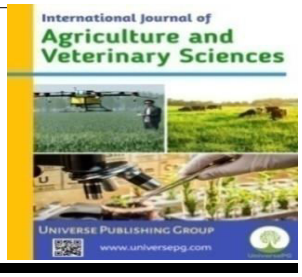
Publisher homepage: www.universepg.com, ISSN: 2663-7529 (Online) & 2663-7510 (Print)

https://doi.org/10.34104/ijavs.023.01370154

International Journal of Agriculture and Veterinary Sciences

Journal homepage: www.universepg.com/journal/ijavs



Socioeconomic Effects of Oyo State Government COVID-19 Palliatives on Poultry Farmers

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ABSTRACT

This study interviewed 349 poultry farmers who benefited from government poultry feed input palliatives meant to help them to contain the negative effects of COVID-19 of hunger, food insecurity, and poverty. Demo-graphic results revealed that both males and females are involved in poultry farming; the average age of poultry farmers was 45 years, with an average family size of five. The average years of education were 13, equivalent to JSS 3 in the Nigerian education system. Types of poultry show that 49% of the poultry farmers reared broilers, 42% layers, and 1% cockerels, while 8% reared both broilers and layers. Production characteristics reveal that 55.1% of the poultry farmers were members of an association like the Poultry Association, 78.5% benefited from government training, and 98% experienced reduced production costs on their poultry enterprise. The results show that reductions in the cost of production with government intervention were 30% of the total cost of production, and lower death was experienced among broiler enterprises compared to layer enterprises. The major benefits derived from the COVID-19 palliative included 39% of them experiencing increased farm income; 24.7% getting their cost of production reduced; 18.9% experiencing reduced hunger in their families, and 17.4% having increased output of bird produce through the palliative intervention. Using the Logit regression as an econometric model, the result for layer bird enterprises shows that Farm experience (p<0.1), and Increased production (p<0.05), among others, positively and significantly increased perception of hunger reduction by the beneficiaries; while the number of Birds owned (p<0.1), and Cost of medication (p<0.05) negatively and significantly reduced perception on hunger reduction by the beneficiaries. On broiler enterprise 12 explanatory variables statistically and significantly influence the decision of farmers on their perception of "hunger reduction"; the variables included those that positively and significantly influence farmer perception of reduced hunger. These are Education Squared (p<0.01), Poultry Association (p<0.05), % Cost Reduction (p <0.01), and Increased Production (p<0.01). Variables that statistically reduced perceptions on reduced hunger, among others, included Cost of Medication ($p<0.01$) and Production Cost/Bird (p<0.01). Therefore, government and non-governmental organizations are recommended to push forward with interventions, especially focusing on identified factors, to strengthen farmers' capacity to battle against hunger and poverty.

Keywords: Logit regression, Palliatives, Hunger reduction, Poultry, Econometric model, and Perception.

INTRODUCTION:

Nigeria is currently ranked very low in all the human capital development indices and so is one of poorest countries in the world with a large proportion of her population living below the poverty line. The situation worsened during the COVID-19 global pandemic. The

coronavirus type or strain 19, also known as COVID-19, affected the world economies. As expected, the pandemic effect on the humans obviously received tremendous attention; however, the actions and the reactions by government and economic stake-holders have had a severe impact on agricultural production and its value chain. As part of biosafety measures released by the National Centre for Disease Control (NCDC) in Nigeria, the agency came out with several regulations to curb the disease's devastation and casualties (NCDC, 2020). Notably, the restriction of humans in both intra- and inter-city over a period of time by the NCDC, referred to as the lockdown policy to curb or avoid the COVID-19 pandemic, had social and economic implications on the food production sector of the Nigerian economy (Siemaszko, 2020; Waltenburg *et al.,* 2020). The COVID-19 pandemic brought an overwhelming defect on the global economy. The smallholder farmers were severely affected due to their vulnerability. As part of the palliative measures embarked upon by the various governments, the Oyo State government came up with providing the agricultural inputs, e.g., maize inputs to the poultry farmers. The study tries to investigate the effects of the palliative input supplies to the beneficiaries in regard to their poultry enterprises in all LGAs in Oyo State. Agriculture employs about two-thirds of Nigeria's total labor force, contributes 42.2% of the Gross Domestic Product (GDP), and provides 88% of non-oil earnings. The agricultural GDP is contributed by crops (85%), livestock (19%), fisheries (4%), and forestry (1%) (Nwandu *et al.,* 2016). The poultry industry occupies a pivotal position because of its enormous potential for rapid economic growth. The importance of the poultry subsector is chiefly in providing meat and eggs as well as the provision of employment either directly or indirectly & the contribution to the revenue (GDP) of the country (Rekwot *et al.,* 2015). Compared to several other livestock species like cattle, sheep, goats, pigs, and rabbits, domestic fowl are easier to rear, less laborious to cater for, and financially less expensive to maintain (Ezeano *et al.,* 2017). Domestic fowl has fast growth and high financial returns, with few social, health, and religious taboos against its consumption, usage, and production than the animals mentioned above (Job, 1992; Bincan, 1992). Kekeocha, (1998) and Elenwo and Okafor-Elenwo, (2014) reported that domestic fowl production is less demanding for space as it can be done in relatively small spaces such as the backyard and wooden cages (especially in vertical tiers). Poultry meat and eggs play a very useful role in bridging the protein gap in Nigeria. They are palatable and generally acceptable. This acceptability cuts across nearly all cultural and religious boundaries in the country. The importance of poultry to the national economy cannot be over emphasized, as it has become a popular industry for the smallholders that greatly contribute to the economy of the country. The enterprise has assumed greater importance in improving employment opportunities and the animal protein production in Nigeria (Afolabi *et al.,* 2013). With such advantages, it is clear that the commercial poultry production is an indispensable tool for the alleviating poverty among farmers. Recently, the high cost of feed, poor quality feed ingredients, inefficiency in production, and rising prices of ingredients have led to the fallen performance of the poultry industry in the Nigeria (Heinke and Alexand, 2017). The Nigerian Agricultural sector is responsible for providing food and livestock, with poultry production being responsible for 80% of the production (Omotosho and Oladele, 1988). However, the output level still remains low compared to the input com mitted (Ajibefun *et al.,* 2000) and the poultry products are grossly inadequate because the supply is lower than the Profitability analysis, hence, the need for an increase in the production of poultry and poultry products. Poultry is highly dependent on grains and other feed ingredients normally utilized by man. They, therefore, compete directly with man for feed, but grain production in Nigeria is far less than demand. A change in the output of maize vis-a-vis its price is immediately reflected in a change in output and the prices of poultry products. There is a paucity of information on the effect of some government policies on the performance of agriculture, and as part of responsive governance strategies and important policy trust, there is the need to assess the empirical impact of COVID-19 palliative supplies to beneficiary farmers in Oyo State; this paper focuses on identifying effects of maize input giving to the poultry farmers. One fundamental question needs to be answered: what are the economic incentives for farmers that collected and used the government's palliative? The present study, referred to as "Assessing Palliative

Measures", proposes to analyze users' acceptance of the palliative in Oyo State and the effect on their livelihoods, among others. The remaining part of this paper is organized as follows: the next section presents the methodology; the third presents the results and their discussion, while final section presents the conclusion & recommendations.

