



**DETERMINANTS OF THE USE OF AGRO-INPUTS IN THE REDUCTION OF  
GREENHOUSE GAS EMISSION IN COMMERCIAL CHICKEN FARMS IN  
SELECTED STATES OF NIGERIA**

<sup>1</sup>Oyoboh, D. E., <sup>1</sup>Irhivben, B. O., <sup>1</sup>Oyita, G. E., <sup>1</sup>Inoni, O. E. and <sup>2</sup>Omotesho, O. A.

<sup>1</sup>Department of Agricultural Economics and Agribusiness,  
Dennis Osadebay University, Asaba, Nigeria.

<sup>2</sup>Department of Agricultural Economics, University of Ilorin, Nigeria.

**Corresponding Author's Email:** oyoboh.dan@dou.edu.ng, **GSM:** +2348037034611

**ABSTRACT**

The study examined the determinants of the use of agro-inputs in the reduction of greenhouse gas emission in commercial chicken farms in selected States of Nigeria. A structured questionnaire was used to collect the quantitative data used for the study through a two-stage sampling technique. The first stage involved a purposive selection of the selected states which are commercial chicken production hubs in Nigeria. The second stage was proportion-to-size random sampling selection of 349 commercial farms using the register of the Poultry Association of Nigeria (PAN) the umbrella body of poultry farmers in Nigeria as sampling frame. The study made use of primary data collected in the previous production season with the aid of semi-structured questionnaire. The managers of the selected farms were interviewed and the data collected using the questionnaire and a checklist of commercial chicken farms groups. Data were obtained on socio-economic characteristics and access to agro-inputs that could reduce greenhouse gas emission. The analytical methods used in the study included descriptive statistics and binary logistic regression to model the factors influencing socio-economic and access to these agro-inputs. Findings revealed that most chicken farms in Nigeria have limited access to key inputs like high quality feed (59.6%) and circulation fans (58.6%), affecting their ability to manage emissions effectively. Significant determinants of access to inputs included capital investment (odd ratio =3.86), farm age (odd ratio=1.11) and revenue (odd ratio=2.83). The study concludes that Nigerian chicken farms are currently ill-equipped to handle greenhouse gas emissions adequately, highlighting a need for improved management practices to mitigate the pains it has on the risk to health of the human and the environment.

**Keywords:** Commercial, Chicken, Greenhouse, Gas, Input, Access

**INTRODUCTION**

Chicken production is undoubtedly the most economic species of the poultry subsector in Nigeria by virtue of providing quality animal protein through eggs and meat production (Castro *et al.*, 2023). In 2020, poultry meat constituted nearly 40% of the global meat production, a significant increase from its 28% contribution in the 1990s, surpassing beef's contribution of 26.5% in the same period (Food and Agriculture Organization, 2018). This growth underscores an emerging and expanding influence it has on the poultry sector of the livestock industry. In Nigeria, chicken production is a substantial source of income and revenue for farmers, reflecting its importance in the country's agricultural sector. Moreover, the overall chicken value chain is bedeviled with fewer social and religious challenges compared to other livestock which enhance its relevance (Korver, 2023). The livelihoods and incomes of households are affected by increasing food prices and also plays a crucial role in employment and commodity markets (Mulugata *et al.*, 2023). It is No 19 on the reference list. The poultry subsector of the economy of Nigerian is one of the most vibrant, popular and commercialized value chain with the largest and fast growing indices at the moment (Bawa, *et al.* 2023). It has been documented that the poultry industry in Nigeria is worth \$4.2 billion as at 2019 and added about 25 % to total Gross Domestic Product (GDP) of the Nigerian economy (Akpan, 2020). Currently, the chicken population boost of astonishing figures of about 165 million birds that hatch almost 650,000 and 300,000 eggs and meat respectively in terms of metric tonnes (Awojulugbe, 2019). In the aspect of employment of labour, the poultry industry with chicken inclusive has the largest in



the agricultural sector with more than 20 million Nigerians engaged directly or indirectly in its labour activities. It is known to be the fastest growing sub-sector of the Nigerian economy through its enormous value chains activities which commences from the farm and terminates at fork. Owing to the invaluable nature of chicken meat in the provision of protein need for the average Nigerian diet, any decline in its supply would cause some distress on the protein requirements of the people. Korver (2023) and Arthur (2024) opined that with such an enormous benefits from the commercial poultry industry, there are also a lot challenges some of which are beyond the stakeholders. Overtime, chicken farmers in Nigeria have continued to dedicate a quantum of resources to the rearing of birds, while the output in terms of productivity has remained low, and a phenomenon that has entangled them in a vicious cycle of poverty. A school of thought believed that enterprise diversification is a sure way to creating opportunities that are economical outside agriculture (Ojo *et al.*, 2024). Going forward therefore, an orchestrated effort with a strategic drive must be made to improve the rearing of chicken products for the Nigerian population that is increasing astronomically. The aim of every entrepreneur is to maximize profit, a pursuit that is subject to optimal and efficient allocation of resources (Bamiro *et al.*, 2017).

