Appraisal of Biosecurity Measures as Cost Control Technique on Poultry Production in Okigwe Agricultural Zone, Imo State, Nigeria.

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Abstract

The study evaluated the impact of biosecurity measures on poultry production cost control in Okigwe Agricultural Zone, Imo State, Nigeria. A total of 90 respondents were selected using a purposive sampling technique. Data was collected through structured questionnaires and analyzed using descriptive statistics. Findings revealed that 80% of respondents were aware of and familiar with biosecurity measures, with a 64.44% implementation rate. Additionally, 58.89% had received training on these measures. The study highlighted an impressive overall (90%) biosecurity measures audits on their farms, with (67.78%) having quarantining facilities. Respondents perceived the cost implications of implementing biosecurity measures as significantly cost-saving (58.89%), with majority (78.89%) agreeing that the benefits outweigh the costs. Other positive outcomes reported by respondents included reduced disease outbreaks (78.89%), improved health and productivity at (77.78%), and cost reductions in veterinary, medication (80%), and feed expenses (76.67%). The study recommended continuous training for farmers, stakeholder collaboration, and government financial support to offset initial investment costs in biosecurity measures.

Keywords: appraisal, biosecurity measures, cost control, poultry production, Okigwe.

Introduction

Poultry production is an important component of the agricultural sector in Nigeria. Poultry refers to domestic birds raised for their meat, eggs, or feathers, including chickens, turkeys, ducks, geese, among others. The poultry enterprise plays a significant role in the national economy. In their separate studies, Makasi et al. (2020), and National Bureau of Statistics - NBS (2020), reported that the Nigerian poultry industry contributes approximately 25% to agricultural GDP of the country. They further stated that only in the year 2020, poultry production contributed to the expansion of Nigeria's agricultural sector with about 2.29% to the country's Gross Domestic Product. Furthermore, the poultry industry contributes to food security by providing a major source of animal protein for the Nigerian population. Poultry production offers a very fast and healthy approach to meeting the growing demand for animal protein (Ministry of Foreign Aaffairs – MFA, 2020). Additionally, poultry farming serves as a source of employment and income for many smallholder farmers, playing a crucial role in poverty alleviation and rural development. According to Anang and Kabore (2013), poultry production contributes significantly to the socioeconomic development of people all over the world. Aminu and Hermanns (2018) also reported that poultry industry provides employment and regular income for entrepreneurs through its value chain activities.

In recent years, the poultry industry in Nigeria has experienced rapid growth, driven by increasing demand for poultry products and a growing population. According to the Food and Agriculture Organization –FAO (2015), Nigeria is the largest producer of eggs in Africa, with the poultry sector accounting for a significant portion of the country's agricultural GDP. The sector has the potential for further expansion and modernization, however, is confronted with several challenges that can result in substantial economic losses for farmers. One of the key challenges faced by poultry producers in Nigeria, including Okigwe Agricultural Zone of Imo State, is the threat of disease outbreaks, which can have devastating effects on production levels and profitability. According to a recent study by Oladele et al. (2019), outbreaks of diseases such as avian influenza and Newcastle disease have led to significant losses for poultry farmers in the region. Similarly, Bello et al; (2017), reported that disease outbreak has successfully occasioned the liquidation of some poultry establishments while millions of naira are continuously being lost to poultry disease on cost of treatment, prevention, control and mortality of birds. These losses are not only financial but also have an impact on food security and the livelihoods of poultry farmers and their families. However, effective biosecurity measures can be adopted by farmers to meliorate the impacts of disease outbreaks on poultry production.

The Food and Agricultural Organization's Biosecurity Kit, (2007) defined biosecurity as a strategic and integrated concept that encompasses the policy and regulatory frameworks (including instruments and activities) that analyze and manage risk in food safety, public health, animal life and health, and plant life and health, including associated environmental risk. Avian pathogens are best prevented by effective implementation of biosecurity measures such as enhancing management measures, vaccination, medication, quarantine, eradication and other measures that limit the transmission in the farm. In specific to poultry industry, Delabouglise et al. (2017) defined Biosecurity as a set of measures and procedures designed to prevent the introduction and spread of infectious diseases within a poultry farm or production facility. Effective biosecurity measures help to maintain the health and productivity of poultry flocks, minimizing the risk of disease transmission and associated economic losses. Effective biosecurity measures encompass a range of protocols, including restricted farm access, hygiene practices, and disease surveillance, among others (Suleiman et al., 2019). Studies have shown that the implementation of biosecurity measures significantly reduces the incidence of diseases and mortality rates in poultry farms, thus enhancing overall flock health and productivity (Olowoniyi et al., 2018).