METHODOLOGY:

The Study Area

The study was carried out in Oyo State, Oyo State was created on 3 February 1976 out of the old Western Region by the then regime of the General Murtala Mohammed and it is located in Southwest Nigeria. Oyo State is one of the 36 States of the Federal Republic of Nigeria with headquarters in Ibadan. It has a land area of 27,249 km2 (Fajuyigbe *et al.,* 2007).

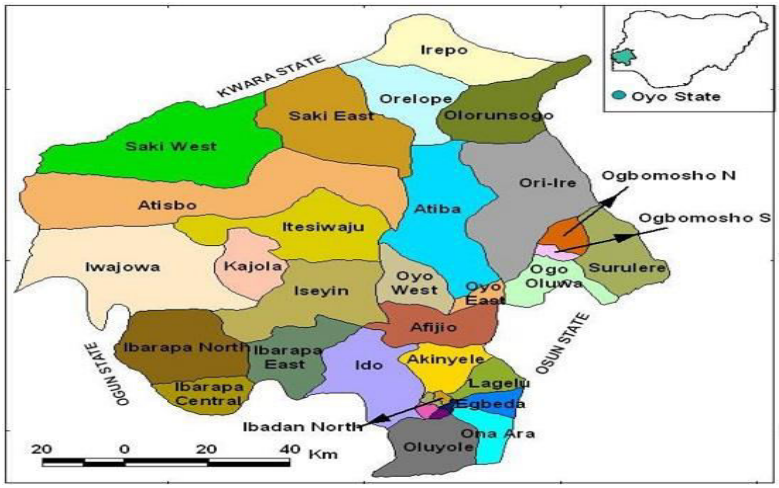

Fig. 1: Map of Oyo State, Nigeria.

The 2006 official population census for the State was 5,591,589 (NBS, 2009). For administrative convenience, Oyo State is divided into geographical zones; Ibadan, Oke - Ogun, Ogbomoso, Oyo and the Ibarapa (Oyo state Government, undated). All these zones are divided into: Local Government Areas (LGAs) resulting into 33 LGAs in the State (https://oyostate.gov; Modiake Austin 2014; https://www.nigeriagalleria.com/Nigeria/States_Nigeria/Oyo/, Adeyonu *et al.,* 2016).

The State is bounded in the north by Kwara State, in the south by Ogun State, in the east by Osun State, and in the west by Republic of Benin. The vegetation of the state ranges from rainforest to derived savanna with rainfall pattern, the vegetation pattern is that of rain forest in the south and guinea savannah in the north. Agriculture is the main occupation of the people resident in the State. Production of the major Nigerian food and cash crops is done all over the State. Animal husbandry, especially poultry production, is a common enterprise in all parts of the State especially in the areas characterized by savannah grassland. The types of poultry that are commonly reared in Oyo State are chickens, ducks, guinea fowls, turkeys, and pigeons. Those that are of commercial or economic importance however, are chickens and turkeys, amongst which the chickens predominate (Adene and Oguntade, 2006).

Sampling Technique

The 33 local government areas (LGAs) has been divided into the seven regions and beneficiaries were selected from seven regions known for the poultry production using a purposive sampling technique; these regions are Ibadan Less City, Ibadan Urban, Ibarapa, Ogbomoso, Oke Ogun1, Oke Ogun2, and Oyo as shown in **Table 1**. To assess the palliative effect on the produce of the beneficiaries, a sample of the beneficiaries was selected based on the percentage of the beneficiaries in each region; regions with higher percentages have more beneficiaries in the samples selected as shown in **Table 1**. A structured electronic questionnaire was used as the research instrument using the Kobo tool box; the enumerators that were staff from the OYSADA were trained how to use the research instrument for interviewing farmers through phone calls. Information on questions that ranges from socioeconomic data of the beneficiary respondents to output of their produce (layer birds and broilers) was

solicited by the use of trained and experienced enumerators. Out of the sample size of the 550 poultry farmers, only 349 were the successfully reached with questions, and responses on their poultry production were collected for analysis.

Table 1: Distribution of Palliative Beneficiaries by Regions.

Region	LGA	Farmers' Contacted
Ibadan Less City	Akinyele	6
	Ido	26
	Oluyole	33
Ibadan Urban	Ibadan North	13
	Ibadan South West	8
Ibarapa	Ibarapa Central	10
Ogbomoso	Ogbomoso Central	22
Oke Ogun1	Atisbo	8
	Olorunsogo	43
Oke Ogin2	Iseyin	17
	Itesiwaju	12
	Kajola	23
Oyo	Afijio	75
	Atiba	51
	Iseyin	2
Total		**349**

Theoretical Model

The perception of the poultry farmers of "hunger reduction" due to the government palliative program for poultry was a binary choice that built on utility maximization theory. This was because the choice on whether or not a farmer reduction in hunger due to intervention was considered under the general framework of utility maximization (Pryanishnikov & Katarina, 2003). Within this framework, economic agents were poultry producers whose perceptions of hunger reduction were measured by perceived utility or conviction from any option from whether they experience hunger reduction or not. Although utility was not directly observed, the actions of economic agents were observed through the choices they made. Suppose that Uj and Uk represent a household's utility for two choices, which are, correspondingly, denoted by Yj and Yk, respectively. The linear random utility model could then be specified as 1:

$$Uj = \beta jXi + ej \text{ and } Uk = \beta kXi + ek \text{ ---------- (1)}$$

Where, Uj and Uk are perceived satisfaction from hunger reduction choice and no hunger reduction choice j and k, respectively. Xi the vector of the explanatory variables that influence the perceived desirability of each choice, βj and Uk satisfaction shifters, and ej and ek are error terms assumed to be independently and identically distri buted (Greene, 2003). From the economist perspective, an individual i makes a decision to choose if the satisfaction associated with that choice (Uj) is higher than the satisfaction associated with the decision of alternative choice (Uk). In the case of the hunger reduction, if a household has a perception of choosing option j, it follows that the perceived satisfaction or benefit from option j is greater than the satisfaction from other option (say k) depicted as in equation 2:

$$Uij (\beta jXi + ej > Uik (\beta jXi + ej), k \neq \forall I \text{ ---------- (2)}$$

Analytical Tools

Empirical Framework

A preliminary report is done using descriptive statistics to characterize the farmers, their farms, and their socioeconomic profiles where the necessary. Means, standard deviation, percentages, t-test, and chi-square test were used for descriptive analysis. More information will be generated from the data with the use of relevant econometric models applicable to perceptions of farmers in regards to the benefits of the palliative intervention of the government in terms of improved: yield, farm income, food security, livelihood of the farmers, among others.

