EGYPTIAN ACADEMIC JOURNAL OF
BIOLOGICAL SCIENCES
ENTOMOLOGY

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ISSN
1687-8809

WWW.EAJBS.EG.NET

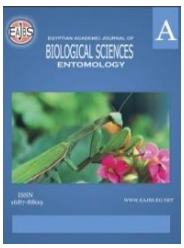
Vol. 17 No. 3 (2024)

Citation: *Egypt. Acad. J. Biolog. Sci. (A. Entomology) Vol. 17(3) pp.101-115 (2024)*
DOI: **10.21608/EAJBSA.2024.376803**

Egypt. Acad. J. Biolog. Sci., 17(3):101-115 (2024)

Egyptian Academic Journal of Biological Sciences
A. Entomology

ISSN 1687- 8809
http://eajbsa.journals.ekb.eg/



Evaluating Farmers' Awareness and Adoption of Housefly Maggots as Alternative Protein for Broiler Chicken Production in Mbarara District, Western Uganda

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ARTICLE INFO
Article History
Received:11/7/2024
Accepted:28/8/2024
Available:1/9/2024

Keywords:
Awareness, alternative source, housefly maggots.

ABSTRACT

In Mbarara District, smallholder farmers face challenges in accessing affordable protein sources for broiler chicken production. Housefly maggots are a cheap sustainable source of protein in broiler chicken production that smallholder farmers can employ to improve food security. This study evaluated farmers' awareness, access, and adoption of maggots as a protein source. A mixed-methods approach surveyed 130 broiler producers. Results show 71.5% of farmers are aware of maggot-based feeds, but only 6.1% use them, indicating a knowledge-application gap. Wealthier farmers were more likely to adopt this approach. To address this gap, the study recommends targeted media campaigns, educational initiatives, and demonstration projects showcasing economic benefits. Establishing local maggot production facilities, farmer cooperatives, and knowledge-sharing platforms could further support adoption.

INTRODUCTION

Meeting the world's growing demand for animal feed by 2050 will require a 70% increase in production, with a significant portion of this growth driven by the need for protein-rich ingredients (Chisoro *et al.*, 2023). However, traditional sources like soybeans and fishmeal face mounting sustainability challenges, including resource scarcity, environmental degradation, and high production costs (Veldkamp *et al.*, 2012). In response, the livestock industry is turning to alternative protein sources, such as insect meal, which offers a promising solution due to its high protein content, eco-friendly production process, and potential to reduce reliance on resource-intensive feed ingredients (Sajid *et al.*, 2022).
In Uganda, smallholder farmers play a critical role in meeting the country's growing demand for poultry products. However, they face significant challenges in accessing affordable and sustainable protein sources for broiler chicken production, with many relying on expensive and imported feed ingredients (Okello *et al.*, 2023). Housefly maggots, a locally available and nutritious feed ingredient, offer a promising alternative. Yet, despite their potential benefits, adoption remains limited due to a lack of awareness, access, and acceptance among farmers (Bbosa *et al.*, 2019).

The study evaluated farmers' awareness, access to, and use of housefly maggots as an alternative protein source for broiler chicken production in Mbarara District, western

Uganda. Despite increased information dissemination, farmers still rely on conventional protein sources, which are costly and less sustainable. By exploring the complex relationships between awareness, access, and adoption, this research would contribute to the development of sustainable and equitable poultry feed systems in Uganda, ultimately enhancing the livelihoods of smallholder farmers and improving food security in the region**.**

MATERIALS AND METHODS

Study Design:

The study used a mixed-method research design with a cross-sectional survey to gather data on broiler farmers' awareness of using maggot feeds as a protein source. Cross-sectional studies were cost-effective and provided quick, easy, and affordable data collection. A sample size of 130 respondents, including 100 farmers, local leaders, feed stockists, and agriculture extension workers, was selected for statistical analysis. The researcher used a questionnaire to gather quantitative data from the broiler farmers who were registered with the district production department and were selected randomly. Interview guides were used to gather qualitative data from key informants who were purposively selected.

