Profitability and comparative analysis of commercially formulated and self-compounded feeds among small-scale poultry farmers in Ila Local Government Area, Osun state, Nigeria.

Okunola Solomon Olufemi*, Olapade Ogunwole Folayimi, and Adesiyan Olusegun Israel

Department of Agricultural Economics, Ladoke Akintola University of Technology, Ogbomoso, Nigeria
Corresponding Author

Abstract: **The study undertook a comparison between methods of feed formulation among small-holder farmers because most poultry products in Nigeria come from this segment. Most poultry farmers were females (51.7%) because their male counterparts were into other aspects like arable farming and palm wine tapping in the study area. All (100%) had one form of education. Most respondents kept a relatively large family used as labor supplements. Age was significant at (p<0.10) and Access to facilities expansion was significant at (p<0.05) but they were positively signed while Education was also significant at (p<0.05) and had a negative sign. The cost of operation like the (Average Total Cost (A TC), Average Total Fixed Cost (TFC) and Average Total Variable Cost (TVC)) were higher for the farmer using commercially formulated feeds but the profitability parameters like the Gross Margin (GM) and profit were also higher for an average farmer using commercially formulated feeds. Although the two systems were profitable, using commercially formulated feeds gives more prospects for expansion which is needed in the poultry sub-sector of the Nigerian agriculture.**

Keywords: **Poultry sub- sector,. Feed costs, Self-compounded, Commercially formulated, Epidemic and Pandemic**

I. INTRODUCTION

The importance of poultry to the nutritional, economic and social life of man cannot be over emphasized. The advantage of poultry over other livestock is primarily due to the short and relatively quick turn over on investments and high quality protein products (Adeyemo et al., 2010). As a result of growing human population, there is high demand for poultry products (FAO, 2002). For the poultry sub-sector to perform this important role, the birds need to be fed with adequate nutritious feed. Thus feed is a point of convergence and a critical commodity for which all livestock species compete and it is a major pillar towards ensuring economic, social and environmental goals of livestock production [Makkar, 2016]. The local farmer and small-holder reels under the exorbitant cost of feed and other materials on yearly basis. Feed costs alone account for over 70% of the total cost of livestock and poultry production (Ogunfowora, 1994; Oluyemi, 1998). Animal performance, regardless of whether it is expressed as yield (meat or milk), growth rate or disease resistance, is dependent on the quality of nutrition. However,

nutrition is often the most limiting factor of productivity in ruminants and non-ruminants (Corson et al., 1999). Feed costs typically represent the highest cost item in smallholder production systems, implying that both quantity and quality of feed have a significant effect in determining profitability (Muller et al., 2007; Roy et al., 2004). Furthermore, when concentrates are fed, they are provided in small quantities, and therefore low returns are achieved from their inputs (Biwott et al., 1998). From the foregoing, a small-holder needs a thorough examination of the procedure to adopt in procuring feeds in order to ensure a breakthrough to profitability, be it from self or commercial formulated diets. This has a direct effect on the performance of the enterprise. An optimal combination of ingredients ensures a rational use of available resources whilst meeting the nutritional requirements of the animal. Therefore, the feed manufacturer can reduce costs and the livestock keeper can maximize profitability through increased productivity (Babic and Peric, 2011).No matter the method adopted in procuring feeds, health and safety concerns are paramount procedures for the feed industry. The feed industry is dominated by many actors across the value chain and these include the farmers, raw material suppliers, manufacturers and distributors. All these actors influence the quality of a feedstuff but they also face their own individual challenges (Bishop, 2013), Despite being an important link in the livestock production chain, the animal feed industry is important to help ensure the safety of food for human consumption, and in order to achieve this, producers must adhere to good manufacturing practices in the procurement, handling, storage, processing and distribution of animal feed (FAO and WHO, 2008). Another critical factor affecting profitability in poultry enterprises is the mortality rate especially when the chicks are young. The mortality rate goes up when there is high predation, malnutrition, disease and climate exposure. Mortality rates have been shown to reduce dramatically when chicks are reared in confinement with the hen, are creep-fed for the first couple of weeks after hatching, and are vaccinated against Newcastle disease (Alders and Pym, 2008). Disease on the other hand respects no boundary, hence when there is a disease outbreak, authorities and relevant agencies concerned struggle to curtail it and prevent

it from becoming an epidemic (regional) or a pandemic (worldwide)(Authors comment). Although the relative importance of poultry diseases may differ between countries and geographical areas, there are few important diseases that are unique to particular parts of the world" (Biggs, 1982). This study was directed towards smallholder poultry farmers because much of the products envisaged came directly from them in Nigeria.