The importance of biosecurity in safeguarding the health and welfare of poultry has been well-documented in the literature. Research conducted by Olowoniyi et al. (2018) in Nigeria highlighted the positive impact of robust biosecurity measures in mitigating disease risks and enhancing the sustainability of poultry production systems. Beyond its role in disease prevention and control, biosecurity measures have also been recognized as cost-effective strategies for poultry producers. Biosecurity measures are vital for better performance and quality of chicken production in the competitive world (Fabrice et al; 2021). Similarly, The FAO (2013) report says that the most important measure for sustainable and profitable production on a poultry site is to have forward defenses in place – i.e., a biosecurity programme. The report further noted that the most common breaks in biosecurity occur when infectious poultry diseases are introduced by the movements of people. By minimizing the prevalence of diseases and enhancing overall flock health, biosecurity measures can reduce the reliance on costly treatments and medications, ultimately leading to cost savings for poultry farmers (Bhatti et al., 2016). Furthermore, the implementation of biosecurity measures can contribute to increased productivity and profitability within poultry farms (Bamidele et al., 2017).

A study by Bhatti et al. (2016) in Nigeria demonstrated that poultry farms with stringent biosecurity protocols experienced lower production costs and improved profitability compared

to farms with inadequate biosecurity measures. These findings underscore the potential of biosecurity as a cost control technique in poultry production, highlighting its role in enhancing economic efficiencies within the sector. In the Nigerian poultry industry, various challenges and opportunities exist concerning the adoption and implementation of biosecurity measures. Factors such as limited resources, inadequate awareness, and cultural practices may influence the successful integration of biosecurity protocols within poultry farms (Musah et al., 2020). It is crucial for stakeholders, including government agencies and agricultural extension services, to promote and support the adoption of biosecurity measures among poultry farmers to optimize production outcomes and mitigate disease risks (Kurfi et al., 2019).

Despite the numerous potential benefits of biosecurity measures in poultry production, there is limited research on the adoption and effectiveness of biosecurity measures in Okigwe Zone. The lack of understanding of the cost implications of implementing biosecurity measures for poultry producers in the region is a knowledge gap that needs to be closed. Given the importance of cost control in ensuring the profitability and sustainability of poultry production, it is essential to investigate the role of biosecurity as a cost control technique in Okigwe Zone, and provide valuable insights for policymakers, researchers, and poultry producers on the potential benefits of investing in biosecurity as a cost control technique.

This study therefore, aims to address and provide answers to the following research questions:

i. What are the current biosecurity measures employed by poultry producers in Okigwe Agricultural Zone?
ii. What is the level of awareness and compliance with biosecurity measures among poultry producers in the study area?
iii. What is the cost implication of implementing biosecurity measures on poultry production in the zone?
iv. What is the perceived impact of biosecurity on disease control, production efficiency, and cost reduction in poultry production in Okigwe Agricultural Zone?

Methodology

The study was conducted in Okigwe Agricultural Zone of Imo State, Nigeria. The Agricultural Zone comprises six Local Government Areas, i.e. Ehime Mbano, Ihitte Uboma, Isiala Mbano, Obowo, Okigwe, and Onuimo Local Government Areas. Okigwe Agricultural Zone lies between latitude of 5°3’ N to 5°57’ N and longitude 7°04’ E to 7°26’ E, covering a land area of about 952.3 sq.km. In the year 2019, the population of Okigwe Agricultural Zone was estimated at 1,059,591 (Imo State Ministry of Information, 2020). Okigwe Agricultural Zone has a very rich cultural heritage with abundant agro and mineral based raw material resources. The people are predominantly farmers who engage in food and livestock production and marketing. Animals reared at both subsistence and commercial levels are poultry, goats, sheep, pigs and fishes (Imo State Ministry of Information, 2020). The population for this study comprised of poultry farmers in Okigwe Agricultural Zone who are perceived to practice biosecurity measures on their farms. A purposive sampling technique will be used to select a representative sample of 15 poultry farmer from each of the six Local Government Areas of the zone, giving a total representative sample of 90 farmers. These selected farmers are experienced in production and participated willingly in the study. Data was collected using structured questionnaire designed to capture information on the biosecurity measures, awareness, compliance, and cost implications related to poultry production.