At any rate, chicken production activities for both pullet and broilers contribute to greenhouse gas emissions through essentially enteric fermentation that occurs on the beddings, energy use, manure management and feed production (Oke *et al.*, 2024). Even in developed countries like the United States (US), which has the prerequisite to effectively manage this emission, by 2019 estimation, agriculture contributed about 9.6 % of the entire US greenhouse gases emitted, although this was small compared to the emission from the industrial sector (U.S. EPA, 2021).

In recent times in Nigeria, there has been tremendous expansion in the poultry production in the last twenty years. This was made possible due to the Nigerian government's total ban on poultry product importation over 2 decades ago. The ban was aimed at boosting internal rearing and self-sufficiency through domestic production (Oyoboh, *et al.*, 2022). This also led to the emergence of commercial chicken farms across Nigeria most especially in Southwest and North central. Despite the ban on poultry products importation, which seemed ineffective as Liverpool-Tasie *et al.* (2017) alluded, there still exist chicken products importations. The ban opened a huge potential for domestic production of commercial chicken. However, as the chicken production increased, there is a direct relationship with greenhouse gases emission. With the size of the chicken industry growing in Nigeria, one major challenge that is linked to the environment that should be tackled so as to enjoy lives that are healthy and clean is the greenhouse gas emission that is continuous. The enormous amount of chicken birds that Nigeria produced is resulting to a large quantum of greenhouse gas emission (Roman *et al.*, 2019). In chicken production, the emitted greenhouse gases could be harmful and are released from respiratory activities, water got from drinking and atmospheric humidity, sawdust and litters coming from the processes of fermentation, manure as well as the heating techniques and beddings and dust formed on the feed (Al-Kerwi, *et al.*, 2022). Gases like carbon (iv) oxide, methane, hydrogen sulphide, nitrous oxide and ammonia constitute the greenhouse gases in commercial chicken farms. According to Kang *et al* (2025), a kg of chicken reared locally emits approximately 4.08 kg of carbon (iv) oxide, with a greater %age of the emissions coming from the feed production stage which at most times accounts for 56.80 % of the total. There are also for every pullet bird and every ton of broiler bird produced, certain amount of greenhouse gas (1kg of nitrous oxide, 11kg of ammonia, 1 kg of methane, some amount of carbon (iv) oxide, and hydrofluorocarbon are being emitted into the atmosphere and are very harmful and detrimental to the environment. In the same vein, Oyoboh *et al* (2022) and Im *et al.* (2020) opined that to correct such anomaly, some practices are adopted globally in the production of chicken to reduce greenhouse gas emission on the environment. In Nigeria, some of the commercial chicken farmers are inadvertently or deliberately using some practices to reduce the emission of such greenhouse gases. These practices are called greenhouse gas emission reduction practices (GHGERPs) which includes; the uses of drum composter, circulatory fans, enclosed pens, radiant heating system, Light Emitting Diode (LED) or fluorescent bulbs, good quality feed, spark ignition brooders, greenhouse gas emission friendly energy use which is in terms of energy saving.



Added to the aforementioned practices are the use of wood shavings, digestive enzymes in chicken feed, energized water and larvicides. These agro-inputs reduce the negative impacts of the greenhouse gas emission (Al-Kerwi *et al.*, 2022). However, there seems to be a dearth of empirical studies on the accessibility of these agro-inputs that could be used to reduce the emission in commercial poultry farms in Nigeria. Therefore, the predominant aim of conducting the study was to examine the accessibility status of the commercial chicken farms to agro-inputs that could reduce greenhouse gas with the aim of reducing the environmental and health hazards that may result from the continuous emission of these gases in Nigeria. Specifically, the survey examined the managers of the commercial chicken farms' perception of agro inputs and identify the determinants of the use of the agro-inputs used in the reduction of GHGERPs in the area of study.

## METHODOLOGY

### The Study Area

The study was done in Nigeria and specifically in North central and Southwestern zones. Two states each, Kwara, and Plateau, and Oyo and Ogun which are the two zones and hub of major chicken production in Nigeria were used. The justification for having preference of Kwara and Plateau out of the six States of the North central and Ogun and Oyo from the Southwest was because of the registered members of the Poultry Association of Nigeria (PAN) who were on their list as the sampled population. The selected states have more number of chicken birds in terms of sizes of commercial chicken farms more than the other states across Nigeria.

### Sampling Procedure and Sample Size

Structured survey tool was used to collect cross-sectional data through a two-stage sampling technique which followed as; first stage of a purposive selection of the North central and South-west zones which are the major commercial chicken production hubs in Nigeria. The zones are having more number of birds in their commercial chicken farms according to the PAN register. Second stage, adopted a proportionate-to-size random selection of 380 commercial chicken farms as the sampling frame from the two zones using the register of PAN registered list. The survey tool for 31 commercial chicken farms was not used during data cleaning because they were not filled adequately by the respondents from obvious facts and perceived exaggeration of information provided. This gave the response rate of 91.8%. Therefore, 349 commercial chicken farms with a minimum of 1,000 birds were used for this study. Cross-sectional data with the aid of a well-structured protocol were obtained and the instrument used was validated with the use of Spearman's Rank Order Correlation to obtain a correlation coefficient ( $r$ ) of 0.72. This indicates that the consistency of the instrument was high enough to make it reliable.