The general objective was to compare and analyze the profitability between self-compounded feeds and commercially formulated feeds used among smallholder poultry farmers in Ila Local Government of Osun State, Nigeria.

The specific objectives were to:

i. describe the socio-economic characteristics of the respondents in the study area.
ii. identify the various poultry production systems among the poultry farmers.
iii. estimate the costs and returns associated with poultry production with the aim of determining the profitability.
iv. analyze the factors affecting the revenue of poultry farmers in the study area.
v. identify the constraints to poultry production.
vi. do an economic comparison of the farmers using self-compounded and commercially formulated feeds.

II. MATERIAL AND METHODS

Research Methodology

The Study Area

Ila Local Government Area is in Osun State, Nigeria. Its headquarters is in the town of Ila Orangun. It has an area of 303 square kilometers and a population of 62,049 as at the 2006 Census and it is situated at 8°01′N 4°54′E on the Nigerian map. It is about 145km Northeast of Ile Ife, the cradle of Yoruba race. It's a gateway to both Ekiti and Kwara States and shares boundaries with Ora and Oke- Ila Orangun to the Northeast, Agbamu, Arandun, Rore and Aran-Orin to the North, Oyan to the West, Otan-Ayegbaju to the South West and Oke-Imesi in Ekiti State to the East. Yoruba and English are the official languages of the people in the area. They practice Islam, Christianity and paganism called traditional religion. The people of the Local Government are mainly farmers, traders and artisans. Their other occupations include hand-woven textiles, blacksmithing, leather work and weaving. The Local Government is known for palm wine tapping (Emu *Ila*).

Population of the study

The population for the study included all poultry farmers in Ila Local Government of Osun State.

Sampling technique and sample size

Apart from Ila-Orangun Township, where we had 20 poultry farmers, ten poultry farmers (10) each were randomly chosen from Ajaba, Ogbagbara, Alagbede and Edemosi making a total of 60 poultry farmers.

Method of data collection

Primary data were used for this study. Data were gathered using structured questionnaire for the literate and interview schedule meant for illiterate or those that found it difficult to fill the questionnaire where possible.

Data collected include:

a) The socio-economic characteristics of the poultry farmers such as age, family size, gender, educational level, farming experience, membership of any organizations e.t.c.
b) Production data such as the cost and returns, the system of poultry production and their revenue.
c) Data relating to preference between the two types of feeds based on different parameters.

Method of data analysis

The statistical tools that were used included descriptive and inferential statistics.

(a) Descriptive Statistics.

Descriptive tools such as frequency and percentages were used to analyze socio-economic characteristics of the poultry farmers such as age, family size, gender, educational level, farming experience, membership of any organizations etc.

(b) Gross Margin analysis

Gross Margin analysis was used to analyze the costs and returns associated with poultry production in the study area.

The Gross Margin model is represented as follows:

$GM = TR - TVC$

$TC = TFC + TVC$

Where:

GM = Gross Margin

TR = Total revenue

TVC = Total Variable Cost

(c) Benefit-Cost Ratio (BCR)

The BCR was used to ascertain whether poultry production was profitable in the study area or not.

BCR = Total Revenue / Total cost

(d) Inferential Statistics

The inferential tool used was the Logit Regression which is presented as follows:

Logit Regression Analysis

Logit models can be used to analyze models where the dependent variable is dichotomous, categorical, or qualitative. The case of whether a farmer self-compound or not is a binary one—the dependent variable has only two possible values, yes or no, usually coded numerically as 1 or 0, respectively. Linear regression models are inappropriate for predicting the outcome of such binary choices since the assumptions of the linear regression model are violated in that the error terms are heteroskedastic, correlated with the explanatory variables, and the predicted value would not necessarily fall within the logical range of zero to one. The Logit models are used to circumvent these problems. The Logit model is associated with the cumulative logistic probability function. The model was chosen because of the dichotomous dependent variables and because the technique has no restrictive distribution assumptions. (Okunola and Olagunju, 2019)

The logistic (logit) probability function is given as

$P_i = 1/1 + e^{zi} = f(Z)$ ----------------------- (1)

Where Pi is the probability that a farmer i ($i = 1, 2 … n$) used a particular feed type. Index Zi is a random variable which predicts the probability of a farmer i using a feed type or not. The probability Pi in equation 1 is further transformed to give equation 2.