The analytical tool used to analyze collected data in this study was descriptive statistics such as frequencies, percentages, mean, media etc.

Results and Discussions

Table 1. Distribution of Respondents According to the current biosecurity measures adopted by poultry farmers in the Okigwe Agricultural Zone.

Variables	Frequency	Percentage (%)
Do you currently implement biosecurity measures on the farm?		
Yes	58	64.44
No	32	35.56
Total	**90**	**100**
How frequently do you conduct biosecurity audits on your farm?		
Monthly	24	26.67
Quarterly	27	30.00
Semi-annually	17	18.89
Annually	13	14.44
Not at all	9	10.00
Total	**90**	**100**
Have you had any serious disease outbreak(s) on your farm in the past year?		
Yes	19	21.11
No	71	78.89
Total	**90**	**100**
Do you have designated areas for quarantining new/sick birds in your farm?		
Yes	61	67.78
No	29	32.22
Total	**90**	**100**
Do you use personal protective equipment while working on your farm?		
Yes	58	64.44
No	32	35.56
Total	**90**	**100**

Source: Field Survey, 2023

The results from table 1 indicated that majority (64.44%) of poultry farmers in Okigwe Agricultural Zone of Imo State, Nigeria, are currently implemented biosecurity measures on their poultry farms. This is an indication that poultry farms in the zone will have low risk of disease outbreaks and other biosecurity threats. The result for the frequency of biosecurity measures audits conducted by poultry farmers in the zone varied. While some farmers conduct monthly audits, others only conduct audits annually or not at all. Regular audits of biosecurity measures are crucial to ensure that the measures in place are effective and up-to-date. Only 21 farmers representing 23.33% of the respondents reported a serious disease outbreak on their farm in the past year, while the majority (76.67%) of the respondents stated otherwise. This could be an indication that the biosecurity measures implemented by some farmers were effective in preventing disease outbreaks. The result on facilities in the poultry farms showed that greater percentage (67.78%) of the respondents have quarantining facilities for sick or new birds. Quarantining facilities are essential for preventing the spread of diseases within a poultry flock and for properly managing new bird introductions. This indicates that a significant portion of farmers are taking proactive steps to protect their poultry from disease risks. Additionally, most farmers (64.44%) reported wearing personal protective gear while working on their farms. Personal protective gear, such as gloves and boots, can help prevent the transmission of diseases between birds and humans, as well as protect farmers from potential health hazards.

Table 2: Distribution of Respondents According to the awareness and compliance level of poultry farmers with biosecurity measures in the study area.

Variables	Frequency	Percentage (%)
How familiar are you with biosecurity measures in poultry farming?		
Familiar	72	80
Not Familiar	18	20
Total	**90**	**100**
Have you received training on biosecurity measures for poultry farming?		
Yes	53	58.89
No	37	41.11
Total	**90**	**100**
How important do you believe that implementing biosecurity measures can help to prevent disease outbreaks in poultry farms?		
Very important	61	67.78
Somewhat important	20	22.22
Not important	9	10.00
Total	**90**	**100**
On a scale of 1 to 5, how do you comply with biosecurity measures on your farm?		
1	16	17.78
2	12	13.33
3	21	23.33
4	24	26.67
5	17	18.89
Total	**90**	**100**

Source: Field Survey, 2023

The result in table 2 showed that majority (80%) of the respondents are familiar with biosecurity measures in poultry farming. This indicates that there is a general awareness of the importance of biosecurity measures among poultry farmers in the study area. And over half of the respondents (58,89%), have received training on biosecurity measures for poultry farming. Training and education are critical components of biosecurity implementation, as they provide farmers with the knowledge and skills necessary to effectively implement and maintain biosecurity measures on their farms. The majority of respondents (67.78%) recognized the importance of implementing biosecurity measures in preventing disease outbreaks on the farm. This understanding is crucial, as biosecurity measures serve as a first line of defense against the introduction and spread of diseases within poultry flocks.

The responses on a scale of 1 to 5 indicate varying degrees of compliance with biosecurity measures. A significant portion of respondents rated their compliance level as 3 (23.33%) and 4 (26.67%) on the scale. This suggests that a considerable number of farmers have a moderate to high level of compliance with biosecurity measures in place on their farms. Additionally, 18.89% of the respondents rated their compliance level as 5, indicating a high level of adherence to biosecurity measures. On the other hand, there were also respondents who rated their compliance level as 1 (17.76%) and 2 (13.33%), indicating lower levels of compliance with biosecurity measures.