### Method of Data Collection

The study made use of primary data collected in the previous production season on the chicken farms perception of agro-inputs and variables that determine accessibility to inputs. Variables were adequately measured in line with international measurement standards like the USAID and IFAD modules. For example, accessibility to inputs was measured on a rating scale of 3-point of "Not Accessible" scored 1, "Partially Accessible" scored 2 and "Readily Accessible" scored 3. This was used to calculate the accessibility index as follows: In the study, eight (8) inputs that could reduce greenhouse emissions were listed and measured at 3 point rating scale. The maximum obtainable score was  $3 \times 8 = 24$  while the minimum was  $1 \times 8 = 8$ . The range was obtained as  $24 - 8 = 16$ . To categorize accessibility into two levels of high and low, the range was divided by 2 to obtain 8. Therefore, the obtained range was added to the minimum to have  $8 + 8 = 16$ , thus, farms with accessibility scores ranging from 8 – 16 were categorized as having low access to agro-inputs while those with accessibility scores ranging from 16 to 24 were grouped as farms with high accessibility. These were further scored as 0 and 1, respectively as dependent variable for the binary logistic analysis to model the determinants of agro inputs accessibility among farms.

### Method of Data Analysis

For the analysis of the data, descriptive statistics were used to describe the perception of the farm managers on the access to agro-inputs of the chicken farms. These include means, frequency



distribution and %ages. Specifically, accessibility index was used to analyze farms' access to GHGERIs while extent of use of inputs for the reduction of greenhouse gases (GHGs) was analyzed with the use of weighted mean score (WMS), mean score (MS) and %age mean scores (PMS). The identification of what determines the access to agro inputs known to have the capacities to reduce greenhouse gas emissions has the use of Binary Logistic Regression.

The logistic regression had level of accessibility as dependent variable and capital invested, farm age, sales revenue and access to credit as independent variables.

The independent variables hypothesized on access to agro inputs for GHGERIs for chicken farms are specified as follows:

The implicit form of the model is

$$\Pr(Y=1/X_i) = \text{Ln} \left[ \frac{Y_i}{1-Y_i} \right] = a + b_1X_1 + \dots + b_nX_n + U \quad (1)$$

where:

Ln = Natural log

$\Pr(Y=1/X_i)$  = Probability of Y (input access) occurring, given that  $X_1$ - $X_n$  have occurred

a = The coefficient of the constant term

$b_1$ - $b_n$  = The coefficient of the independent variables (capital invested, farm age, sales revenue and access to credit)

$X_1$ - $X_n$  = The independent variable

U = Error term

The mathematical expression of the model is explicitly specified as:

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + U \quad \dots(2)$$

where:

$Y_i$  = Accessibility level (high=1, low=0)

$X_1$  = capital invested

$X_2$  = farm age

$X_3$  = sale revenue

$X_4$  = access to credit (0/1)

U = Error term

### Measurement of Variables Used in the Model

(i) Capital invested ( $X_1$ )- This was the amount of capital used for the purchase of the GHGERPs by the commercial farms both from the formal and informal sources during the 2019 production year. It is an important input in chicken production. It was measured in Naira (₦).

(ii) Farm age ( $X_2$ )- This was measured in years by how long the farms have been in chicken production. It also serves as proxy for farm experience of GHGERPs practices. The older the farm, the more the chances of embracing the practices.

(iii) Sales revenue ( $X_3$ ): This was measured by the total amount of money accrued to the farms from the sales of its products in the previous production year. It was the total sales from the farms' products. It was measured in Naira (₦). Eggs are sold in crates, meat is sold in kilogramme and spent layers are sold per bird. A crate of eggs contains 30 pieces and multiplied by the price to get the revenue, while the meat is sold in kilogram multiplied by the price to the amount and the spent layer is sold per bird multiplied by the price to get the amount. The income from these different products were summed up to get the sales revenue of the farm.

(iv) Access to credit ( $X_3$ )- This is a dummy variable. It was measured by those with access to credit are classified as 1, while those that did not have access to credit are classified as 0. This variable is expected to have a positive effect on the decision to use GHGERPs because availability of funds ensures timeliness of availability of GHGERPs and the timely execution of farm operations.





## RESULTS AND DISCUSSION

### Socioeconomic Characteristics of the Respondents.

The distribution of the respondents by socioeconomic characteristics as revealed in Table 1 such as gender, level and field of education, form and years of trainings, association name and membership of association. As shown in Table 1, majority (71.6%) of the respondents were males while only 28.4% were females. This result reveals that the management of chicken farms in Nigeria were dominated by the male gender. It is on good authority that cultural norms dictates that men have a greater control of the resources and position than women in whatever is related to farming. Ajadi *et al.* (2015) opined that in most countries of Africa, there are significant differences in the control and access of resources. The rearing of chicken requires land ownership as Pyburn (2023) posited that less than 2% of the global land is owned by the female folks and that in North Africa and Sub-Saharan Africa, they make up less than 5% and about 15% respectively of landholders. These surveys also stated that the poor rate of ownership of land has adversely obstructed the use of land as collateral for financial loans which are inclusive of credit and savings. These are resources that could be invested in commercial chicken enterprises. Akpa *et al* (2024) stated that human capacity development opportunities in the form of trainings and growth of career paths have been restricted to the female gender than men. This is a reflection that women are not advantageous with respect to education, resource allocation and control as well as inequality of income in Sub Saharan Africa. The resultant effect is manifested where the female folks were in less number in the ownership and management of commercial chicken farms.