$Pi = e^{zi} / 1 + e^{zi}$ ------------- (2)

Therefore for the ith observation, a farmer's feed choice will be

$Zi = In\ Pi / 1 - Pi = \beta o + \Sigma \beta o\ X$ ---------------------------- (3)

Therefore, $ln\ (P/1-P) = 1$, if the farmer used a feed type $ln (P/1-P) = 0$, if otherwise

Implicitly, the model can be empirically estimated as:

$Y = \beta o + \beta i\ Xi + \beta_2\ X_2 + \beta_3\ X_3 + \beta_4\ X_4 ………… \beta_8\ X_8$ -- (4)

Where: Y = Feed type status of the farmers sampled (1= farmer used a feed type, 0 otherwise)

X_1= Age
X_2= Gender
X_3= Household size
X_4=Education qualification of the poultry farmer
X_5= Years in poultry farming
X_6= poultry size (number of birds)
X_7= Inadequate finance
X_8= Access to Credit facilities
X_9= Access to facilities expansion

III. RESULTS AND DISCUSSION

Socioeconomics Characteristics of Respondents

Age of Respondents

The table 1 below shows the age distribution of the respondents in which 46.7% of them were between the ages of 21 and 30 years, 23.3% were within the age range of 31-40

years. 23.3% were within the age range of 41-50 years while 6.7% of the respondents were 51 years of age and above. This indicates that most of the farmers were young which implies increased energy and a set that might likely be more receptive to new technologies for increased poultry production. This corroborates the findings of past studies (Adisa and Akinkunmi, 2012 and Okeke et al., 2018; who reported that younger people are more involved in livestock farming than aged people. This implies that the younger the farmers the better the productivity.

Table 1: Distribution of Respondents by Age

Age	Frequency	Percentage
21 – 30	28	46.7
31 – 40	14	23.3
41 – 50	14	23.3
≥ 51	4	6.7
Total	**60**	**100.0**

Source (Authors survey)

Marital Status of Respondents

The table 2 below shows the marital status of the respondents. The table shows that 45.0% of the respondents were singles, 53.3% of the respondents were married while 1.7% were widowed. This implies that most of the farmers were married. This result also shows that married people were more engaged in poultry farming in the study area. This might be as results of the respondents desire to supplement their income in order to take adequate care of their families.

Table 2: Distribution of Respondents by Marital Status

Marital status	Frequency	Percentage
Single	27	45.0
Married	32	53.3
Widow	1	1.7
Total	**60**	**100.0**

Source (Authors survey)

Gender of the Respondents

Table 3 presents the distribution of the respondents based on gender. The result of the analysis showed that most (51.7%) of respondents were females while 48.3% were males. This implies that females were more into poultry production (small-scale) than their male counterparts Unlike the theory, most male farmers in the area were into other aspects of agriculture like arable crop production and palm wine tapping as a secondary job than into poultry production.

Table 3: Distribution of Respondents by Gender

Gender	Frequency	Percentage
Male	29	48.3
Female	31	51.7
Total	**60**	**100.0**

Source (Authors survey)

Household Size of Respondents

The table 4 below shows the household size of the poultry farmers in the study area. The table shows that 36.6% of the respondents had 5 members in their households and below, 58.3% of the respondents had between 6-10 members in their households while 5.0% had 11 members of household and above. This may be regarded as fairly large households which could serve as a source of family labour. This implies that most of the poultry farmers had people in their families which could help them in their poultry business.

Table 4: Distribution of Respondents by Household Size.

Household size	Frequency	Percentage
≤ 5	22	36.6
6 – 10	35	58.3
≥ 11	3	5.0
Total	**60**	**100**

Source (Authors survey)

Educational Qualification

The distribution of the respondents based on education level is presented in Table 5, the finding shows that 35.0% had primary education while 35% also had secondary education and 30% had tertiary education. The implication is that all of the respondents had one form of education or the other. It can be said that the educational status of the respondents was enough to provide them with the ability to read, write, handle and interpret messages relating to their farm operations in the instruction manuals on input and equipment usage. Their level of education could equally prove important in influencing the decision adopt new innovation of technology.

Table 5: Distribution of Respondents by Educational Qualification

Educational Qualification	Frequency	Percentage
Primary education	21	35.0
Secondary education	21	35.0
Tertiary education	18	30.0
Total	**60**	**100.0**

Source (Authors survey)

Poultry Production Experience

The table 6 below shows the poultry production experience of the farmers. The table shows that 50.0% of the respondents had 5years and below of experience in poultry farming while 30.0% of the respondents had between 6-10 years poultry production experience while others 20% had 11years and above experience. Experience becomes important when management and confidence to handle critical issues are considered especially in adoption of new technology.