Econometric Estimation Model

The qualitative response regression models that are used to estimate the parameters of the qualitative or limited dependent variables are numerous and include LPM, Logit, Probit, and switching regression models. What they have in common is that the dependent variable is a discrete outcome, such as "'yes"' or "'no"' decisions (Wooldridge, 2002). The most widely used qualitative response models are Probit and Logit models, i.e., in these models, the probabilities are bound between 0 and 1, and they fit well to the non-linear relationship between the probabilities and the explanatory variables. However, Gujarati, (2004) has noted that in most applications, the cumulative normal function (Probit) and the logistic function (Logit) are quite similar, the main difference being that the logistic function has slightly fatter tails. That is to say, the conditional probability (ρi) approaches zero or one at a slower rate in Logit than in Probit. Therefore, there is no compelling reason to choose one over the other; it depends on the personal preference, experience, and availability of software. Thus, based on the assumption of logistic function of the dependent variable, the Logit model was used to estimate the perception of poultry farmers on hunger reduction due to the government palliative projects and is built on a latent variable with the model below. Perception is measured by a dummy variable in the model, which was assigned a value of 1 for farmers who perceived hunger reduction and a value of 0 for farmers who did not perceive hunger reduction. It indicated that the probability of an individual with a given set of attributes would fall in one choice (perceive) rather than the alternative (or not) but not both. Climate change events were defined in the questionnaire as increased or decreased temperature, rainfall, drought, flood, salinity, etc.

Logit model

Logistic regression is a widely applied statistical tool to study farmers' perception of conservation technologies (Shiferaw, 1998; Neupane *et al.,* 2002; Dessalew, 2014). Logistic regression allows predicting a discrete outcome from a set of variables that may be continuous, discrete, dichotomous, or a combination of them. The dependent variable (i.e., perception of the hunger reduction) is a dichotomous discrete variable that is generated from the questionnaire survey as a binary response, and the independent variables are a mixture of discrete and continuous. Following the methods used by (Abera, 2003; Mekuria, 2005) the logistic regression model characterizing the perception of the sample households is specified as:

$$Pi = F(\alpha + \beta Xi) = 1/1 + e^{-(\alpha + \beta Xi)} \quad (3)$$

Where, i denotes the i th observation in the sample; Pi is the probability that an individual will make a certain choice given Xi ; "e" is the base of natural logarithms and approximately equal to 2.718; Xi is a vector of exogenous; variables α and β are parameters of the model, β1, β2……, βk are the coefficients associated with each explanatory variables X1, X2, …, Xn. For simplicity Equation (3) was expressed as

$$P_i = 1/1 + e^{-Zi} \quad (4)$$

Where, Pi is the probability of perception of the farmers the i th respondent and it ranged from 0 – 1 e - Zi: stands for the irrational number e raised to the power of Zi , Zi : is a function of N-explanatory variables and expressed as:

$$Z_i = \beta_i + \beta \sum k X_{ik} + \varepsilon$$

Where, β0: is the intercept, β1 ⋯ βn: are slopes of the equation in the model.

Therefore for Layer's bird production:

$$Z_{Layer} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu$$

$$Z_{Broiler} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \mu$$

RESULTS:

Socioeconomic Characterization of the Beneficiary Farmers

In 2020, during the COVID-19 pandemic, Oyo State government registered some resource-poor farmers to provide them with measures to be able to cope with hunger that characterized the period. On poultry, 150 kg of maize grain was given to each beneficiary poultry farmer for feed formulation, and poultry extension agents assisted them with the advisory services. This

paper aims to investigate the effect of this on each beneficiary.

Table 2: Determinants of farmers' perceptions on hunger reduction due to government palliative project.

Variables	Descriptions	Apriori Signs
Layer Birds		
Dependent variable		
Hunger Reduction (Z)	Yes = 1; No = 0	
Explanatory variables		
Farmer's Age (Years) (X_1)	Age of household head	±
Farming experience (Years) X_2	Years of farm experience of household heads	+
Household size (Number) X_3	Number of people in the family	±
Education (Year) X_4	Years of education of household head	+
Education2 X_5	Square of Education	+
Dead Birds (Count) X_6	Number of dead layer birds in a production cycle	+
Duration of production(egg laying) X_7	Production duration (in weeks)	±
Cost of Medication (%) X_8	Cost of medication (% of total cost)	-
Average Price (Pullet in $) X_9	Average price of a pullet when sold	+
Increase Production (Dummy, Yes = 1) X_{10}	Did the farmer have increased output?	+
Broiler Birds		
Dependent variable		
Hunger Reduction (Dummy) Z	Yes = 1; No = 0	
Farmer's Age X1	Age of household head	±
Family Size X2	Number of people in the family	±
Education (Years) X3	Years of education of household head	+
Education Squared X4	Square of Education	+
Poultry Association (Dummy) X5	Yes = 1; No = 0	+
Farm Experience (Years) X6	Years of farm experience of household heads	+
Birds owned (Count) X7	Number of birds owned by a farmer	+
Birds Sold (Count) X8	Number of birds sold	+
Selling _Price/Bird($) X9	Price of a broiler bird	+
% Cost Reduction X10	Cost reduction due to palliative(% of cost of production)	-
Cost of Medication (%) X11	Cost of medication (% of total cost)	-
Production Cost/Bird ($) X12	Cost of producing a broiler bird	-
Dead Broilers (Count) X13	Number of dead broiler birds in a production	-
Increase Productivity (Yes = 1) X14	Did the farmer have increased output?	+

Prior to the estimation of the logistic regression model, the explanatory variables were checked for the existence of multicollinearity. For this purpose, colinearity was checked for categorical variables using the contingency coefficient test. The independent variables of the study are those which are expected to have an association with farmers' perception of the hunger reduction. More precisely, the findings of past studies on the farmers' perception, the existing theoretical explanations, and the researcher's know ledge of the hunger and food security in the study area were used to select explanatory variables. The perception of the farmers' decisions to choose "hunger reduction" or "not" depends on the households' demographic, socio-economic, and institutional factors assuming that for each household 'i'. The definition of the dependent & explanatory variables used in the logistic regression model is presented in **Table 2**. In binary regression models, the goodness of fit (R2 values) is not important; the important feature is the expected signs of the regression coefficients and their statistical and/or practical significance. Therefore, the interpretation focuses on statistical significance and the direction of the regression coefficients (either positive or negative. The Logit regression model for econometric analysis was used with the aid of the STATA version 13 in this paper.