Majority (75.9%) of respondents attended tertiary education as shown in the findings. The respondents who attended none or primary school education were less than 5%. This finding implies that the respondents attained higher education might have the requisite educational trainings to carry out their responsibilities in a better or professional manner in GHGERPs than those with lesser educational status. Famakinwa *et al.* (2019) reported that for some rearing activities to be performed efficiently and effectively, it is critical for education as a factor that would drive the performance of roles of rural community leaders in South west, Nigeria. Thus, there is a direct relationship that a better educated farm manager would adopt GHGERPs because it would enhance the skills and knowledge of the practices as this will increase productivity as asserted by Kurtsal *et al.*(2024). It is evidenced that most of the farm managers have background knowledge in the field of agricultural study. As a result, they may likely manage GHGERPs in the farm in a better way as they may have been taught during their course of study at the tertiary institution.

On any form of training on chicken production practices, it was observed that 87.1% of the respondents had training in chicken management. This shows that most of them had acquired one form of training related to chicken management. The mean number of years spent on attending other forms of training was 2 years. The lessons from this finding is that the managers of the sampled farms must have gotten the required competence in animal husbandry that would enable them to manage GHGERPs and potentially contribute to reducing global warming. Suffian *et al.* (2018) noted that proper management of chicken feeds and litters may reduce greenhouse gas emission and subsequently contribute to the reduction of climate change through global warming.

All the farm managers belonged to Poultry Association of Nigeria (PAN) as the farms were picked from the PAN register. This may be explained by the fact that PAN is the umbrella body of all poultry stakeholders in Nigeria. The mean year of being in such association was approximately 4 years with a minimum of 2 years and a maximum of 23 years. The significance of association to farming cannot be underestimated as it serves as informative sources, market drivers and linkage as well as a platform to secure subsidized production resources (Akinola *et al* ,2023) The study revealed a 5 year and 40 year period as minimum and maximum number of years respectively for the years of experience of the farms in chicken production. It had a mean age of 8 years as sampled. This collaborated the notion that the study area has evidence of a long history of practicing chicken farms production. The findings confirmed what Sonaiya *et al* (2022) mentioned that most parts of South West and North Central, Nigeria have always had a robust history of the existence of the production of chicken in their farms. For example, the origin of commercial poultry production began in 1957



when the Government of Western Nigeria (GWN) came up with some plans and policies to produce table eggs to reduce the importation of eggs from Britain. For this to take place over these years, there must be evidence of some of the earlier subsistence chicken farms in the study area have migrated into full blown commercial chicken farms as recorded by Sonaiya *et al.* (2022). The results of the farm managers' years of experience on commercial chicken production revealed a maximum and a minimum of 30 years and 3 years respectively with a mean year of 5 years approximately.

**Table 1: Distribution of Respondents According to Socioeconomic Characteristics (n=349)**

Characteristics	Category	Frequency	Percentage	Mean
Gender(manager)	Male	248	71.6	
	Female	101	28.4	
Level of education	None	3	0.8	
	Primary	14	4.1	
	Secondary	67	19.2	
	Tertiary	265	75.9	
Field of education	Agriculture related	213	61.1	
	Non-Agriculture	136	38.9	
	Poultry			
Form of training	Practice	304	87.1	
Years of training	Poultry practice		2.3	
Association name	PAN	349	100	
	AFAN	77	22.1	
	Agro dealers	34	9.6	
Years of				
Membership	Association		3.27	
Age of farm	Year		7.45	
Farm experience	Year		4.87	

Source: Field Survey, 2021.

### Access to Greenhouse Gas Emission Reduction Inputs

The accessibility index in this study was used to measure the availability of inputs for commercial chicken farms that could help reduce greenhouse gas (GHG) emissions. According to Table 1, the mean accessibility of these inputs ranged from 52.4% to 59.6%. High-quality feeds were the most accessible, followed by circulation fans and enclosed pens, ranked first, second, and third, respectively. Conversely, radiant heating systems and fluorescent or LED lighting were less accessible. The study revealed that none of the surveyed commercial farms had sufficient access to inputs that could reduce GHG emissions by 60% or more. This suggests that managing GHG emissions may not be effective due to limited access to essential inputs. Consequently, commercial chicken farms in Nigeria might produce significant amounts of GHGs, exacerbating environmental issues. The study referenced research by Wang *et al.* (2017), (now included as the last on the reference list ) which found that despite technological advancements, the poultry industry in China



produced substantial GHGs between 1960 and 2010. Additionally, Suffian *et al.* (2018) reported that manure and feeds were major sources of carbon dioxide and methane, respectively, indicating that low-quality feeds could contribute significantly to global warming and environmental hazards.

