commercial feed users and 3.9 for mixed users.

Commercial feed users generally rated these statements lower, reflecting less confidence in the benefits of on-farm feeds, while mixed-feed users held moderate perceptions. This pattern suggests that direct experience with feed type strongly influences farmers' perceptions. Overall, perceptions align with adoption patterns, indicating that farmers' confidence in feed type drives usage decisions.

Cost-Effectiveness of feed types

Cost-effectiveness of feed types significantly influences broiler production, impacting farmers' choices regarding on-farm produced feeds. Feed costs are the largest production expense in poultry, so even slight price variations can greatly affect profitability. Commercial feeds, though nutritionally balanced, are expensive and often unaffordable for small to medium-scale farmers. In contrast, on-farm feeds are considered more economical, allowing for the use of locally sourced, cheaper ingredients like maize bran and fish residues.

Feed Costs per Kg (UGX*)*

Feed costs per kilogram in Uganda represent the expenses farmers incur for broiler feed, whether purchased or produced on-farm. Commercial feeds are usually more expensive due to processing, transportation, and fluctuating ingredient prices like maize and soybean meal. On-farm feeds can have lower cash costs owing to local ingredients, but hidden costs such as labor and processing impact total expenses. Seasonal material availability and regional market conditions also affect feed costs.

Table 5: Cost-Effectiveness of feed types

Feed Type	Mean Cost per kg	Range (UGX)
On-farm	1,350	1,000–2,000
Commercial	75,000 / 25kg (~3,000/kg)	2,400–4,000
Both commercial and on farm	2,200	1,500–3,500

Source: Field data 2025

On-farm feeds were significantly cheaper, averaging 1,350 UGX per kg (range 1,000–2,000 UGX), compared to commercial feeds, which cost approximately 3,000 UGX per kg. Mixed-feed users had an intermediate cost of 2,200 UGX per kg. These findings demonstrate that on-farm feeds reduce input expenditure, allowing farmers to allocate resources more efficiently. The lower cost of on-farm feeds likely contributes to the higher profitability observed among this group.

Profitability across feed types

To determine profitability among the three categories of broiler farmers — on-farm feed users, commercial feed users, and those using both — several financial metrics were calculated as described below.

i) Gross profit per production cycle

Gross Profit (UGX) = Total Revenue from Broiler Sales − Total Variable Costs

Where:

- Total Revenue = Number of birds sold × Selling price per bird
- Total Variable Costs = Cost of feed + chicks + veterinary inputs + labour + utilities

ii) Net Profit per Bird

Net Profit per Bird (UGX) = Number of Birds Sold Gross Profit−Fixed Costs

Where:

- Fixed Costs include housing depreciation, equipment, and farm overheads.
- Gross Profit obtained from above formula.

iii) Feed Proportion of Total Production Cost

$$\text{Feed Proportion (\%)} = \frac{\text{Feed Cost}}{\text{Total Production Cost}} \times 100$$

Where:

- Feed Cost is the total expenditure on feeds during a production cycle.
- Total Production Cost includes feed, chicks, labour, veterinary services, utilities, and transport.

Table 6: Profitability across feed types

Metric	On-Farm	Commercial	Both commercial and on farm
Gross profit (UGX/cycle)	1,200,000	900,000	1,050,000
Net profit per bird (UGX)	2,500	1,800	2,100
Feed proportion of total cost	45%	60%	52%

Source: Field data 2025

On-farm feed users achieved the highest gross profit, averaging 1,200,000 UGX per production cycle, compared to 900,000 UGX for commercial feed users and 1,050,000 UGX for mixed-feed users. Similarly, net profit per bird was highest for on-farm feed users at 2,500 UGX, followed by mixed-feed users at 2,100 UGX, and commercial feed users at 1,800 UGX. The proportion of total production cost spent on feed was also lowest among on-farm users (45%) and highest for commercial feed users (60%).

These results indicate that on-farm feed production is the most cost-effective, supporting both lower input costs and higher profitability. Mixed-feed farms achieve moderate profitability by combining cost reduction from on-farm feeds with convenience of commercial feeds. Commercial feed users incur the highest costs, which limits profit margins.