Table 3: Demographic and socioeconomic characteristics of farmers.

Variables	% of Yes (N = 349)	Averages
Age		45(11)
Family size		5(3)
Adult (> = 18)		3(1)
Education (years)		13(3)
Gender		
Male	75	
Female	25	
Marital Status		
Married	94	
Single/Separated	6	
Training from Government	46.9	

Note: Numbers in the brackets are SDs

Table 3 is on demographic features of farmers from 349 responses of data collected. Women represented 25% of the beneficiaries, while males were 75%. **Table 3** shows that 94% of the sampled farmers were married. The average age of the farmers was 45 years, and the Standard deviation (SD) shows no abnormal variability among the farmers as it was smaller than the average year. The average family size was 5, and average years of education were 13, equivalent to Junior School Certificate 3 in the Nigerian education system. **Fig. 2** shows the frequency distribution of types of poultry. Broiler farmers constituted 49% (170), layer bird farmers 42% (146), farmers rearing both broiler and layer birds 8% (29), & cockerel farmers 1% (4). Multiple frequencies were done for farmers rearing broilers and layers, some farmers are enterprising with broilers and layers, thus the reason for multiple frequencies. **Fig. 3** shows that 199 farmers produced broilers, 177 layers, and 4 cockerels.

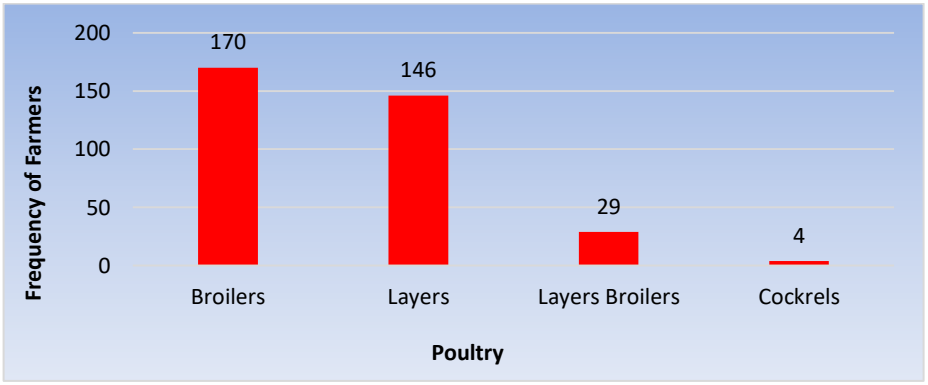

Fig. 2: Frequency Distribution Types of Poultry.

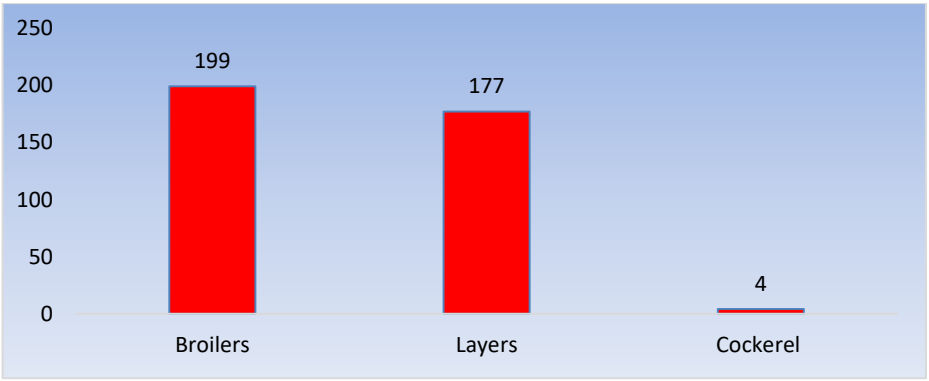

Fig. 3: Multiple Frequency Distributions for Types of Poultry.

Table 3 showing production characteristics of the beneficiaries reveals that 55.1% of the beneficiaries are members of associations and 78.5% of them had gone through government training in the agriculture; their sources of information on agriculture ranked between farmer to farmer, government extension agents, Media, NGOs, & research. The beneficiaries (98%) are of the opinion that their cost of production was reduced by a certain percentage with the government intervention during the COVID-19 epidemic. The average layer size by counting was 978, and for broilers it was 529. This means that poultry farmers under study are not smallholders but rather medium-scale farmers. The cost of a layer at the "point of lay" was $4.4 but $2.2 for a chick, while the cost of producing a broiler was $6.6, that is to raise it to consumption level. The average price of a crate of eggs was $2.7, while the average price of a layer (pullet) when sold was $4.4. The average sales price of a broiler was $10; medication took 27% for broilers and 23% for a layer of the total cost of production, respectively. As a result of the maize input and the government's training intervention to beneficiaries, the beneficiaries claimed to have a 30% reduction in the death rate of their birds; an average death rate of 14 birds from broilers and 24 birds from layers was recorded by the beneficiaries.

Table 4: Production Characteristics.

Variables	% of Yes (N=349)	Averages
Percentages		
Association membership	55.1	
Training from Government	78.5	
Reduced cost of production	98	
Sources of information		
Farmer to farmer	71.5	
Government Extension	7.5	
Media	15.9	
NGOs	1.4	
Research	3.7	
Average		
Layer birds kept in 2020		978(914)
Price of a layer $		$2.2(2.1)
Cost at the point of lay $		$4.4(3.8)
Crates of eggs/production cycle		87(111)
Average cost of a crate of eggs $		$2.7(0.8)
Cost of medication/vaccination (%)		23(27)
Average price of pullet (layer) when sold $		$4.4(1.5)
Number of broiler birds kept		529(962)
Cost of medication/vaccination(%)_broiler		27(38)
Numbers of it sold		498(935)
Average price per a broiler $		$10(3.6)
Cost of producing a broiler $		$6.6(18.4)
Record of death of birds_Layers		24(69)
Record of death of birds_Broilers		14(23)
Reduction percentage of production cost		30(21)

Note: Numbers in the brackets are SDs; $1=N380 (2020 $ to Naira exchange rate.