The implication of this finding is that greenhouse gases will be poorly managed as none of the farms sampled recorded up to 60% accessibility status from the accessibility index obtained. It could be shown that accessibility may be cost induced as reported by Sanchi, *et al.* (2022) that scarcity of inputs may also be a factor that influences accessibility.

**Table 2:** Accessibility Index for the GHGERIs

GHGERPs	Percentage	Rank
Use of good quality feed	59.6	1 <sup>st</sup>
Use of circulation fans	58.6	2 <sup>nd</sup>
Use of enclosed pen	56.6	3 <sup>rd</sup>
Energy use reduction	56.1	4 <sup>th</sup>
Use of drum composter	55.3	5 <sup>th</sup>
Spark ignition brooders use	54.9	6 <sup>th</sup>
Fluorescent or LED light use	52.5	7 <sup>th</sup>
Radiant heating system use	52.4	8 <sup>th</sup>

Source: Field survey, 2021.

#### Extent of Greenhouse Gas Emission Reduction Inputs Use

The extent of usage of GHGERIs in the study used weighted score (WS), mean score (MS), mean % score (MPS) and then ranked as seen in Table 2. None of the eight GHGERIs used by the chicken farms attained a compliance level of 31%. All of them complied between the ranges of 25.2% to 30.8%; indicating low extent of use. The first two major GHGERIs had a compliance use range of 29.4% to 30.8%. These were the use of good quality feed and the use of circulation fans respectively. The good quality feed had a compliance level of 30.8% which was due to the imperativeness of it to the reduction of greenhouse gas emission. This cannot be over emphasized a good quality feed is one that contains the required nutrients; (energy, protein, amino acid and minerals) in adequate amounts and proportions. With the use of good quality feed, the digestible protein produced is an effective tool for reducing greenhouse gas emission. While the use of circulation fans was ranked next among the GHGERIs identified with a compliance level of 29.4% of the use by the farms. The installation of the circulation fans practice is to prevent temperature stratification inside the pen. The quantification of the ventilation rate is crucial for the control and maintenance of the environment in commercial chicken production. This has given rise to a lower effect of greenhouse gas emission. However, the rate of use was generally less than 50%. This may not be unconnected to the low accessibility earlier reported. Sanchi *et al.* (2022) opined that usage of crucial inputs in the reduction of greenhouse gas emission is cost intensive. Therefore, farmers improvise through the use of locally made materials and some of these may not be effective in the management of greenhouse gas emission.

In addition, the next two GHGERIs that the commercial chicken farms used had a compliance range of 27.8% to 28% which were the use of enclosed pens and the use of energy reduction respectively. For the use of enclosed pens that was ranked third, it had a compliance level of 28%. The adoption of enclosed pen input led to the reduction of propane gas use by preventing heat loss and by enclosing pens that do not have solid walls and insulate curtain openings, walls and ceilings. Many of the farms use propane to help meet their energy needs as its reduction has led to lower emission of greenhouse gas. The use of energy as GHGERIs was ranked fourth with a compliance level of 27.8%. The reduction in the general use of energy will lead to the reduction in greenhouse gas emission.

Meanwhile, the GHGERIs that were ranked fifth and sixth were the utilization of drum composter and spark ignition brooders respectively by the farms. The practices had a compliance range of 26.6% and 27 %. As for the use of drum composter, the farms complied with 27% of the

practices. The drum composter is a friendly means of a natural source of managing mortality to reduce air pollution and water and at the same time still retain smell and nutrients pathogen.

All things being equal, organisms that are of microbial origin would adopt a catabolic method to destroy organic materials which in this case is the chicken mortalities as well as carbon into some finished and useful products that are of immense value. It could galvanise the prevention of disease and biosecurity practices which has to be carried out on a self-contained environment. This practice will lead to the reduction in greenhouse gas emission. The farms complied with the use of spark ignition brooder of the GHGERIs at 26.6%. The use of spark ignition brooders saves fuel and reduces maintenance and by this process reduces greenhouse gas emission.

However, the last two GHGERIs based on compliance by the farms were with the range of 25.2% to 25.6% by the commercial chicken farms. These were the fluorescent or LED lights and radiant heating systems uses. The use of fluorescent or LED light ranked seventh among the GHGERIs identified in the study had a compliance level of 25.6% by the farms. It is a device that uses a semiconductor principle to emit incoherent light spatially at a lower frequency spectrum through an electro-luminescence effect. The colour that emanates from the bulb will depend on how the applied semiconductor material is composed and it ranges from ultraviolet to infrared. The consumption of the energy such as the intermittent lighting regime which applies for the production of eggs will be reduce in that process. Such practices that are globally accepted for its high efficacy and long life in lighting emits cold light. By this process, it will lead to the lower emission of greenhouse gas. While radiant heating system use is the last to be ranked and it came eighth among the GHGERIs identified, it had a compliance level of 25.2% by the chicken farms.