Evaluate the cost implications of implementing biosecurity measures on poultry production.

Table 3 below showed that the majority (58.89%) of the farmers perceived that implementing biosecurity measures results in significant cost savings on their poultry farms. This is an important finding as it indicates that many farmers in the study area recognize the

financial benefits of implementing biosecurity measures in terms of preventing disease outbreaks and potentially reducing production losses and expenses associated with disease control. Regarding investment levels in biosecurity measures (see table 3.3), results varied but indicated positive investment level, with 38.89%, 41.11% and 20% of the respondents indicated a significant investment, a moderate investment, and 20% a negligible investment, respectfully. Investing in biosecurity measures is crucial for maintaining the health and biosecurity of poultry flocks, and it is positive to see that a significant portion of farmers are making investments in these measures to protect their farms.

Table 3: Distribution of Respondents According to the cost implications of implementing biosecurity measures on poultry production in the Zone.

Variables	Frequency	Percentage (%)
How do you perceive the overall cost implications of implementing biosecurity measures on poultry farm?		
Significant cost savings	53	58.89
No significant impact on costs	25	27.78
Increased costs	12	13.33
Total	**90**	**100**
To what extent have you invested in biosecurity infrastructures on your farm?		
Significantly	35	38.89
Moderately	37	41.11
Negligibly	18	20
Total	**90**	**100**
How do rate the initial investment costs of implementing biosecurity measures on your farm?		
Low	8	8.89
Moderate	34	37.78
High	48	53.33
Total	**90**	**100**
Have ongoing maintenance expenses for biosecurity measures been:		
a. cost-effective?		
Yes	69	76.67
No	21	23.33
Total	**90**	**100**
b. a significant financial burden?		
Yes	20	22.22
No	70	77.78
Total	**90**	**100**
Have you realized any reduction in disease treatment costs since implementing biosecurity measures?		
Yes	67	74.44
No	23	25.56
Total	**90**	**100**
To what extent have biosecurity measures contributed to increasing overall farm profitability?		
Significantly	58	64.44
Moderately	25	27.78
Negligibly	7	7.78
Total	**90**	**100**
In your opinion, do the benefits of implementing biosecurity measures outweigh the costs incurred?		
Yes, the benefits outweigh the costs	71	78.89
No, the costs outweigh the benefits	19	21.11
Total	**90**	**100**

Source: Field Survey, 2023

The results further showed that a majority (53.33%) of respondents rated the initial investment costs of implementing biosecurity measures on their farms high. In the same vein, about 76% of the farmers reported that the ongoing maintenance expenses have been cost-effective. These suggest that there is a significant financial commitment required to establish and implement biosecurity measures effectively, and that farmers perceive the investment in maintaining biosecurity measures as worthwhile and beneficial in terms of protecting their flocks from diseases. However, it is important to view this initial investment as a proactive measure to prevent disease outbreaks and potential economic losses in the long run.

Majority of respondents (76.67%) reported a reduction in disease treatment costs since implementing biosecurity measures on their farms. This finding highlights the potential cost-saving benefits of biosecurity measures in preventing disease outbreaks and reducing the need for expensive treatments.

Additionally, the responses indicate that a significant number of farmers (64.44%) believe that biosecurity measures have contributed significantly to increasing overall farm profitability. This finding underscores the importance of implementing biosecurity measures in poultry farming as a means to enhance productivity, reduce disease-related losses, and ultimately improve financial performance. In response to whether the benefits of biosecurity measures outweigh the costs incurred, 78.89% of respondents expressed the belief that the benefits outweigh the costs. This indicates that a significant proportion of farmers in the study area recognize the overall value and returns on investment associated with implementing and maintaining biosecurity measures on their farms.

Determine the impact of biosecurity measures on disease control, production efficiency, and cost reduction on poultry production operations Okigwe Agricultural Zone of Imo State, Nigeria.

Table 4 indicated that most of respondents (76.67%) have not experienced any disease outbreaks on their production facility in the past year, while 23.33% of the respondents reported to have experienced disease outbreaks. This suggests that a significant portion of poultry farmers in the zone have been able to effectively control and prevent disease outbreaks through the implementation of biosecurity measures.

Table 4. Distribution of Respondents According to the impact of biosecurity measures on disease control, production efficiency, and cost reduction on poultry production operations Okigwe Agricultural Zone.