Likert Scale Characterization of Effects of COVID-19 Palliatives on Farmers' Livelihoods

On the effect of the palliative on livelihoods (**Fig. 4**), beneficiaries were of opinion that output of the birds increased by 70% and 28.2% believed that it was strongly increased, among others. On the effect of the palliative on the food security and hunger reduction, 20.5% of the farmers stated that the palliatives reduced hunger dramatically after production, while 71.2% agreed that the palliatives just reduced hunger, & 3.7% were inconclusive (**Fig. 5**). On-farm income in **Fig. 6**, 27.7% believe that their farm income strongly in-

creased, while 70.3% agreed that there was an increase in their farm income; 1.2% of the beneficiaries were inconclusive. Since the beneficiaries were given 150 kg of maize grains to prepare their feeds and services of government extension personnel, it is good to seek the perception of beneficiaries on the effect of the palliative on the cost of production of chicken. From **Fig. 7**, 31.5% of the beneficiaries were of the opinion that the palliative strongly helped in reducing the cost of production, 47.1% said that it reduced the cost of production, while 19.7% claimed that their cost of production increased; only 0.6 were inconclusive. Those claiming an increased cost might have inefficiency in their feed preparation leading to losses (Abiodun *et al*., 2022).

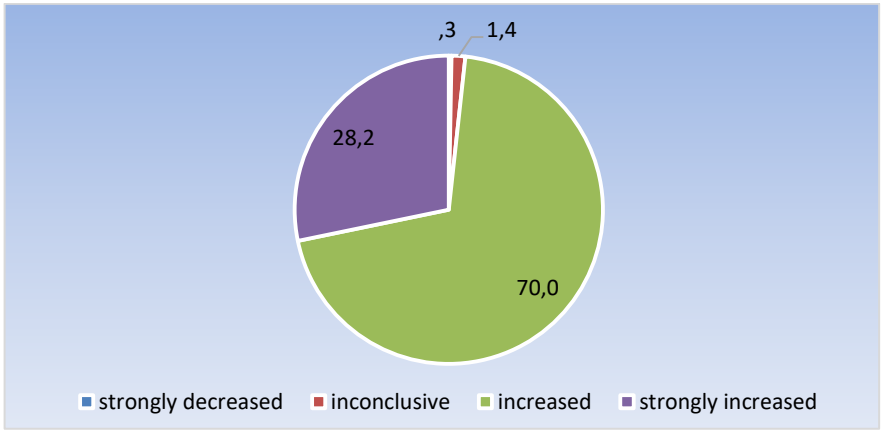

Fig. 4: Perception of poultry farmers on the output of poultry (%).

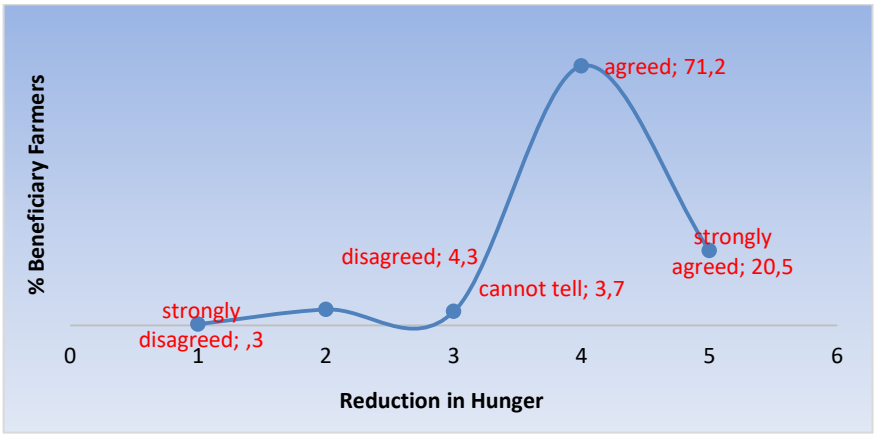

Fig. 5: Effect of COVID-19 Palliative on Hunger Reduction.

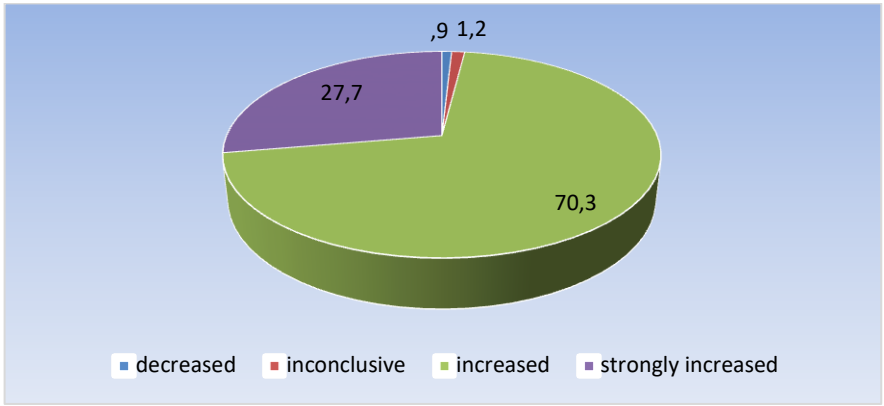

Fig. 6: Effect of COVID-19 Palliative on Farmers' Farm Income.

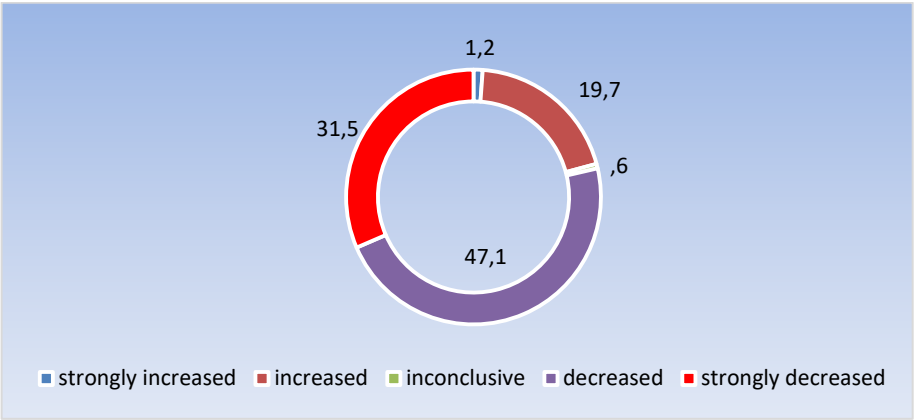

Fig. 7: Effect of COVID-19 Palliative on Cost of Production.

The farmers were asked to the state a major benefit derived from the COVID-19 palliative: 39% of them believed that they experienced an increase in farm income, followed by 24.7% of them claiming that their cost of production was reduced; 18.9% were of the opinion that the palliative reduced hunger in their families, while 17.4% had increased output through the palliative intervention as seen in **Fig. 8**.