Table 6: Distribution of the Respondents by Poultry Production Experience

Experience (years)	Frequency	Percentage
≤ 5	30	50.0
6 – 10	18	3010
11 and above	**12**	**20.0**
Total	**60**	**100.0**

Source (Authors survey)

Religion of Respondents

The table7 below shows the religion of the respondents in the study area. The table shows that 75.0% of the respondents were Christians and 15.0% of the respondents were Muslims. The result shows that the two dominant religions were involved in poultry farming hence there might be no religious bias.

Table 7: Distribution of Respondents by Religion

Religions	Frequency	Percentage
Christian	45	75.0
Muslim	15	15.0
Total	**60**	**100**

Source (Authors survey)

Groupings Respondents belong to

The table 8 below shows the various associations the poultry farmers in the study area belonged to. The table shows that 40.0% of the respondents did not belong to any association, 30.0 % of the respondents belonged to cooperative societies, 23.3% of the respondents belonged to farmer's clubs while 6.7% of the respondents belonged to other associations societies like credit and thrift societies.

Table 8: Distribution of Respondents by Groupings they belong to

Societal association	Frequency	Percentage
None	24	40.0
Cooperative	18	30.0
Farmer's club	14	23.3
Other association	4	6.7
Total	**60**	**100.0**

Source (Authors survey)

Poultry Size of the Poultry Farmers.

Table 9 shows the number of poultry birds kept by the respondents. Most,48.7% of the respondents kept less than or equal to 200 birds, 25.0% kept between 201 and 400 birds, 23.3% kept between 401 and 600 birds while 5.1% kept between 601-1000 birds in their farms. The implication of this is that all of the respondents were small holders. In Nigeria, flocks below 500 birds are small scale holders while flocks above 500 but below 5000 are medium holders while flocks above 5000 are large. Okunola S.O, .2019

Table 9: Distribution of Respondents according to Poultry size

Poultry size	Frequency	Percentage
≤ 200	28	46.7
201 – 400	15	25.0
401 – 600	14	23.3
601-- 1000	3	5.0
Total	**60**	**100.0**

Source (Authors survey)

Types of poultry Bird kept

Table 10 shows the types of birds kept by the poultry farmers in the study area, 60.0% of the respondents were into broiler production, 21.7% were into layers production while 18.3% combined both broilers and layers.

Table 10: Distribution of Respondents according to the Type of poultry Birds kept

Type of poultry Bird kept	Frequency	Percentage
Broilers	36	60.0
Layers	11	21.7
Both	13	18.3
Total	**60**	**100.0**

Source (Authors survey)

Poultry Production Systems

Table 11 shows the poultry production systems adopted by the poultry farmers in the study area, 75.0% of the respondents used deep litter system, 16.7% used battery cages while 8.3% kept their birds on free range system. Since housing system is a major contributor to the success of poultry entrepreneurship deep-litter system have been proposed and increasingly practiced in the past two decades. They provide physical space and greater environmental complexity including litter, perches, dust-bathing, pecking, scratching behaviors and egg laying facilities (Elson, 1992).

Table 11: Distribution of Respondents according to Poultry Production Systems

Production Systems	Frequency	Percentage
Deep litter	45	75.0
Battery cage	10	16.7
Free range	5	8.3
Total	**60**	**100.0**

Source (Authors survey)

Factors Affecting the Choice of feeds adopted by the respondents

The table11 below shows the factors affecting the choice of feeds adopted by the respondents. Age was significant at ($p<0.10$) and it is positively signed implying being old could increase the probability of a farmer compounding feeds himself/ herself. This is also corroborated by the fact that all farmers that were above 51 years of age were self-compounding feeds Education was also significant at ($p<0.05$) and had a negative sign. Low education increases the probability of self-compounding feeds while higher educational status reduces the probability. Access to facilities expansion was significant at ($p<0.05$) highly positively signed indicating that low access to expansion especially in size and funds would increase the probability of self-compounding and vice versa,

