ISSN 0189-0514
J. Anim. Prod. Res. (2017) 29(2):249-263

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RISK BEHAVIOUR OF HOMSTEAD BROILER ENTREPRENEURS IN NIGER STATE OF NIGERIA

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ABSTRACT

The research empirically determines the risk attitudes of poultry broiler entrepreneurs in Niger state of Nigeria, using 2016 production cross-sectional data collected from 97 active broiler entrepreneurs chosen *via* multi-stage sampling design. The results were achieved using both descriptive and inferential statistics. Evidenced by the study showed that, neither of the farmers was risk neutral nor risk taker. The major factors relapsing broiler farmers from taking risks were the age of the farmer, title of land ownership and electricity tariff. Among the recommendations made was that the government should review the current tariff charges or make policy on subsidizing electricity, petrol and diesel charges for small-medium poultry entrepreneurs in order to enable them to survive and compete favourably in the business environment. By so doing, it will enable them to balance the existing wide gap between the supply and demand, which in most cases is balanced by smuggled imported products which drained the country national income.

Keywords: Risk behaviour; Broiler; Niger state; Nigeria

INTRODUCTION

Agricultural production is subject to risk and the farmers' reaction towards risk will influence their decisions on selection of inputs. In agriculture, the majority of the farmers show their risk aversion in different ways: hedging, forward marketing, production practices, insurance, holding liquid reserves, diversification and liability management, or their combination.

Management of risk in agriculture is important on several grounds, even though that minimization of farming risk does not always improve their welfare. Claire (2010) stated that failure to manage risks would have direct consequences on farmers' incomes, market stability and food security.

Generally, farmers are known to be willing to sacrifice their potential income to avert risk or uncertainty due to the attendant negative outcome that accompanies risk (Dewan, 2011; Picazo-Tadeo and Wall, 2011). Naturally, small-scale farmers are risk aversive in order to avoid any discomfort in their livelihoods. This behavioural attitude of the farmers determines the quantities and type of resources they employed, which inturn influence the aggregate farm output they are likely to obtain. According to Mosley and Verschoor (2003), the vicious circle of poverty takes many forms, but the key element in many versions of the spiral in most of the production environments is an aversion to risk. If the weaker section of the society is averse to risk, to an extent that they are not willing to invest in the acquisition of modern agricultural inputs because of the risks involved, they will surely remain poor. In the study area, despite the researches' conducted on the sustainability of the poultry sub-sector, evidenced showed incessant relapse of the

industry with most of the poultry farms folding-up day in day out, thus, a major threat to animal protein food security. Thereafter, literature reviewed showed all the researches on poultry enterprise in the study area to have focused on sustainability of the sector *via* efficiency in the utilization of the productive resources without having an empirical look at the risk attitudes of the farmers which is very vital and key to the sustainability of the nascent sub-sector at the moment.

Since risk and uncertainties have influence on investment decisions, it is imperative to empirically assess the risks and uncertainty situations surrounding the most important livestock sub-sector in the studied area with the aim of comprehending and finding better ways of improving the industry. Also, in much risk-related work, it is necessary to have some measure of the decision maker's behaviour towards risk. In view of this, the present research applied the safety-first behavioural parametric approach adopted by Moscardi and deJanvry (1977) to estimate the coefficient of absolute risk aversion of the broiler farmers from their observed economic behaviour.

The broad objective of this study was to determine the risk attitude of the broiler farmers in Niger state of Nigeria, while the specific objectives were to describe the socio-economic profiles of the broiler entrepreneurs in the studied area; to estimate the costs and incomes of the broiler enterprise in the studied area; and, to measure the risk attitudes of the broiler entrepreneurs and the factors influence this scenario.

RESEARCH METHODOLOGY

The study was conducted in Niger state of Nigeria, and the coordinates of the state are latitudes 8°20'N and 11°30'N of equator and longitudes 3°30'E and 7°20’E of the Greenwich Meridian time (NGIS, 2014). The vegetation of the state is northern guinea savannah with sparse of southern guinea savannah. Agriculture is the major occupation in the study area complemented with civil service jobs, artisanal, craft work, *Ayurveda* medicine and petty trade (NIBS, 2016). The research relied on cross-sectional data obtained from 97 active homestead poultry broiler farms drawn from the studied area sampling frame using multi-stage sampling design. The sampling procedure was: convenient selection of Kuta agricultural zone out of the 3 existing agricultural zones in the state due to time and costs constraints of the researchers; purposive selection of two Local Government Areas (LGAs) *viz.* Chanchaga and Bosso due to high density of poultry entrepreneurs coupled with readily available demand driven-market; proportionate sampling of 50% of the respondents across the board of the selected LGAs in the sampling frame provided by NSAMDA; and, a representative sample size of 97 active broiler farmers using simple random technique were drawn for the study. The data were elicited using structured questionnaire complemented with interview schedule on fortnight basis during the 2016 production period. The collected data were analyzed using descriptive and inferential statistics. The first, second and third objectives were achieved using descriptive statistics, cost concepts and income measures; and, the safety-first approach adopted by Moscardi and deJanvry (1977) and the Tobit regression model.