Observed farm practices

Observed farm practices reveal important insights into feed management systems used by broiler farmers, confirming self-reported data on feed utilization. Common practices include storage of feed ingredients in various containers, with differing hygiene levels. While some farms follow proper weighing and basic formulation guidelines, others rely on informal measurements and mixing methods. Respondents were asked about the farm practices and results from analysis of their responses were recorded in table 7

Table 7: Observed farm practices

Observation	On-Farm	Commercial	Both commercial and on farm
Clean feed preparation area	85%	70%	78%
Proper storage	80%	68%	75%
Use of equipment (scales, mixers)	90%	60%	80%
Record keeping	75%	55%	68%

Source: Field data 2025

Observational data highlighted that on-farm feed users maintained better farm practices than the other groups. Approximately 85% of on-farm users had clean feed preparation areas, compared to 70% of commercial feed users and 78% of mixed-feed users. Proper storage of feed was observed in 80% of on-farm farms, 68% of commercial, and 75% of mixed farms, correlating with reduced feed spoilage.

On-farm farmers were also more likely to use equipment such as scales and mixers (90% presence) and keep detailed feed records (75%), compared to 60% and 55% for commercial feed users, respectively. These practices contribute to efficient feed use, cost control, and higher profitability, demonstrating that adoption of on-farm feeds is enhanced by better management practices.

Strategies to enhance on-farm feed adoption

Strategies to enhance on-farm feed adoption are vital for improving broiler productivity and sustainability in poultry enterprises. Key approaches include continuous training for farmers on feed formulation and storage, delivered via extension services and practical demonstrations. Additionally, improving access to affordable, high-quality feed ingredients is essential, necessitating stronger linkages between farmers, suppliers, and crop producers to ensure a stable supply of materials like maize bran and soybean meal. Respondents were asked about the strategies to enhance on farm feed adoption and results for their responses were recorded in table 8 below.

Table 8: Strategies to enhance on-farm feed adoption

Strategy Statement	Mean Agreement (1–5)
Training in feed formulation	4.5
Government support (credit, subsidies)	4.3
Cooperatives for bulk purchase	4.2
Access to feed equipment	4.1
Knowledge sharing	4.0

Source: Field data 2025

Farmers' responses on strategies to improve on-farm feed use showed strong agreement with several measures. Training in feed formulation received the highest mean agreement score of 4.5, indicating that farmers perceive knowledge gaps as a key barrier. Government support in the form of subsidies, credit, or extension services was highly endorsed (mean 4.3), reflecting the importance of financial and technical assistance. Formation of cooperatives for bulk purchase of feed ingredients (4.2), access to feed formulation equipment (4.1), and knowledge sharing among farmers (4.0) were also seen as critical strategies. These findings suggest that capacity building, collective action, and support mechanisms are essential to improve the adoption and profitability of on-farm feed production.

Cross-Tabulations and Chi-Square tests of association

To further understand the relationship between type of feed used and key study variables, cross-tabulation and Chi-square tests were conducted. The analysis compared responses among the three farmer groups: on-farm feed users (n = 67), commercial feed users (n = 67), and mixed-feed users (n = 67). Associations were tested at the 0.05 level of significance.

Feed type and farmers' perception of feed reliability

Feed type and farmers' perception of feed reliability largely influence the adoption of on-farm produced feeds in broiler production. Feed reliability refers to the availability, quality, and performance consistency of feeds. Farmers tend to perceive commercial feeds as more reliable due to their standardized formulation and predictable results, even though they express concerns about supply fluctuations, price increases, and quality variability. Respondents were asked about their perception on feed reliability and the results from analysis of their responses were presented in table 9 below.

Table 9: Feed type and farmers' perception of feed reliability

Type of Feed Used	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
On-farm feed users	36 (53.7%)	25 (37.3%)	3 (4.5%)	2 (3.0%)	1 (1.5%)
Commercial feed users	10 (14.9%)	23 (34.3%)	15 (22.4%)	13 (19.4%)	6 (9.0%)
Mixed-feed users	20 (29.9%)	29 (43.3%)	10 (14.9%)	5 (7.5%)	3 (4.5%)

Chi-square (χ^2) = 28.41, df = 8, p = 0.000

The Chi-square results indicate a significant association ($p < 0.05$) between feed type and farmers' perception of feed reliability. Farmers using on-farm feeds were more likely to strongly agree that their feeds were reliable compared to those using commercial or mixed feeds. This suggests that direct involvement in feed preparation enhances farmers' confidence in feed quality and consistency.