Quantitative data collected was cleaned, coded and analyzed using SPSS and was presented in tables for easy interpretation. Qualitative data was organized into concepts and themes for a deeper understanding of the phenomena. Quantitative data was categorized under subheadings and analyzed using simple descriptive statistics like frequencies and percentages. Inferential statistics like Chi-square, Pearson correlation, and regression coefficients were used to measure the level of farmers' awareness, access to and the use of housefly maggots as an alternative source of protein to enhance broiler chicken production. The study ensured high data quality through precautionary measures, including a questionnaire pre-test, simple random sampling, well-trained research assistants, face-to-face interviews, data cleaning, labeling, and careful entry and analysis. Validity and reliability tests were used as major quality control measures.

RESULTS AND DISCUSSION

Socio-economic Profile of the Respondents:

4.2.1 Gender of Respondents:

The gender of an individual determines the level of involvement of gender in different poultry management activities like feeding (including involvement in maggot rearing) and disease control and infrastructure establishment for example poultry house. Results from Table 1 indicate that the majority of the respondents were males at (65.4%) as compared to females who comprised a minority of (34.6 %) of respondents. This would be due to the Traditional gender roles in Uganda, particularly in Mbarara District, that favor men in poultry farming due to their perceived physical demands or skills. Similarly, men might have better access to resources such as land, capital, and information, which are essential for starting and maintaining a poultry farm. Limited access to these resources could discourage women from entering or staying in the poultry farming sector (Table 1).

Table 1: Gender of respondent.

Gender of respondents		Frequency	Valid Percent	Cumulative Percent
Gender	Male	85	65.4	65.4
	Female	45	34.6	100.0
Total		**130**	**100**	

The results of the study concur with Mayala's (2021) report, which stated that in the Karamoja sub-region, traditionally men are polygamous, own and oversee livestock including poultry enterprises and finances, and are in charge of making decisions, with little to no input from women. Women serve a primary reproductive role and are responsible for domestic work, including the provision of food for the household, childcare, fetching water, collecting firewood, and building and fixing houses. This implies that women embrace new technologies considerably more slowly than males do because of inequalities in how easily they can acquire information about technology advancements and complementary input and services.

Age of Respondents:

Age is a variable that plays an important role in determining the engagement of household members in agricultural activities. The respondents were asked to state their ages, which were classified under different categories. The overall findings revealed that the majority of the respondents 77 (59.2%) were aged between 36-60 years, followed by young respondents < 36 years old constituting (26.2%) of the respondents. A relatively small percentage (14.6%) of respondents were in the elderly age category of above 60 years old (Table 2).

Table 2: Age of respondents**.**

Age of respondents	Frequency	Valid Percent	Cumulative Percent
Less than 36 years	34	26.2	26.2
36-60 years	77	59.2	85.4
Above 60 years	19	14.6	100.0
Total	130	100	

Source: Research data 2024

The overall analysis showed that across the study area, middle age farmers between 36-60 years were the majority followed by young farmers who were below 36 years. The elderly respondents above 60 years were the minority; this could have been attributed to the fact that the middle-aged farmers could have viewed poultry farming as one of the alternative sources of income and when coupled with the use of housefly maggots would enable them to manage poultry enterprise sustainability due to low costs and environment friendly of maggot rearing. This finding suggests that the majority of the respondents were more active to perform in different poultry management practices including maggot rearing the study area is mostly less than 60 years old, which is the economically active age group, giving a total of 85.4%. This reveals that there are significantly higher productive age and energetic people with interest and accumulated skills and experiences in poultry rearing. This corroborates the statement of Mayala (2021) that respondents within this age limit are in the economically active age bracket to undertake various livelihood activities including poultry rearing. While those aged above 60 years are the least involved in poultry rearing in the study area.

The Education Level of the Respondent:

The study results established that 8 (6.2%) had not attended school, 16 (12.3%) revealed that they were literate, 28 (21.5%) had completed primary, 43 (33.1%) mentioned secondary and 35 (26.9%) mentioned post-secondary (Table 3).

Table 3: Education level of respondent.