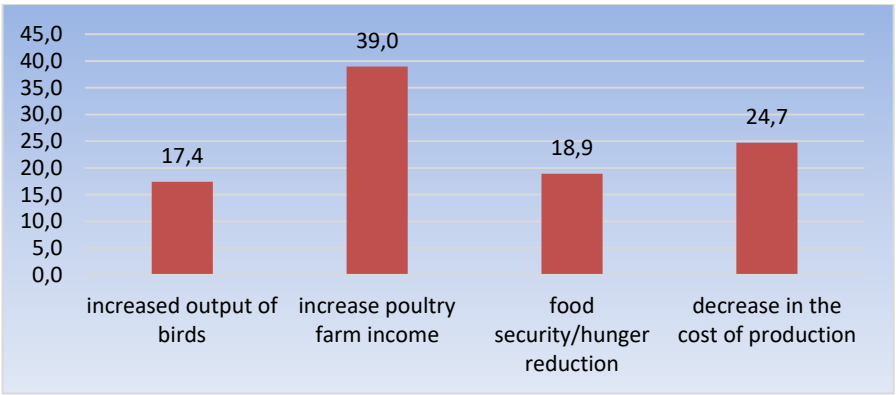

Fig. 8: Major benefits derived by farmers from COVID-19 palliatives.

Challenges to the Farming Activities and Advice to Government the farmers elicited some of the obstacles to their farming activities, as listed in **Table 5**. The primary obstacle was marketing their produce, which according to them is poor and needed attention. Other challenges are not very serious, as indicated by the percentages in the **Table 5**. Government may wish to proffer solutions to some of these challenges for improved poultry income for farmers.

Table 5: Challenges faced by farmers in their COVID-19 farming activities.

Major challenges	% Beneficiary Farmers' Perception of Major Challenges
Poor marketing	94.9
Poor rural road/transport	1.1
Capital	1.1
High cost of production	0.4
Others	2.6

Table 6 highlights the mind of the beneficiary farmers regarding their expectations or needs from the constituted authority of the Oyo State government. Only 226 of the 349 beneficiaries commented. Forty-two percent of them appreciated the state governor for the assistance and wished that the government should continue with the initiative and even improve on it in quality and quantity of feed inputs; 29.2% solicited for government loan to improve on their livestock production; 18.1% of them requested for direct financial

assistance from the government; some (5.8%) want government to improve on the palliatives by increasing the quantity of feed inputs given; 3.1% demanded for more government projects that could improve the livelihood of farmers. Some asked for a better way of passing information to farmers and 0.9% was of the opinion that government should construct rural access roads for the haulage of their produce.

Table 6: Advice from the beneficiary farmers to government on palliative issues.

Farmer's Remark	Freq	%
Better communication with farmers	2	0.9
Construction of rural access roads	2	0.9
Financial assistance	41	18.1
Improvement in feed palliatives	13	5.8
More agricultural projects	7	3.1
Appreciation for the palliative and wish that such initiative should continue and improve upon	95	42.0
Government loan	66	29.2
Total	226	100.0

Regression Results

The Logistic regression model was used to analyze determinants of farmers' perception of hunger reduction due to the government palliative given to farmers. The results are presented in two phases; the first phase has to do with the perception of poultry layer farmers and the second phase is with poultry broiler farmers. The correlation coefficient test was applied before the data analysis to the diagnose collinearity and omit independent variables that were highly dependent and strongly correlated to each other for both models for poultry layers and broilers. Looking at Table 7, this study has a Log pseudo-likelihood of −7.58501, Wald chi2 (10) and the Hosmer and Lemeshow test to validate and test the fit of poultry farm data. The log pseudo- likelihood and Wald chi2 are significant ($p < 0.05$), indicating evidence to show that at least one of the independent variables contributes to the prediction of the outcome. The overall fit of the model is shown by the Hosmer and Lemeshow test which can only be accepted if the p-value is greater than 0.05. The p-value of the Hosmer and Lemeshow test is 0.9692, greater than 0.05, thus, the overall model is well-fitted, meaning that there is no statistically significant difference between observed & predicted values, so we cannot reject our model. The success of the overall prediction by the regression model indicates that the variables sufficiently explained the perception of farmers on hunger reduction, and there is a strong association between the perception and the group of the explanatory variables as shown by the Hosmer and Lemeshow test. A positive esti- mated coefficient in the model implies an increase in the farmers' perception of reduced hunger with an increased in the value of the explanatory variable. At the same time, the negative estimated coefficient in the model implies decreasing perception with an increase in the value of the explanatory variable. The Logit model result shows that among the 10 explanatory variables considered in the model, the Choices of farmers on their perception of hunger reduction is influenced significantly by the following six variables: Farm experience (+ve), Average price of pullet(+ve), Increased production (+ve), number of Birds owned(-ve), duration of layer production(-ve), Cost of medication (-ve). Consequently, only those six variables that the significantly determine farmers' perception of the hunger reduction due to government palliatives decision are discussed. Poultry farming experience was the found positive and had a significant (at the 10% level) relationship with the farmers' perception of reduced hunger in the family, as confirmed by the logistic regression model. Experienced farmers know better how to manage the poultry system and optimize the few resources at their disposal to get maximum output; this paper reveals that the palliative given to them was well managed to help in reducing hunger. A year's more experience by the poultry farmer will increase the perception of hunger reduction by 0.000217; this is in line with the work of Dessalew, 2014. These experiences might be helpful in understanding the prediction of the future direction of any livelihood intervention and have been identified in other research (Gbetibouo, 2009; Sanog *et al.,* 2012; Montle & Teweldemedhin, 2014). The logistic regression model results (**Table 7**) explain that the number of birds kept is negative and significantly related to the

perception of hunger reduction (at 10% level). This implies that the probability of perception of hunger reduction is greater for those who have a lower number of layers compared to the farmers that have higher numbers.

Table 7: Logit regression model on farmers' perception of hunger reduction due to Government palliative assistance (Layers).