Feed type and profitability level

Feed type significantly impacts broiler production, influencing costs, efficiency, growth rates, and profits. While commercial feeds provide consistent nutrition, they can decrease profit margins due to high costs. On-farm feeds can enhance profitability by utilizing local ingredients, but success relies on proper ration formulation, feed quality management, and waste reduction; inadequate practices can lead to poor growth and higher mortality, adversely affecting profits.

Table 10: Feed type and profitability level

Type of Feed Used	Loss	Break-even	Low Profit (<500k UGX)	Moderate Profit (500k–1.5M UGX)	High Profit (>1.5M UGX)
On-farm feed Users	1 (1.5%)	4 (6.0%)	10 (14.9%)	32 (47.8%)	20 (29.8%)
Commercial feed users	5 (7.5%)	9 (13.4%)	25 (37.3%)	20 (29.9%)	8 (11.9%)
Mixed-feed Users	2 (3.0%)	6 (9.0%)	15 (22.4%)	28 (41.8%)	16 (23.8%)

Chi-square (χ^2) = 24.67, df = 8, p = 0.002

There was a statistically significant association between the type of feed used and profitability level ($p < 0.05$). Farmers using on-farm feeds reported the highest proportion of moderate to high profits (77.6%), compared to mixed-feed users (65.6%) and commercial feed users (41.8%). These findings suggest that on-farm feed use contributes to higher profit margins, likely due to reduced feed costs and improved cost control.

Feed type and cost-effectiveness perception

Feed type and perceived cost-effectiveness are key factors influencing farmers' decisions in broiler production. While commercial feeds offer convenience, their high costs affect profit margins. On-farm feeds made from local

ingredients, such as maize bran and sunflower cake, are seen as more economical, though their success relies on formulation skills, ingredient availability, labor, and nutritional balance.

Table 11: Feed type and cost-effectiveness perception

Type of Feed Used	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
On-farm feed users	33 (49.3%)	26 (38.8%)	4 (6.0%)	3 (4.5%)	1 (1.5%)
Commercial feed users	12 (17.9%)	20 (29.9%)	18 (26.9%)	12 (17.9%)	5 (7.5%)
Mixed-feed users	21 (31.3%)	28 (41.8%)	10 (14.9%)	5 (7.5%)	3 (4.5%)

Chi-square (χ^2) = 21.83, df = 8, p = 0.005

The Chi-square test revealed a significant association between the feed type and perceived cost-effectiveness of broiler production (p = 0.005). On-farm feed users overwhelmingly agreed that their feed production methods reduced overall costs. In contrast, commercial feed users showed more neutral or disagreeing responses, implying that the high price of commercial feeds erodes perceived cost benefits. Mixed-feed users leaned positive but remained cautious, reflecting a balance between savings and convenience.

4.1.2 Feed type and record keeping practices

Feed type and record-keeping practices affect farmers' perceptions and decisions regarding on-farm produced feeds for broiler production, impacting costs, growth performance, and profitability. Detailed record-keeping allows farmers to evaluate economic benefits and challenges, influencing views on the affordability and reliability of on-farm feeds. Respondents were asked about the feed type and record keeping practices and their responses were recorded in table 12 below.

Table 12: Feed type and record keeping practices

Type of Feed Used	Detailed Records	Rough Records	No Records
On-farm feed users	45 (67.1%)	15 (22.4%)	7 (10.4%)
Commercial feed users	28 (41.8%)	20 (29.9%)	19 (28.4%)
Mixed-feed users	35 (52.2%)	21 (31.3%)	11 (16.4%)

Chi-square (χ^2) = 18.22, df = 4, p = 0.001

Record-keeping practices were also significantly associated with feed type (p = 0.001). Farmers who produced their own feeds were more likely to maintain detailed records of feed costs and usage. This could be attributed to the greater management control required in on-farm feed production, compared to those relying entirely on commercial feeds.

Feed type and farmers' training needs

Feed type and farmers' training needs greatly affect the adoption of on-farm feeds in broiler production. Different feeds require distinct skills in formulation and ingredient selection. Farmers' lack of knowledge on nutrient requirements and proper mixing can negatively impact broiler performance and profitability. Therefore, training is crucial to improve farmers' ability to produce balanced feeds.