Education level of respondents		Frequency	Valid Percent	Cumulative Percent
Valid	Not literate	8	6.2	6.2
	Literate	16	12.3	18.5
	Primary	28	21.5	40.0
	Secondary	43	33.1	73.1
	Postsecondary	35	26.9	100.0
Total		**130**	**100**	

Source: Research data 2024

Further findings stressed that the majority 43 (33.1%) of poultry farmers were secondary education holders as compared to those who had no formal education, primary education and post-secondary education, this probably contributed to accessing more information from different sources like media, fellow farmers, published information on the use of maggots in poultry rearing and its effectiveness in improving poultry yields and quality. The results further established that irrespective of the level of education, poultry farmers would ably adopt the use of maggots as an alternative source of protein in poultry production if accurate and timely information is provided to them from different sources, especially from agriculture extension workers. The study finding is in disagreement with Reniko, (2020) report, which showed that educated farmers have a high level of understanding, which helps them in decision-making. Usman further argued that farmers with higher education probably did not find the practice to be a motivating and lucrative enterprise thus resulting in their low adoption rate.

Civic Status:

The marital status of an individual determines the level of involvement in decision-making concerning the allocation of resources to poultry management. Respondents were asked about their marital status and results indicate that (71.5%) of the respondents were married, (16.2%) were single, and (6.2%) of the respondents had divorced and widowers respectively (Table 4)

Table 4: Civic status**.**

Civic status		Frequency	Valid Percent	Cumulative Percent
Valid	Married	93	71.5	71.5
	Single	21	16.2	87.7
	Divorced	8	6.2	93.8
	Widower	8	6.2	100.0
Total		130	100	

The overall findings showed that the majority of poultry farmers were married and all the respondents irrespective of their marital status participated in the study. It was established that married couples were more involved in poultry production to earn a diversified source of income to improve their standards of living. The study findings concur with Ramasawmy (2017) who argued that married couples tend to share experience of technologies and therefore their engagement in chicken keeping is conceived to be highly meaningful of livelihood to sustain their families particularly for married and living together families.

Religious Affiliation Status Distribution:

The study looked at the distribution of respondents by their religious affiliations. Out of 130 respondents, the study showed that 105 (80.8%) of the respondents were affiliated with Christianity and 25 (19.2%) were affiliated with Islam (Table 5).

Table 5: Religious Affiliation Status Distribution**.**

Religious Affiliation status		Frequency	Valid Percent	Cumulative Percent
Valid	Christian	105	80.8	80.8
	Muslim	25	19.2	100.0
Total		130	100	

Source: Research data 2024

The results indicate that all the respondents irrespective of religious affiliation were involved in poultry production and were willing to adopt the use of maggots as an alternative source of proteins if only they accessed information on different maggot-rearing methods. The results corroborate with Matthew 23:37 which states that in predominantly Christian regions, attitudes towards poultry rearing can be influenced by biblical teachings. For example, in the Old Testament, there are references to poultry such as doves and pigeons being offered as sacrifices. In the New Testament, Jesus uses imagery related to chickens and hens to convey messages about protection and care. The overall finding indicated that religious affiliation has minimal impact on the use of housefly maggots in poultry rearing. The findings support **(**Murphy 2011) study which revealed that historically insects are referred to as food in Leviticus chapter 11, verse 22 and in Matthew chapter 3, verse 4.

Household Size:

Household size can influence the adoption of maggots as an alternative source of protein in poultry rearing by affecting food demand, resource availability, economic considerations, the scale of poultry rearing, and cultural acceptance. Respondents were asked about their household size and the results indicate that the majority (89.2%) had less than 11 members and only 14 (10.8%) had between 11-20 members (Table 6).

Table 6: Household size.

Household size		Frequency	Valid Percent	Cumulative Percent
Valid	Less than 11 members	116	89.2	89.2
	Between 11-20	14	10.8	100.0
Total		130		

Source: Research data 2024

The study's conclusions showed that most households contained fewer than eleven people. This indicates that most households had small families, which may have prevented most poultry farmers from implementing various cutting-edge technologies, such as using maggots as a substitute source of protein because there were few opportunities to benefit from economies of scale in terms of labor force for the use of maggots. This study supports the findings of **(**Donkoh *et al.,* 2019) which suggest that household size has a significant impact on factors like labor force availability, which may affect the adoption of new technology.