The radiant tube heaters are closed-flame systems that have heating potentials. They apply the principle of combusting the air from the outside of the pen (chicken house) and the flame is trapped in a metal box which is connected to a long metal tube. A fan that is inbuilt then forces the hot combustion gas through the tube to radiate energy to the litter. This process leads to the reduction in greenhouse gas emission.

**Table 3:** Extent of Use of GHGERI

<b>Inputs</b>	<b>WS</b>	<b>MS</b>	<b>MPS</b>	<b>Rank</b>
Use of good quality feed	1038	1.54	59.5	1 <sup>st</sup>
Use of circulation fans	1022	1.47	58.6	2 <sup>nd</sup>
Use of enclosed pens	988	1.40	56.6	3 <sup>rd</sup>
Energy use reduction	979	1.39	56.1	4 <sup>th</sup>
Use of drum composter	966	1.35	55.3	5 <sup>th</sup>
Use of spark ignition Brooder	958	1.33	54.9	6 <sup>th</sup>
Use of fluorescent/ LED Light	916	1.28	52.5	7 <sup>th</sup>
Use of radiant heating system	915	1.26	52.4	8 <sup>th</sup>

WS=Weighted Score; MS=Mean Score; MPS=Mean % Score.

Source: Field survey, 2021.

### **Determinants of Extent of Access to Agro Inputs**

Table 4 presents and discusses the binary logistic regression result that modeled the determinants of the agro inputs access to reduce GHGE on commercial chicken farms. The extent of access to agro inputs is assumed to be influenced by the same variables of capital invested, farm age and sales revenue. The results shows that at 1% level of significance ( $p < 0.01$ ), farm age ( $p=0.00p = 0.00$ ) and revenue ( $p=0.00p = 0.00$ ) are statistically significant determinants of access to agro-inputs aimed at reducing greenhouse gas emissions (GHGE) in commercial chicken farms. This suggests a very strong confidence in these factors influencing access to agro-inputs. The significance of farm age (Odds ratio = 1.11) implies that older farms have a higher probability of utilizing agro-inputs for GHGE reduction, possibly due to their accumulated experience and established market networks





(Mekonnen et al., 2022). Similarly, the significant effect of revenue (Odds ratio = 2.83) suggests that farms with higher earnings are more likely to access and invest in agro-inputs, reinforcing previous studies indicating that financial stability enhances sustainable agricultural practices (Nguyen & Hoang, 2021).

However, credit access ( $p=0.11$ ) was not statistically significant at this level, suggesting that while credit availability may influence input acquisition, its effect is not strong enough to be a key determinant in this model. The overall model fit, with an  $R^2 = 0.7409$ , indicates that 74% of the variation in access to agro-inputs is explained by these predictors, demonstrating a robust explanatory power (Gujarati & Porter, 2020).

The results show that at 5% level of significance ( $p < 0.05$ ), capital invested ( $p=0.04$ ) was a significant determinant. This suggests that farms that invest more capital are approximately four times more likely to access agro-inputs for GHGE reduction compared to those with lower investment levels. This finding aligns with prior research that links financial capacity with the adoption of sustainable farming technologies (Tambo & Wünscher, 2017). The significance of capital investment at 5% but not at 1% suggests that while its impact is relevant, it is not as statistically robust as farm age and revenue.

Thus, at the 5% level, farm age, revenue, and capital investment are key determinants of agro-input use, while credit access remains statistically insignificant. This supports the argument that financial strength and farm experience are crucial for integrating climate-smart agricultural practices (Abdulai & Huffman, 2014).

The plausible reason for this could be diverting of credit accessed to other areas of needs such as infrastructural development and other investment in the farms. The finding from the study of Sanchi *et al.* (2022) that documented the cost intensiveness in the required inputs that may be utilized to lessen the effects of the emission of greenhouse gases is in tandem with the above findings where capital invested was a significant variable. It was also reported that low accessibility to productive inputs may be hindered by poor access to credit which is a major problem of farmers in Nigeria. The above finding slightly contradicts the assertions of Aromolaran *et al.* (2013) that reported access to credit as a major challenge facing commercial chicken farms in Nigeria. However, this current finding could not see access to credit as a determinant of agro inputs that would be used to lower the effect of the emissions of greenhouse gas. It is as a known fact that access to credit will induce access to other agro-inputs cannot however be disputed.

**Table 4:** Determinants of Extent of Use of GHGERIs

Extent of use.	Coef.	Std Error	P> t	Odd ratio
Capital invested( $X_1$ )	1.35	6.48	0.04**	3.86
Farm age( $X_2$ )	0.105	0.001	0.00***	1.11
Revenue( $X_3$ )	1.04	1.96	0.00***	2.83
Credit access( $X_4$ )	0.015	0.009	0.11	1.02
Number of observations	349			
F (4,345)	246.63			
Probability > F	0.0002			
R-squared	0.7409			
Adjusted R- squared	0.7379			
Root MSE	0.07854			

Source: Field survey, 2021

\*\*\* 1 % level of significant, \* $P<0.05$ ).