Exogenous_Variables	Coef.	Robust Std. Err.	dy/dx	z	P>z
Farmer's Age	–0.1043	0.2034	–0.000073	–0.51	0.61
Farm_Experience	0.3114	0.1657	0.000217	1.88	0.06
Family Size	1.2130	1.2726	0.000844	0.95	0.34
Birds owned	–0.0013	0.0007	–0.000001	–1.83	0.07
Education (Years)	0.1090	0.0952	0.000076	1.15	0.25
Death Birds	2.6759	2.0128	0.006844	1.33	0.18
Duration of production (egg laying)	–0.4077	0.1470	–0.000284	–2.77	0.01
Cost of Medication (%)	–0.0360	0.0163	–0.000025	–2.20	0.03
Average_Price (Pullet)	0.0067	0.0029	0.000005	2.30	0.02
Increase Production (Yes = 1)	8.8024	3.6999	0.775066	2.38	0.02
Constant	0.1425	4.3387		0.03	0.97
Number of obs	60				
Wald chi2(10)	18.42				
Prob > chi2	0.0482				
Log pseudo-likelihood	−7.58501				
Pseudo R2	0.6111				
Hosmer-Lemeshow chi2(8)	2.33				
Prob >chi2	0.9692				

This is against a priori (Ayiekoa *et al.,* 2015) and one of the reasons might be the affordability of production cost, especially since the period was the COVID-19 period, smaller enterprises might be able to cope as they have lower costs of the production compared to bigger enterprises who spend much on an enterprise will little money left for consumption, thus increasing hunger. Duration of production was negatively and significantly ($p < 0.01$) related to hunger reduction; it was against expectation because the longer the layers keep laying eggs, hunger is expected to reduce as the farmers are supposed to make more farm income through the sales of poultry eggs. Since the relationship was negative, it means the farmers are not able to keep up with the cost of production for long and this cost led to the use of their income to cover the cost of sustaining poultry, leading to increased hunger among the family. The diversion of funds to the sustain egg production might leave little income to spend on consumption. The study shows that the higher the cost of medication, the lower the perception of farmers on the intervention capability in reducing hunger ($p < 0.05$); the higher the percentage of money spend on farm medication, the lower the perception of farmers on hunger reduction. A unit percentage increase in the cost of medication will be 0.000025. According to Nnaemeka, (2022) the health expenditure negative parameter suggests that as farmers start to spend more on health matters, there is a tendency to increase hunger and food insecurity. The average price of a spent layer and increased production in layers are positively and significantly related to an increased perception of reduced hunger. **Table 4** reveals that the average price of a spent layer is $4.4; the higher the price, the more the perception of farmers on reduced hunger increases significantly ($p < 0.05$). A high price will enable farmers to the obtain sufficient profits to promote investment, technology, and productivity and thereby promote hunger reduction and food security (Mahendra Dev and Chandrasekhara Rao, 2010). According to the farmers, the palliative helped in the increasing their output (egg production), thus the model result shows that an increase in egg production increases the perception of the farmers on hunger

reduction significantly ($p < 0.05$). Table 8 reveals the result on broiler analysis using the Logit regression model; on broiler production, the Log pseudo-likelihood of -16.8 and Wald ch2 (14) are significant ($p < 0.01$), indicating evidence to show that at least one of the independent variables contributes to the pre-diction of the outcome. The P value of Hosmer and Lemeshow test is 1.50, and it is not significant (P<0.99), thus the overall model is well-fitted, meaning that there is no significant difference between observed and predicted values, thus we cannot reject our model. The model aims to the identify factors influencing farmers' perception of hunger reduction.

The Logit model result shows that there are 12 explanatory variables that statistically and significantly influence the decision of farmers on their perception of hunger reduction. The variables included those that positively and significantly influence farmer perception of reduced hunger; these are Education Squared (higher education), Poultry Association, Birds owned (number), Selling_Price/Bird, % Cost Reduction and Increase Production (Yes = 1). On the other hand, variables that are negatively and statistically significant on farmer perceptions of reduced hunger included Education (in years), Farm Experience, Birds Sold (Count), Cost of the Medication (%), Production Cost/ Bird, and Dead Broiler (Count).

Table 8: Logit regression model on farmers' perception of hunger reduction due to Government palliative assistance (Broilers).

Exogenous Variables	Coef.	Robust Std. Err.	dy/dx	z	P>z
Farmer's Age	0.1188	0.0809	0.00004	1.47	0.142
Family Size	0.1754	0.3707	0.00006	0.47	0.636
Education(Years)	–7.2997	2.5132	–0.00249	–2.9	0.004
Education Squared	0.2489	0.0936	0.00008	2.66	0.008
Poultry Association	3.0157	1.3448	0.00140	2.24	0.025
Farm Experience	–0.6396	0.2250	–0.00022	–2.84	0.004
Birds owned	7.7474	2.8283	0.00264	2.74	0.006
Birds Sold(Count)	–4.2557	1.9591	–0.00145	–2.17	0.03
Selling _Price/Bird	4.5739	1.4255	0.00156	3.21	0.001
% Cost Reduction	0.1901	0.0661	0.00006	2.88	0.004
Cost of Medication (%)	–6.5452	1.6719	–0.00223	–3.91	0.00
Production Cost/Bird	–3.1560	1.0029	–0.00107	–3.15	0.002
Dead Broiler(Count)	–0.0572	0.0201	–0.00002	–2.85	0.004
Increase Production(Yes=1)	8.3216	1.8035	0.53878	4.61	0.00
Constant	26.0172	9.1258		2.85	0.004
Number of obs	138				
Wald chi2(14)	33.94				
Prob > chi2	0.00				
Log pseudolikelihood	–16.82				
Pseudo R2	0.53				
Hosmer-Lemeshow					
chi2(8)	1.50				
Prob >chi2	0.99				

Farming experience was found to have a negative and significant (at the 1% level) relationship with farmers' perception of hunger reduction, as confirmed by the logistic regression model. Farmers with less experience have a higher perception of a reduction in hunger due to the palliative intervention by government. The training given to farmers might have helped them utilize the palliative productively to give them a high production of boilers that helped them to stem hunger down drastically and therefore gave them a positive perception of the hunger reduction than experienced farmers. This is against a priori expectation; the experienced farmers might not allow their experiences to be guided by the modern training given to them by government extension agents. People with the lower education have a negative and significant ($p < 0.01$)