Farm Size:

Land is one of the factors that accommodates other factors of production. Respondents were asked about their farm size and the results indicate that the majority of the respondents 105 (80.8%) had less than 11 acres of land and only (19.2%) of the respondents had between 11-20 acres of land (Table 7).

Table 7: Farm size.

Farm size		Frequency	Valid Percent	Cumulative Percent
Valid	Less than 11 acres	105	80.8	80.8
	Between 11 acres-20 acres	25	19.2	100.0
Total		130	100	

Source: Research data 2024

The study findings established that the majority of the poultry farmers had moderately small plots of land of less than 11 acres and such land was occupied by different enterprises. Although poultry farmers had such land, they were not involved in producing crops to provide proteins to their poultry hence they were relying majorly on commercial feeds that would increase the costs of production. The study findings are in agreement with **(**Dissanayake *et al.*, 2022) study, which argued that farm size highly, contributes to farmers' adoption of new technology.

The Main Occupation of Respondents:

The study established that a majority (74.6%) of the respondents whose main source of livelihood was crop farming, 28 (21.5%) were agri-food processors while a small proportion (3.8%) of the respondents had business (traders) as their main source of livelihood (Table 8).

Table 8: The main occupation of respondents.

Main occupation of respondents		Frequency	Valid Percent	Cumulative Percent
Valid	Farming	97	74.6	74.6
	Trader	5	3.8	78.5
	Agri-food processor	28	21.5	100.0
Total		**130**	**100**	

Source: Research data 2024

The overall results showed that the majority of poultry farmers (74.6%) relied primarily on crop farming for their income, while just 3.8% of respondents said that business was their primary source of income. This was consistent with reports from (Bbosa *et al.*,2019) that stated that farmers in Siaya, Homa Bay, and Kisumu primarily make their living from crop production. The fact that there is a potential for farmers to use maggots as a substitute feed source that could support their home poultry farming endeavors is indicated.

Experience of Farmers in Poultry Farming:

Farmers' experience is very crucial in the management and use of both indigenous and modern technologies in the management of poultry enterprises. Respondents were asked about their experience and results indicate that the majority of the respondents (63.1%) had spent between 11-20 years whereas 36.9% had spent less than 11 years while practicing poultry rearing (Table 9).

Table 9: Experience in rearing poultry**.**

Experience in rearing poultry		Frequency	Valid Percent	Cumulative Percent
Valid	Less than 11 years	48	36.9	36.9
	11 -20 years	82	63.1	100.0
Total		130	100	

Source: Research data 2024

The study findings established that all the respondents had spent some years with the majority between 11-20 years. This implies that the majority of the respondents had enough experience and they were using both indigenous knowledge and modern technologies in performing and establishing different poultry management practices.

Type of Poultry Rearing System:

Based on the number of birds and the housing infrastructures available, farmers use different poultry management systems while keeping the birds. Results indicate that the majority of the respondents 121 (93.1%) were rearing poultry in confinement while 9 (6.9%) were using semi-scavenging (Table 10).

Table 10: Type of poultry rearing system.

Type of poultry rearing system		Frequency	Valid Percent	Cumulative Percent
Valid	Semi-scavenging	9	6.9	6.9
	Confinement	121	93.1	100.0
Total		**130**	**100**	

Source: Research data 2024

From the study, it was established that the majority of the respondents 121 (93.1%) were using intensive systems to manage their birds. The deep litter system was the only intensive system used by the majority of the farmers where birds are kept in one pen of up to 250 birds but the majority of them were having birds less than 250 due to fear of risks and costs in terms of feeding and management. This can be compared with Mfulwane (2023), who pointed out that the intensive system is mainly used by layer producers where birds are completely kept in houses or cages. Capital expenditure is high and birds are totally dependent on owners for all their requirements. Production cost and productivity in this system are also relatively higher than the extensive and semi-intensive systems.