## CONCLUSION AND RECOMMENDATIONS

The findings show that commercial chicken farms in the study area have poor access to inputs to reduce the effect of greenhouse gases. It was also established that the extent of use of the inputs for



the reduction of greenhouse gases was also low due to the inadequate access of the agro-inputs. The findings revealed that capital invested, farm age and revenue were the significant determinants of extent of access inputs. The findings conclude that commercial chicken farms in the study area had poor access to inputs that are very critical in reducing greenhouse gas emission. Therefore, reduction of greenhouse gases among the commercial chicken farms in Nigeria may not be sustainable. The following actionable recommendations are made based on the findings of the study.

- The Poultry Association of Nigeria should improve advocacy to gear up the extent of use of GHGERPs by its members.
- The stakeholders in the energy sector should explore the numerous opportunities that abound in bioenergy generation from poultry waste to provide biogas for domestic and industrial uses.
- The Bank of Agriculture and commercial banks should provide credit to poultry farmers at affordable rates.

## REFERENCES

- Abdulai, A., and Huffman, W. (2014). The Adoption and Impact of Soil and Water Conservation Technology. *Land Economics*, **90**(1): 57-73.
- Ajadi, A. A., Oladele, O. I., Ikegami, K. and Tsurata, T. (2015). Rural Women's Farmers' Access to Productive Resources: The Moderating Effect of Culture among Nupe and Yoruba in Nigeria. *Journal of Agriculture and Food Security*, **4**(1): 26 – 29.
- Akinola, A., Kehinde, A., Tijani, A., Ayanwale, A., Adesiyun, O., Tanimonure, V., Ogunleye, A. and Ojo, T. (2023). Impact of Membership in Agricultural Cooperatives on Yield of Smallholder Tomatoes Farmers in Nigeria. *Journal of Environmental and Sustainability Indicators*, **20**(1): 100 - 113.
- Akpa, A .F., Amengnaglo, C. J. and Chabossou, A. F. (2024). Women's Engagement in Agriculture and Income Inequality in Sub-Saharan Africa. *Journal of Social Sciences and Humanities*, **9**(1): 108 - 118.
- Akpan, C. (2020). "Looming Collapse of ₦10 Trillion Poultry Industry: Five Million May Lose Jobs". Culled from [www.vanguardngr.com](http://www.vanguardngr.com). 6/12/20.
- Al-Kerwi, M. S., Mardenli, O., Jasim, M. R. M. and Al-Mojeed, M. A. (2022). Effect of Harmful Gas Emitted From Poultry Houses on Productive Health Performance. *Journal of Earth and Environmental Science*, **106**(1): 1088 - 1099.
- Aromolaran, A. K., Ademiluyi, I. O., and Itebu, O. J. (2013). Challenges of Small Poultry Farms in Layer Production in Ibadan Oyo State, Nigeria. *Global Journal of Science Frontier Research Agriculture and Veterinary Sciences*, **13**(2): 5 - 12.
- Arthur, S.O. (2024). Bottlenecks and Prospects of Poultry Production in Kasoa, Awutu Senya District, Ghana. *Open Journal of Business Management*, **12**(1): 1651 - 1665.
- Awojulgbe, S. (2019). "CBN: Nigeria's Poultry Industry Now Worth ₦1.6trn". Opinion on the Nations Newspaper, Published on the 8<sup>th</sup> July, 2019. Pg. 13.
- Bamiro, O.M., Ajiboye, B.O. and Adeyinu, A.G. (2017). *Technical efficiency of battery cage and deep litter system of poultry production in South West, Nigeria. In Agribusiness Development: Panacea For Economic Recession in Nigeria*. Proceedings of the 18<sup>th</sup> Nigerian Association of Agricultural Economics Conference, pp. 238—252, Abeokuta, Nigeria, 16-19 October.
- Bawa, H.S., Sharaaia, A.H., Rahima, R.A., Sahraira, S. and Yuguda, A.U. (2023). Life Cycle Assessment of Poultry Production in Nigeria: A Review of Sustainability and Evaluation Studies. *The Italian Association of Chemical Engineering*. **106**(1) April, 2023. [Online]. [Online]. Available: [www.cetjournal.it/volume 106/number12/](http://www.cetjournal.it/volume%20106/number12/). [Accessed February, 2, 2025].
- Castro, F.L.S., Chai, L. Araogo, J., Owens, C. M., Smith, P.A., Reichelt, S., DuBois, C. and Menconi, A. (2023). Poultry Industry Paradigms; Connecting the Dots. *Journal of Applied Poultry Research*, **32**(1): Pg 1003
- Famakinwa, M., Adisa, B. O., and Alabi, D. L. (2019). Factors Influencing Role Performance of Community Leaders in Rural Development Activities in Southwestern Nigeria. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, **67**(2): 473 - 483.