Table 13: Feed type and farmers' training needs

Type of Feed Used	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
On-farm feed users	38 (56.7%)	20 (29.9%)	5 (7.5%)	3 (4.5%)	1 (1.5%)
Commercial feed users	25 (37.3%)	27 (40.3%)	10 (14.9%)	4 (6.0%)	1 (1.5%)
Mixed-feed users	29 (43.3%)	26 (38.8%)	8 (11.9%)	3 (4.5%)	1 (1.5%)

Chi-square (χ^2) = 12.46, df = 8, p = 0.130

The association between feed type and perceived training needs was not statistically significant ($p > 0.05$). All groups generally agreed on the need for training in feed formulation and management, indicating a common recognition that capacity building is crucial for improved feed efficiency regardless of feed type used.

Summary of Chi-square findings

The cross-tabulation and Chi-square results show that feed type has a statistically significant relationship with key production and management outcomes. Specifically, feed reliability ($p = 0.000$), profitability ($p = 0.002$), cost-effectiveness ($p = 0.005$), and record keeping ($p = 0.001$) were strongly associated with feed type. However, training needs did not differ significantly across the groups ($p = 0.130$), suggesting a universal interest in improving feed-related knowledge. These results reinforce that on-farm feed production enhances both economic and managerial efficiency compared to exclusive use of commercial feeds.

Discussion, Conclusion and Recommendations

Discussion of findings

Farmers' Perceptions on the Use of On-Farm Produced Feeds

The study revealed that farmers using on-farm feeds had generally positive perceptions, citing reliability, cost savings, and control over feed quality as key benefits. This finding aligns with Munyua and Kariuki (2022), who observed that farmers perceive self-produced feeds as economically advantageous. However, commercial feed users were more cautious, reflecting Nguyen et al. (2021), who reported skepticism about nutritional adequacy due to inconsistent ingredient quality.

Education and access to extension services were significant determinants of perception. Educated farmers and those with frequent extension support demonstrated higher confidence in on-farm feeds, consistent with Osei et al. (2023). These findings underscore the importance of information dissemination and training in shaping perceptions and adoption rates.

Cultural and traditional beliefs also influenced feed choices. Certain locally avoided ingredients limited feed diversity, echoing Amankwah et al. (2021). Farmers often relied on trial-and-error methods due to lack of standardized evaluation tools, corroborating Chen & Li (2020).

Therefore, enhancing perception requires training, practical evaluation tools, and culturally sensitive interventions to bridge the gap between perception and actual feed quality.

The study found that on-farm feeds reduced overall feed costs and proportion of total production costs compared to commercial feeds. Feed expenses accounted for 45% of total production costs for on-farm users, versus 60% for commercial users. These results confirm FAO (2022), who reported that feed represents the largest production cost in poultry farming.

Social factors such as cooperative membership and peer networks enhanced cost-effectiveness, reflecting findings by Owusu et al. (2022) and Bebe et al. (2023). Farmers shared knowledge, bulk-purchased ingredients, and supported one another, improving efficiency.

Technical competence, availability of raw materials, and access to extension services significantly influenced feed cost-effectiveness. Farmers with higher skills in feed formulation and reliable ingredient supply achieved better growth rates and lower mortality, consistent with Ahmed & Hasan (2023) and Kagabo et al. (2024).

Gender dynamics influenced cost-effectiveness. Women farmers faced barriers to resource access and decision-making authority, echoing Njoroge & Mwangi (2022). Environmental factors, including seasonal feed availability and climate variability, also affected production costs, supporting Singh et al. (2023).

Trust in feed quality and supplier reliability shaped adoption of on-farm feed practices, aligning with Fernandez et al. (2021). Farmers who trusted feed ingredients and had confidence in quality management achieved higher cost-effectiveness and profitability.

Strategies to Enhance Cost-Effectiveness of On-Farm Feed Production

The study revealed that farmer-led innovations played a critical role in enhancing the cost-effectiveness of on-farm feed production. Farmers actively experimented with locally available ingredients, combining grains, protein sources, and supplements to optimize feed quality while minimizing costs. For instance, 58% of on-farm feed users reported that adjusting ingredient ratios based on availability allowed them to reduce feed costs by up to 15% per production cycle. These findings align with Morrison and Baltenweck (2021), who noted that farmer-initiated adaptations are valuable yet often underutilized in formal feed improvement programs. The evidence from this study underscores the importance of recognizing and formalizing local innovations as part of broader feed efficiency interventions.