Level of Farmers' Awareness, Access to and the Use of Housefly Maggots as An Alternative Source of Protein to Enhance Broiler Chicken Production:

The study sought to establish the level of farmers' awareness, access to and the use of housefly maggots as an alternative source of protein to enhance broiler chicken production. This helped the study to understand farmers' level of knowledge on the use of maggots, accessibility and usage in broiler chicken production.

level of Farmers' Awareness of Access to and Use of Housefly Maggots:

The level of farmers' awareness, access to and use of housefly maggots depends on access to information from different sources and the level of willingness to use the acquired information (skills and techniques) in the implementation of different management practices in poultry farming. Respondents were asked about the level of awareness of access to and use of housefly maggots as an alternative source of proteins and their responses were recorded in Table 11 below.

Table 11: level of farmers' awareness access to and use of housefly maggots.

Parameters	Category	Frequency	Percent	Chi-square	p-value
Do you know that maggots can be used for chicken feeding	Yes No **Total**	93 37 **130**	71.5 28.5 **100**	-	0.000
If Yes, did you use Maggots to feed broiler Chicken	Yes No Missing **Total**	8 85 37 **130**	6.1 65.4 28.5 **100**	6.056	0.000
Do you currently use maggots to feed broiler chicken	Yes No Missing **Total**	8 85 37 **130**	6.1 65.4 28.5 **100**		0.234
Source of maggots	Own farm production Not using maggots **Total**	8 122 **130**	6.1 93.9 **100**	1.886	0.062
Acquired training on the use and rearing of maggots as an alternative source of proteins	**Yes**	**130**	**100**	**5.05**	**0.00**
Source of training on the use of maggots	Extension workers Fellow farmers Media platforms **Not aware** Total	40 13 40 37 **130**	30.8 10.0 30.8 28.5 **100**	1.281	0.003

Source: Research data 2024

The study findings established that the majority (71.5%) of the respondents knew that maggots could be used for chicken feeding and a small percentage (28.5%) did not know. This implies that farmers' knowledge and adoption of maggot-based feeding practices for chickens varied, and those who are familiar with the benefits and best practices chose to incorporate maggots into their poultry feeding strategies as a sustainable and cost-effective protein source. The findings can be compared with Yeboah (2022) who argued that to increase the supply of poultry products, awareness campaigns on different approaches should be promoted and encouraged among poultry farmers on the use of housefly maggots as an alternative source of protein and fats to poultry birds. This would be achieved if a combination of the readily available feed sources is fully utilized to their maximum.

The study findings established that 8 (6.1%%) of the respondents were using and still using maggots to feed broiler chickens. A small percentage of the farmers were using maggots to feed their broiler chicken because the majority of the farmers still adhere to using both traditional feeding practices and commercial feeds and hence, they were hesitant to adopt new methods, such as using housefly maggots because they have been successful with such conventional feed sources in their poultry enterprises. This was in line with (Pomalégni *et al.,* 2017) which study showed that 5.6% of traditional poultry farmers in Benin use fly larvae at least occasionally to feed their poultry, with variations among regions.

Further findings indicate that farmers who had already adopted the use of housefly maggots 8 (6.1%) were still using (had not abandoned) since the technology was safe and cost-effective. This is because maggots would be produced relatively inexpensively using organic waste materials, such as manure or food scraps, reducing the overall feed costs for

farmers. By utilizing maggots as a feed supplement, farmers could potentially save money on commercial feed while still providing their broilers with essential nutrients. This is in agreement with Ssepuuya *et al.,* (2019) who revealed that at least in Uganda, the majority of stakeholders are aware of this alternative use of insects, thanks to their own experience, and have a positive attitude towards the subject but despite this high rate of awareness, only a small percentage ever reared or used insects for feeding fish.

The study results also indicate that all the respondents 8 (6.1%) who were using maggots to feed their broilers were producing them from their own farm. This is because On-farm housefly maggot production allows farmers to utilize waste materials that would otherwise be discarded, effectively turning them into a valuable resource and even the availability of maggots in the markets is limited. The study results corroborate with Nkegbe *et al.,* (2018) who pointed out that one of the current constraints in the widespread adoption of fly larvae in poultry farming is their unavailability on the market and seeking an economic measure of fly larvae valorization is a prerequisite to generate relevant indicators needed for better decision-making.