- Food and Agriculture Organization (2018). The State of Food Security and Nutrition in the World 2017. Building Resilience for Peace and Food Security, Rome. P 3.
- Gujarati, D. N. and Porter, D. C. (2020). *Basic Econometrics* (6th ed.). McGraw-Hill.
- Im, S., Petersen, S. O., Lee, D. and Kim, D. H. (2020). Effects of Storage Temperature on Methane Emissions from Cattle Manure and Subsequent Biogas Production Potentials. *Waste*.
- Kang, H. Y., Hwang, Y. W., Lee, J. H., Cho, S. J., Jeon, Y. S., Kim, N. S. and Kim, J. (2025). Evaluating the Greenhouse Gas Emissions Foot Prints of Chicken Meat Production in South Korea: A Life Cycle Perspective. *Journal of Food and Bioproducts Processing*, **150**(1): 230 - 254.
- Korver, D. R. (2023). Current Challenges in Poultry Nutrition, Health and Welfare: Review. *International Journal of Animal Biosciences*, **17**(1): 100755.
- Kurtsal, Y., Rinaldi, G. M., Savini, F., Sirri, R., Melin, M., Pacetti, E., De Cesare, A., Fioraventi, M., Luppi, E., Manfreda, G. and Viaggi, D. (2024). Improving the Education and Training Policies of the Agri-Food and Forestry Sectors: Identifying New Strategies to Meet the Needs of the Sector and Farm-To-Fork Priorities. *Journal of Sustainability*, **16** (3): 126 - 137.
- Liverpool-Tasie, L. S. O., Omonona, B., Sanou, A., Ogunleye, W., Padilla, S., and Reardon, T. (2017). Growth and Transformation of Food Systems in Africa: Evidence from the Poultry Value Chain in Nigeria. *Nigerian Journal of Agricultural Economics*, **7**(6): 1 - 15.
- Mekonnen, D. K., Geremew, K. and Tesfaye, W. (2022). Adoption of Climate-Smart Agricultural Practices: Evidence From Smallholder Farmers. *Agricultural Economics*, **53**(4): 561 - 579.
- Mulugeta, Y. B., Osei-Amponsah, R., Obese, F.Y. and Dessie, T. (2023). Smallholder Poultry Production in the Context of Increasing Global Food Prices: Roles in Poverty Reduction and Food Security. *Animal Frontier*, **13**(1): 17 - 25.
- Nguyen, C. P. and Hoang, T. (2021). Financial Resources and Sustainable Agricultural Adoption. *Journal of Environmental Economics*, **12**(2): 113 - 129.
- Ojo, O. A., Olarinoye, E. B. and Ojo, M. A. (2024). Effects of Livelihood Diversification on Poultry Status of Rural Farming Households of Kwara State, Nigeria. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, **125**(2): 185 - 196.
- Oke, O. E., Akosile, O. A., Uyanga, V. A., Oke, F. O., Oni, A. I., Tona, K. and Onagbesan, O. M. (2024). Climate Change and Broiler Production. *Journal of Veterinary Medicine and Science*, **10**(3): 1416 - 1428.
- Oyoboh, D. E., Omotesho, O. A. and Koledoye, G. F. (2022). Sustainability of Greenhouse Gas Emission Reduction Practices (GHGERPs) Usage: Evidence from Commercial Chicken Farms in Nigeria". *Nigerian Agricultural Policy Research Journal (NAPReJ). Special Edition*. Pp 152 - 161.
- Pyburn, R. and Hallin, R. (2023). Gendered Social Norms in Agri-Food Systems: A Conceptual Framework. *Initiative on Gender Equity, CIGIAR*. P 16.
- Roman, M., Roman, K. and Roman, M. (2019). Methods of Estimating Particulates Emission in Agriculture Exemplified by Animal Husbandry". Proceedings of the International Scientific Conference of Hradec Economic Days. University of Hradec Kralove, Faculty of Informatics and Management, Hradec Kralove, **9**(2): 260 – 268.
- Sanchi, D., Alhassan, Y.J. and Sabo, A.Y. (2022). Rising Cost of Farm Inputs and its Implications on Wet Season Farming in Northwest Sub Region of Nigeria. *Direct Research Journal of Agriculture and Food Science*, **10**(1): 25 – 36.
- Sonaiya, E. B., Oguntade, E. A. and Adesina, A. A. (2022). Commercial Poultry Success Stories in Nigeria: Drivers, Challenges and Lessons. *Forum for Agriculture Research in Africa (FARA) Research Report*. **6**(12): 3.
- Suffian, S. A., Sidek, A. A., Matsuto, T., Al-Hazza, M. H., Yusof, H. M. and Hashim, A. Z. (2018). Greenhouse Gas Emission of Broiler Chicken Production in Malaysia Using Life Cycle Assessment Guidelines: A Case Study". *International Journal of Engineering Materials and Manufacture*, **3**(2): 87 - 97.



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- Tambo, J. A. and Wünscher, T. (2017). Farmer-led Innovations and Rural Development. *World Development*, **98**: 173-182.
- United States Environmental Protection Agency (USEPA, 2021). Draft Inventory of US Greenhouse Gas Emissions and Sinks: 1990 -2019 (EPA 430-R-21-001). Retrieved August, 20, 2022.
- Wang, L., Xue, B. and Tianhai, Y. (2017). Greenhouse Gas Emission from Poultry and Pig Production Sector in China from 1960-2010. *Journal of Integrative Agriculture*. **16**(1): 221 - 228.