Technical training emerged as another significant strategy. The study found that farmers who had undergone training in feed formulation and management demonstrated better performance in terms of feed conversion ratios and profitability. Specifically, trained farmers reported higher gross profits, averaging UGX 1,200,000 per cycle, compared to UGX 900,000 for untrained counterparts. This supports the observations of Lwanga et al. (2022), highlighting that integrating technical skills with business management enhances both adoption and efficient feed use. The findings suggest that regular, context-specific training is critical for improving the practical application of on-farm feed systems.

The use of digital tools for feed management was also explored. While mobile platforms and applications were identified as promising for sharing feed formulation knowledge and monitoring production, uptake was limited by access and literacy challenges. Only 36% of respondents reported using digital tools consistently. This finding is consistent with Adewale et al.

(2023), indicating that while technology has potential to improve feed efficiency, barriers such as connectivity and digital skills must be addressed to realize its benefits.

Policy support was highlighted as a key enabler for cost-effective feed production. Farmers who had access to input subsidies, credit facilities, or extension services reported lower feed costs and higher confidence in their feeding practices. Approximately 44% of respondents indicated that government or NGO interventions had directly reduced their input costs. This mirrors findings by Nang'ayo and Muchui (2022), reinforcing that policy measures can enhance adoption of on-farm feed systems when effectively implemented and accessible.

Participatory approaches were also effective in promoting relevant and practical feeding strategies. Farmers who were actively involved in developing and refining feed recipes reported higher satisfaction and adoption rates. In the study, 51% of farmers emphasized that co-creation workshops with extension officers improved both feed quality and usability. This aligns with Mwenda and Ochieng (2021), suggesting that participatory methods ensure interventions are grounded in local realities and practical constraints.

The study further highlighted the role of cooperative strengthening in improving cost-effectiveness. Farmers engaged in cooperatives benefited from collective procurement of ingredients, shared equipment, and bulk discounts, resulting in a 10–20% reduction in feed costs compared to independent farmers. This finding supports Kiprop et al. (2023), who emphasize that cooperative mechanisms enhance resource efficiency and bargaining power, critical for smallholder poultry systems.

The provision of farmer-friendly feed guidelines was found to facilitate adoption and efficiency. Simplified formulations and easy-to-understand nutritional guidance allowed farmers to consistently produce nutritionally adequate feeds. About 63% of on-farm feed users reported that these guidelines improved feed quality and reduced wastage. This finding is consistent with Kamau and Wanjiku (2022), highlighting the importance of translating expert recommendations into practical tools for smallholder farmers.

The study demonstrates that integrated interventions combining farmer-led innovation, technical training, digital support, participatory methods, cooperative engagement, policy measures, and accessible guidelines are essential for enhancing the cost-effectiveness and sustainability of on-farm feed production. Neglecting any of these components could limit the efficiency and profitability of poultry farming in Mbarara City, as farmers require a multi-faceted support system to optimize feed utilization (Mwangi & Njoroge, 2023).

Conclusions

Farmers' perceptions significantly influence adoption of on-farm feeds. Positive perceptions were strongest among on-farm feed users and were shaped by education, extension access, and cultural practices.

On-farm feed production reduces feed costs, enhances profitability, and improves resource use efficiency compared to commercial feed systems. Social networks, technical skills, and trust in feed quality further reinforce cost-effectiveness.

Adoption and efficiency can be enhanced through farmer-led innovations, technical training, participatory approaches, cooperative strengthening, digital tools, and supportive policy interventions.

Recommendations

Implementing targeted training programs on feed formulation, nutritional evaluation, and cost management for all farmers, especially commercial feed users.

Increasing extension support frequency, incorporating demonstrations and practical tools for evaluating feed quality and performance.

Encouraging formation and strengthening of cooperatives to facilitate bulk purchase of ingredients, shared knowledge, and collective problem-solving.

Developing farmer-friendly mobile platforms and digital tools to provide real-time guidance on feed production and management.

Providing accessible subsidies, credit facilities, and extension services to support smallholder farmers in adopting on-farm feed systems.

Involving farmers in feed development and evaluation to ensure practical, context-specific solutions.

Designing programs that specifically target women farmers, ensuring equitable access to resources, training, and decision-making.

Considering socio-cultural beliefs when promoting feed ingredients to ensure adoption and acceptability.

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