The study findings established that the majority of the respondents 40 (30.8%) were acquiring training from media platforms and extension workers and 13 (10.0%) were acquiring information from fellow farmers and 37 (28.5%) had no information that housefly maggots can be used for broiler chicken feeding. This implies that the majority of the broiler farmers were acquiring information from different channels hence they were aware of the use. This is because media platforms, such as social media channels, provide farmers with access to a wide range of information on various agricultural topics, including innovative feeding practices like using maggots as broiler feeds. Extension workers also disseminate information through workshops, seminars, and training sessions, offering farmers opportunities to learn about new techniques and technologies. This can be compared with Okello, *et al.* (2021) who revealed that the acceptability elements of IBF were more important to farmers with prior awareness of the nutritional benefits of feeding chicken on insects and those belonging to farmer groups than their counterparts who were not aware.

Further analysis established that access to training, access to different sources of information, awareness on different methods of rearing maggots were found to be significantly associated with use of housefly maggots in broiler chicken farming for improved food security ($p<0.05$) (Table 12) whereas farmers status of currently using maggots and access to source of maggots (availability of market) were found to be having no any significant association with use of maggots for improved food security ($p>0.05$). The study findings suggested that access to training (p-value of 0.003), access to different sources of information (p-value of 0.000) and awareness of different methods of rearing maggots (p-value of 0.000) had a statistically significant association with the use of maggots in broiler poultry production ($p<0.05$), this demonstrated how access to training and information on production and use of housefly maggots affects its adoption at farm level.

Farmers' Knowledge and Attitude Towards the Use of Maggots as An Alternative Source of Proteins in Broiler Production:

Farmers' knowledge and attitude towards the use of maggots as an alternative source of protein in broiler production depends on the perceived benefits and costs involved in the production of maggots, access to and the performance and results are indicated in Table 12 below**.**

Table 12: Analysis of the Farmer's knowledge and attitude towards the use of maggots as an alternative source of proteins in broiler production.

Valuable	Category	Frequency	Percent	Chi-square	p-value
Maggots can be an excellent source of protein and could replace fish meal partly or entirely in animal diets	Strongly Agree	97	74.6	2.678	0.975
	Agree	33	25.4		
	Disagree	0	0		
	Strongly Disagree	0	0		
	Total	**130**	**100**		
The use of fly larvae in animal feed is safe if the standards of production on substrates are respected	Strongly Agree	68	52.3	3.925	0.000
	Agree	62	47.7		
	Disagree	0	0		
	Strongly Disagree	0	0		
	Total	**130**	**100**		
Unavailability of maggots on the market may result in abandonment of the technology	Strongly Agree	40	30.7	0.374	0.709
	Agree	90	69.3		
	Disagree	0	0		
	Strongly disagree	0	0		
	Total	**130**	**100**		
Limited prior exposure to maggot feeding inhibited farmers' willingness to use it in broiler production	Strongly Agree	37	28.4	2.222	0.825
	Agree	93	71.6		
	Disagree	0	0		
	Strongly disagree	0	0		
	Total	**130**	**100**		
The use of maggots is more important for wealthy farmers than their less-endowed counterparts.	Strongly Agree	81	**62.3**	**4.630**	**0.000**
	Agree	49	**37.7**		
	Disagree	0	**0**		
	Strongly Disagree	0	**0**		
	Total	**130**	**100**		
Farmers perceive the use of maggots in broiler feeding to negatively affect the future consumer acceptance of their products.	Strongly Agree	0	0	0.553	0.581
	Agree	0	0		
	Disagree	37	28.4		
	Strongly Disagree	93	71.6		
	Total	**130**	**100**		

Source: Research data 2024

The study findings established that 97 (74.6%) of the respondents strongly agreed and 33 (25.4%) agreed that housefly maggots can be an excellent source of protein, and could replace fish meal partly or entirely in animal diets. However further analysis from the ANOVA indicates this perception was not statistically significant since the p-value was greater than 0.05 (p=0.975). This is because Broiler chickens have specific nutritional requirements for optimal growth and performance. While housefly maggots are indeed a rich source of protein, they may not provide all the essential nutrients and amino acids required by broiler chickens in sufficient quantities. Similarly, while maggots can be a nutritious supplement, their digestibility and palatability compared to fish meal may affect feed intake and conversion efficiency in broilers. This is in disagreement with Kenis *et al.* (2014) who revealed that fly larvae, in particular house fly (*Musca domestica*) and black soldier fly (*Hermetia illucens*) were proved to be an excellent source of protein, and could replace fish meal partly or entirely in animal diets.