perception of reduced hunger. Demographic features of farmers in **Table 3** show that the average years of education is 13 years, which is equivalent to JSS 3 in Nigeria's education system. On this note, farmers with lower education can be provided with informal education through extension services on the use of the palliatives to reduce hunger or food insecurity. However, as education increased to a certain higher level (Education Squared), education becomes positively & significantly ($p<0.01$) related to perception of reduced hunger among farmers, i.e., having more education increased perception of hunger reduction. The farmers can now confirm that reduction in hunger is increasing as a result of higher education. Increasing education by a unit year will increase hunger reduction by 0.0008, in other words, the education of household heads was positively associated with the perception of hunger reduction. This is supported by (Dessalew, 2014 and Tenge *et al.,* 2004) who stated that literate farmers often serve as contact farmers for extension agents in disseminating information about agricultural technologies from government agencies. In general, the higher the education, the higher the chance of hunger reduction. The majority of previous literature also reported mixed results for education (Piya *et al.,* 2013; Nhemachena, 2014; Tesfaye & Seifu, 2016). The more birds sold, the less are available for the farm family to consume and thus more hunger for the family (less reduced hunger). The perception of reduced hunger becomes negative and significant ($p < 0.05$) with more birds sold out and few left to consume by the farm family. Loss of birds (Dead Broiler) by farmers led to less and poor perception of reduced hunger due to government palliative intervention as the relationship between dead broilers and reduced hunger is negative and significant at a 1% level of probability. The higher the cost of medication, the less the perception of farmers of reduced hunger effect of government palliative intervention as the Cost of Medication (%) is negatively and significantly ($p < 0.01$) related to the perception of reduced hunger by farmers,; this is supported by the Nnaemeka, (2022). A percentage increase in medical cost will affect perception of reduced hunger by 0.00223. The higher the cost of production per bird (Production Cost/Bird), the less the perception of reduced hunger meaning that part of money that could have been used on consumption has been diverted to the cost of production, leading to more hunger, since there is a negative relationship between cost of production and perception of reduced hunger at a 1% level of probability. The result of the logit model shows a positive and significant (at the 5% level) relationship between poultry association and farmers' perception of the reduced hunger. Farmers belonging to an association have a high perception of reduced hunger than those not in an association; they are of the opinion that the intervention led to decreased hunger in their families. This implies that farmers that are members of poultry associations are more likely to have more access to resources and information on broiler production than farmers that are not members and have higher level of the productivity. This is supported by (Abafe *et al.,* 2021) that affirmed that association membership is strongly correlated with perception. According to the Jatto *et al.,* (2012) an increase in years of participation in a cooperative society/association may give more room to assess credit facilities to enhance their productivity, the productivity can lead to hunger reduction or food security for a poultry farm family. The higher the selling price of a broiler, the higher the reduced hunger perception by farm families. This relationship is significant at a 1% level of probability; the high price will lead to high poultry farm income. The palliative given to farmers by the government led to the cost reduction in their production (**Table 4**); the average percentage in cost of production recorded is 30%. The Logit model shows a positive and significant ($p < 0.01$) relationship between percentage cost reduction and perception of reduced hunger; as the percentage of cost reduction increases, the perception of hunger reduction increases. More than 90% of the broiler farmers stated that the output increased due to government intervention, thus increase in output or produce was used as an exogenous variable. An increase in the fproduce (number of broiler birds that reach market size) is positively and significantly related to perception on reduced hunger at a 1% level of probability. The more birds' death was prevented through feed provision and extension advice, the more broilers reached the market for sale and the more hunger reduced among the poultry farmers due to more poultry income. A unit increase in output will lead to a 0.53878 increase in the perception of reduced hunger among broiler farmers.

CONCLUSION:

This study interviewed 349 poultry farmers that the benefitted from government maize grain palliative for feed formulation and government poultry extension services meant to help poultry farmers contain the negative effects of COVID-19 of the hunger and food insecurity and the poverty. The analysis of the data collected shows the perceptions of poultry farmers on government palliative assistance. Results revealed that both males and females are involved in the poultry farming; the average age of poultry farmers was 45 years, with an average family size of 5. The average years of education were 13 years, equivalent to JSS 3 Nigeria education system. Types of poultry show that 49% of the poultry farmers reared broilers; 42% reared layers 1% reared cockerels, while 8% reared both broilers and layers. Production characteristics reveal that 55.1% of the poultry farmers were members of an association like the Poultry Association, 78.5% benefitted from government training, and 98% experienced reduced costs of production on their poultry enterprise. Most of the information received by the farmers is from their friends (71.5%). The results show that a reduction in the cost of production with government intervention was 30% of the total cost of production, lower death was experienced among broiler enterprise compared to layer enterprise; cost of medication in broilers (27%) was higher than in layers (23%). The cost of producing a marketed broiler was $6.6 while the market price was $10. The cof a layer at a point of lay was $4.4 and it can produce 87 crates of eggs per production cycle. The Likert scale Characterization of the Effects of COVID-19 Palliatives on Farmers' Livelihoods shows that the effect of palliative on birds output increased by 70%. Regarding the effect of the palliative on food security and hunger reduction, the beneficiaries believed that hunger was reduced by 71.2%; poultry income increased by 70.3%. On the cost of production reduction, the beneficiaries were of the opinion that the palliative reduced their costs of production by 47.1%. The farmers were asked to state a major benefit derived from the COVID-19 palliative: 39% of them believed that they experienced an increase in farm income, followed by 24.7% of them claiming that their costs of production reduced; 18.9% were of the opinion that the palliative reduced hunger in their families, while 17.4% had increased output through the palliative intervention. The Logit regression result for layer bird enterprise shows that Farm experience ($p < 0.1$), Average price of the pullet ($p < 0.05$), and Increased production ($p < 0.05$) positively and significantly influenced perception on hunger reduction by the beneficiaries while number of Birds owned ($p < 0.1$), duration of layer production ($p < 0.01$) and Cost of medication ($p < 0.05$) negatively and significantly influenced perception on hunger reduction by the beneficiaries. The regression result for broiler enterprise reveals 12 explanatory variables that statistically and significantly influence the decision of farmers on their perception of hunger reduction. The variables included those that positively & significantly influence farmer perception of reduced hunger; these are Education Squared ($p < 0.01$), Poultry Association ($p < 0.05$), Birds owned ($p < 0.01$),, Selling _Price/ Bird ($p < 0.01$), % Cost Reduction ($p < 0.01$), and Increase Production ($p < 0.01$). On the other hand, variables that are negatively and statistically significant on farmer perceptions on reduced hunger included - Education ($p < 0.01$), Farm Experience ($p < 0.01$), Birds Sold ($p < 0.05$), Cost of Medication ($p < 0.01$), Production Cost/Bird ($p < 0.01$), and Dead Broiler ($p < 0.01$).

A positive estimated coefficient in the model implies increase in the farmers' perception of reduced hunger with an increased in the value of the explanatory variable. Whereas, a negative estimated coefficient in the model implies decreasing perception with increase in the value of the explanatory variable. The implication is that taking these factors into account while planning food security measures will enhance farmers' commitment to fighting hunger.

ACKNOWLEGEMENT:

The authors duly acknowledge to the management acumen displayed in the management of enumerators and logistics for data collection by Mr. Adedeji Julius, Ms Peter Gift Precious of the Business Incubation Platform of IITA, Ibadan, Nigeria, and Mr Olushola Popoola of OYSADA, Ibadan, Oyo State, Nigeria.

CONFLICTS OF INTEREST:

There are no potential conflicts of interest to publish the present research work.

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Citation: Adebowale A., and Bamikole A. (2023). Socioeconomic effects of Oyo state government COVID-19 palliatives on poultry farmers. *Int. J. Agric. Vet. Sci.*, **5**(6), 137-154.
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