Table 11: Factors Affecting the Revenue of Poultry Farmers

Factors	coefficient	Std.Err.	z	p>(z)
Age	1.6411	0.8702	1.89	0.059 *
Gender	-0.4740	1.1932	-0.40	0.691
Hhsize	0.2599	0.2529	1.03	0.304
Eduqua	-1.2311	0.6089	-2.02	0.043 **
Yrsinpoul	-0.1767	0.1469	-1.20	0.229
Poultsize	-0.0048	0.0053	-0.90	0.369
Inadfin	-1.2122	1.6543	-0.73	0.464
Credfac	-0.8688	1.4728	-0.59	0.555
Facexp	3.9537	1.8551	2.13	0.033 **
Cons	1.3023	3.7384	-0.35	0.728

Number of observation = 60   Log likelihood = -12.489167
Pseudo R2   = 0.4699   LR chi2 (9)   = 22.14
*=10% level of significance   Prob > chi2   = 0.0084

Source (Authors survey)

Constraints to Poultry Production

The table 12 below shows the responses of farmers to the constraints facing poultry production.

All (100.0%) of the farmers were affected by increase in price of poultry feeds. This, the farmers said was the highest of all the costs in poultry production. Prevalence of poultry diseases was another constraint affecting poultry production in the study area. All (100.0%) of the farmers experienced invasion of poultry diseases in one way or the other. Low demand for poultry products was never rampant in the study area as only 8.3% of the farmers were affected. This implies that the market is big enough to absorb expansion of poultry production in the study area. Insufficient fund was another constraint affecting poultry production, 76.7% of the farmers were unable to access finance for their production. Shortage of labour did not have much effect on poultry production in the study area as only 10.0% of the farmers were affected. As far as access to credit facilities and fund were related, most of the farmers were unable to access credit facilities as. 70.0% of the farmers were affected. Other major problems faced by the farmers included the fluctuating prices of poultry materials as 66.0% of the respondents were affected while 46.7% of the farmers were affected by poor management skills and.83.3% by absence of good infrastructural facilities.

Table 12: Constraints to poultry production

C C Constraints	Frequency	Percentage
H Hig High cost of quality feeds	60	100.0
P Pre Prevalence of diseases	60	100.0
L Low demand	5	8.3
I Insufficient fund	46	76.7
S Shortage of labour	6	10.0
H High rate of bird mortality	21	35.0
I Inaccessible credit facilities	42	70.0
Fluctuating prices	28	46.7
Poor management skills	50	83.3
Poor inadequate infrastructures	36	60.0

Source (Authors survey)

Comparing Commercially Formulated and Self-compounded feeds using different Parameters.

The table 13 below shows main economic and budgetary differences between farmers using commercially formulated feeds and self-compounded feeds. The parameters discussed included: economic and budgetary considerations like the: Total Cost, Total Fixed Cost, Total Variable Cost, Gross Margin and Profit. It should be noted that the main difference between the two sets of farmers was the cost. Weighing all the operations per caput, the average farmer using commercially formulated feeds faired far better than the one using self-compounded feeds. Though the costs were higher (Average Total Cost (A TC), Average (TFC) and Average (TVC)), the benefits in terms of the Gross Margin (GM), N 638658.50 compared to N213510.00 and profit of N 375412.10 to N186280.00. were also higher for an average farmer using commercially formulated feeds. In terms of Benefit-Cost Ratio, the farmer using self-compounded feeds (3) was better than the farmer using commercially formulated feeds with 2. Since the main objective of self - formulating feeds was cost reduction, scope of operation was always smaller than that of farmers using commercially formulated feeds.

Table 13: Comparing Commercially Formulated and Self-compounded feeds

Parameters (N)	Commercially Formulated n=50	Self Compounded n=10
Total Cost	18800395.00	781500.00
Average Total Cost (A TC)	376007.90	78150.00
Total Fixed Cost (TFC)	13162320.00	272300.00
Average (TFC)	263246.40	27230.00
Total Variable Cost (TVC)	5638075.00	509200.00
Average (TVC)	112761.50	50920.00
Gross Margin (GM)	31932925.00	2135100.00
Average	638658.50	213510.00
Profit	18770605.00	1862800.00
Average	375412.10	186280.00
Benefit Cost Ratio	2.0	3.4

Source (Authors survey)

IV. CONCLUSION

The study concluded that the two systems of feed formulation (commercially formulated and self-compounded feeds) were profitable. The cost of operation like the (Average Total Cost (A TC), Average Total Fixed Cost (TFC) and Average Total Variable Cost (TVC)) were higher for the farmer using commercially formulated feeds but the profitability parameters like the Gross Margin (GM) and profit were also higher for an average farmer using commercially formulated feeds. Despite the fact that most poultry products were got from small-scale operators, the policy makers exempted this group from their policy formulation.

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