Results from Table 13, above indicate that the majority of the respondents 68 (52.3%) and 62 (47.7%) strongly agreed and agreed that the use of fly larvae in animal feed

is safe if the standards of production and substrates are respected respectively. Further analysis from the ANOVA indicates it was statistically significant since the p-value was less than 0.05 (p-value is 0.000). This is because when produced under controlled conditions and on suitable substrates, housefly fly larvae can provide a high-quality protein source that meets the nutritional requirements of broiler chickens. By adhering to production standards, farmers can ensure that the larvae are free from contaminants and pathogens, making them safe for consumption by broilers. On the other hand, following strict production standards in maggot production helps minimize the risk of contamination and disease transmission associated with fly larvae production. Farmers can implement hygiene protocols, such as proper waste management and sanitation practices, to prevent the introduction of harmful pathogens into the larvae production process, thereby safeguarding the health and safety of broiler chickens fed with larvae-based diets. This is in line with Makkar *et al.,* (2014) which stated that meeting production standards enhances consumer confidence in the safety and quality of broiler products derived from larvae-fed chickens. Consumers are increasingly concerned about the sustainability and safety of food production practices, and adherence to established standards helps reassure them that larvae-based feeds are produced responsibly and pose no risks to human health.

Results from Table 13 above indicate that the majority of the respondents 90 (69.3%) and 40 (30.7%) agreed and strongly agreed that the unavailability of maggots on the market may result in the abandonment of the technology respectively. Further analysis from the ANOVA indicates it was not statistically significant since the p-value was greater than 0.05 (p=0.709). This implies that If farmers rely solely on purchasing maggots from external suppliers, the unavailability of maggots in the market could disrupt their feeding regimen and production schedule. Farmers may not have alternative sources of protein readily available, leading to concerns about meeting the nutritional needs of their broiler chickens. Inconsistent availability or lack of maggots in the market could pose challenges in maintaining a consistent and reliable supply of feed for broiler chickens. Farmers may prioritize feed stability and reliability to ensure optimal growth and performance in their flocks, and the unpredictability of maggot availability may undermine their confidence in the technology. This can be compared with Pieterse *et al.* (2019) who pointed out that If maggot availability is perceived as unstable or unreliable, broiler farmers may be reluctant to invest time and resources into adopting maggot-based feeding technology, fearing potential disruptions in their production operations. Concerns about continuity and consistency may discourage farmers from fully embracing the technology.

The study findings in Table 13, indicate that the majority of the respondents 81(62.3%) strongly agreed and 49 (37.7%) agreed that the use of maggots is more important for wealthy farmers than their less endowed counterparts. Further analysis from the ANOVA indicates it was statistically significant since the p-value was less than 0.05 (p-value is 0.000). This is because maggot production systems may require an initial investment in infrastructure and equipment. Wealthier farmers may have the financial capacity to set up and maintain these systems more easily than less-endowed farmers. This perception may stem from the belief that the costs associated with maggot production are more manageable for wealthier individuals. This is in agreement with Verbeke *et al.* (2015) who revealed that farmers with off-farm sources had more positive attitudes towards new technologies including the use of maggots in poultry production and hence the versatility features of IBF were more important for wealthy farmers than their less endowed counterparts

The study findings in Table 13 also indicate that the majority of the respondents 93 (71.6%) agreed and 37 (28.4%) strongly agreed that limited prior exposure to maggot feeding inhibited farmers' willingness to use it in broiler production. Further analysis from the ANOVA indicates it was not statistically significant since the p-value was greater than

0.05 (p=0.825). This is because farmers perceive maggot feeding as a relatively unfamiliar and unproven practice since they have not been exposed to it in the past. This perception of risk, coupled with the uncertainty surrounding the effectiveness and outcomes of maggot feeding, inhibited farmers' willingness to adopt it, especially if they prioritize minimizing potential risks and uncertainties in their production systems. This is in agreement with Okello, *et al.,* (2021) who pointed out that farmers consistently had weaker perceptions of benefits and stronger perceptions of the risks associated with the use of insects in animal feed.