Variables	Frequency	Percentage (%)
Impact on Disease Control		
Have you experienced any disease outbreaks on your poultry farm in the past year?		
Yes	19	21.11
No	71	78.89
Total	**90**	**100**
How effective have biosecurity measures been in preventing disease outbreaks on your farm?		
Very effective	59	65.56
Somewhat effective	27	30.00
Not effective	4	4.44
Total	**90**	**100**
Impact on Production Efficiency		
Have you observed improvements in the health and productivity of your poultry flock since implementing biosecurity measures?		
Yes	70	77.78
No	20	22.22
Total	**90**	**100**
To what extent has the implementation of biosecurity measure improved production efficiency on your farm?		
Significantly	59	65.56
Moderately	25	27.78
Negligibly	6	6.67
Total	**90**	**100**
Impact on Cost Reduction		
How do you perceive the cost implications of implementing biosecurity measures on your poultry farm?		
Significant cost savings	63	70.00
No significant impact on costs	16	17.78
Increased costs	11	12.22
Total	**90**	**100**
Have you observed cost savings as a result of implementing biosecurity measures on your farm in the following:		
a. reduced veterinary and medication costs?		
Yes	72	80.00
No	18	20.00
Total	90	100
b. decreased mortality rate?		
Yes	71	78.89
No	19	21.11
Total	90	100
c. reduced feed costs from healthy flocks and better feed conversion rates?		
Yes	69	76.67
No	21	23.33
Total	90	100

Source: Field Survey, 2023

Little more than 65% of the farmers reported that the effectiveness of biosecurity practices in preventing disease outbreaks on farms to be very effective. The majority of respondents perceived biosecurity practices as highly effective in preventing disease outbreaks on their farms, further supporting the idea that these measures play a crucial role in maintaining the health and well-being of poultry flocks and minimizing the risks of disease outbreaks.

While a smaller number of respondents rated the measures as somewhat effective or not effective, it is important to consider that continuous improvement and monitoring of Biosecurity practices are essential to address any potential gaps or challenges and further enhance disease control efforts in poultry production operations. The result (see table 3) further showed that the majority of respondents (77.78%) observed that improvements in the health and productivity of poultry flocks were positive since implementing biosecurity measures. This is an indication that the implementation of biosecurity measures has had a beneficial impact on the health and productivity of the poultry flocks on their farms, leading to improved overall performance and well-being.

The majority (65.56%) of the farmers also acknowledged to have witnessed a significant improvement in production efficiency since the implementation of biosecurity measures. The result indicated that these measures have not only enhanced disease control but also contributed to higher productivity, better growth rates, and overall operational efficiency within their poultry farms. The result (see table 3.4) on the perceptions of the cost implications of implementing biosecurity measures on farms revealed that majority (70%) of the respondents perceived significant cost savings on their farms, which indicates that these measures have contributed to reducing expenses and improving cost efficiencies within their poultry operations. Regarding observed cost savings resulting from the implementation of biosecurity measures on farms, majority (80%), (78.89%), and (76.67%) of respondents indicated that they observed cost savings via reduced veterinary and medication costs, decreased mortality rates, and reduced feed costs, respectively. These findings suggest that biosecurity measures have played a significant role in improving cost efficiency and reducing expenses associated with disease control, mortality, and feed management in poultry production operations in the study area.

Conclusion and Recommendations

The study revealed that poultry farmers in Okigwe Agricultural Zone of Imo State, Nigeria have demonstrated a strong awareness and compliance with biosecurity measures, with many perceiving these measures as highly effective in preventing disease outbreaks and improving overall farm profitability. The implementation of biosecurity measures has led to positive outcomes on farms, including reduced disease outbreaks, improved health and productivity of poultry flocks, and significant cost savings in veterinary and medication costs, mortality rates, and feed expenses. Biosecurity measures have contributed to enhancing production efficiency, with many farmers experiencing higher levels of productivity and operational effectiveness through the adoption of these practices.

Based on the findings, the study recommended:

- Continuous training and retraining of the poultry farmers in the study area on the importance of biosecurity measures and provide them with the necessary skills, knowledge, and resources to implement effective biosecurity protocols on their farms;
- Collaboration and information sharing among stakeholders, including farmers, veterinarians, extension services, and government agencies, to promote knowledge sharing, exchange best practices, and facilitate the adoption of innovative biosecurity solutions in poultry production operations;
- Governments should provide financial support, incentives, and subsidies to poultry farmers to help offset the initial investment costs associated with implementing biosecurity measures on poultry production in the Okigwe Agricultural Zone.

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