The study findings indicate that the majority of the respondents 93 (71.6%) strongly disagree and 37 (28.4%) disagreed that farmers perceive the use of maggots in broiler feeding to negatively affect the future consumer acceptance of their products. Further analysis from the ANOVA indicates it was not statistically significant since the p-value was greater than 0.05 (p=0.581). This is because Broiler farmers perceived that consumers have certain preferences and expectations regarding the quality, safety, and source of poultry products. Introducing unconventional feed ingredients such as maggots into broiler diets would raise concerns or skepticism among consumers about the nutritional value, safety, and hygiene of the final products. This can be compared with Verbeke *et al.* (2015) who pointed out that the use of maggots affects consumer acceptance because the use of maggots in broiler feeding could lead to stigmatization or rejection of their products by certain consumer segments, particularly those with strong preferences or aversions to unconventional food sources. Concerns about consumer acceptance may arise from a desire to avoid potential reputational damage or backlash associated with perceived unorthodox production practices.

Conclusions

The study found that a majority of farmers (71.5%) are aware of the use of housefly maggots as a protein source for broiler chickens. Information about maggots comes from various sources, including media platforms, extension workers, and fellow farmers. However, only 6.1% are actively using maggots in broiler chicken feeding, indicating a gap between awareness and practical implementation. Farmers' perceptions and attitudes towards maggots vary, with wealthier farmers more likely to adopt the practice. Factors such as recognition, prior exposure, availability, and consumer acceptance were not significant in influencing adoption.

Recommendations

*****Implementing educational programs and media engagement to educate farmers on using housefly maggots as an alternative protein source for broiler production.

*****Enhance extension services by training extension workers to effectively communicate maggots' benefits and practical aspects, and establishing farmer field schools for hands-on experience and peer-to-peer learning.

*****Promoting pilot projects and field visits to demonstrate the effectiveness and economic benefits of using maggots in broiler chicken feed, encouraging wider adoption.

*****Establishing local housefly maggot production units for reliable supply, involving community-based initiatives or private enterprises, and providing subsidies and incentives to make it more accessible and affordable

*****Encouraging farmer groups and cooperatives for collective learning, resource sharing, and access to maggot-based feed solutions, and creating knowledge-sharing platforms for farmers to share experiences and solutions.

*****The proposed policy supports the use of maggots in animal feed through the development of a regulatory framework and integration into government agricultural programs.

Declarations:

Ethics Statement: The researcher conducted the study in compliance with all applicable ethical standards and regulations. The study went through an ethical review by a research

and ethics team. No human participants or vertebrate animals were involved in this study.

Authors Contributions: All authors contributed equally, and have read and agreed to the published version of the manuscript.

Conflict of Interest: The authors declare no conflict of interest**.**

Availability of Data and Materials: The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request.

Funding: The study was funded primarily by the researcher, with additional support provided by Bishop Stuart University.

Acknowledgements: First and foremost, I wish to thank Jaramogi Oginga Odinga University of Science and Technology for providing me with an enriching academic environment and the resources necessary for my studies. I am also deeply grateful to Bishop Stuart University, my employer and sponsor, for their unwavering support and encouragement throughout this journey.

I am profoundly indebted to my supervisors, Professor Christopher Gor and Associate Professor Rebecca Kalibwani, for their invaluable guidance, insightful feedback, and continuous support.

I would also like to extend my heartfelt thanks to my wife and children, whose love, patience, and understanding have been a constant source of motivation and strength.

Special thanks go to my research assistants, M/s Tutaryebwa Florence and Mr. Aine Ferdinand, whose hard work and dedication in data collection have significantly contributed to the success of this study.

To all those mentioned and the many others who have offered their support and assistance in various ways, I express my deepest gratitude. This accomplishment would not have been possible without you.

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