Table 1: Sampling frame of active poultry broiler producers

LGAs	Population	Sample size
Bosso	93	47
Chanchaga	99	50
Total	**192**	**97**

Source: NAMDA, 2016

Empirical models

1. Cost concepts and Income measures

Following Subba *et al*.(2004; 2016) the cost concepts and income measures are specified below:

a. ***Cost Concepts***: Costs related to broiler production are split up into various cost concepts such as A_1, A_2, B, C and D

Opportunity/Implicit cost: costs of self-owned and self-employed resource i.e. imputed cost

Accounting/Explicit cost: costs for purchasing and hiring of inputs and input services i.e. paid out costs/cash costs/ nominal/money cost

Economic cost: Opportunity cost + Accounting cost

Cost A_1: The following items are included in Cost A_1

Wages of hired labour

Market rate of feeds

Market rate of brooding stocks, liter, H_2O, kerosene etc

Electricity tariff

Market value of drugs and vaccines

Land revenue, cess and other tax

Depreciation of farm implements/ equipment's

Interest on working capital

Miscellaneous expenses

Cost A_2: Cost A_1 + rent paid for leased in land

Cost B: Cost A_1 or A_2 + interest on fixed capital excluding land + rental value of owned land

Cost C: Cost B + imputed value of family labour

Cost D: Cost C + 10% of TVC as management cost (Sidharth and Pankaj, 2012)

b. Income Measures

These are the returns over different cost concepts. Different income measures are derived using the cost concepts. These measures are given below:

Farm business income

= Gross income – Cost A_1 or A_2 ..... (2)

Family labour income

= Gross income – Cost B ..... (3)

Net income = Gross income – Cost D ..... (4)

Farm investment income = Farm business income – Imputed value of family labour – Imputed management cost (OR) Net income + Imputed rental value of owned land

Return on Naira invested (ROI)

$$= \frac{\text{Gross margin}}{\text{Total variable cost}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Rate of return on capital invested (RORCI)

$$= \frac{Net\ farm\ income}{Total\ cost} \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Note: Unit of plant = 200 birds (Subba *et al*., 2004; 2016)

Plant = Enterprise (Sidharth and Pankaj, 2012)

2. Multiple regression model

The implicit form is as follow:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$

While, the explicit form is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon_t$$

Where:

Y = Broiler Output (kg)

X_1= Chicks (gram)

X_2= Human labour (manhour)

X_3= Feeds (kg)

X_4= Liter (kg)

X_5 = H_2O (litre)

X_6 = Electricity (kw/hr)

X_7= Medication (kg)

X_8 = Depreciation on capital items (₦)

β_0 = Intercept

β_{1-8} = Regression coefficients

ε_t = Noise

The functional forms fitted into the specified equation are as follow:

(a) Linear function

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots\dots\dots\dots\dots + \beta_n X_n + \varepsilon_t$$

$MPP = \beta$

$Elasticity = \beta * \overline{X}/\overline{Y}$

(b) Semi–log function

$$Y = \beta_0 + \beta_1 logX_1 + \beta_2 logX_2 + \beta_3 logX_3 \dots\dots\dots\dots\dots + \beta_n logX_n + \varepsilon_t$$

$MPP = \beta/\overline{X}$

$Elasticity = \beta/\overline{Y}$

(c) The Cobb Douglas (double log) function

$$logY = \beta_0 + \beta_1 logX_1 + \beta_2 logX_2 + \beta_3 logX_3 \dots\dots\dots\dots\dots + \beta_n logX_n + \varepsilon_t$$

$MPP = \beta * \overline{Y}/\overline{X}$

$Elasticity = \beta$

(d) Exponential function

$$logY = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots\dots\dots\dots\dots + \beta_n X_n + \varepsilon_t$$

$MPP = \beta * \overline{Y}$

$Elasticity = \beta * \overline{X}$

Safety-first approach (Risk measurement tool)

Following Moscardi and deJanvry (1977), the safety-first approach used to generate risk aversion parameter (K_s) for each farmer is shown below:

$$K_s = \frac{1}{\theta}\left[1 - \frac{P_i W_i}{P_y \beta_i \ \ \mu_y}\right]$$

Where; K_s is the risk index of i[th] farmer, θ is variance parameter; P_i is the unit price of the chosen most influential input for i[th] farmer; W_i is quantity of the chosen most influential input of the i[th] farmer; P_y is the unit price of the output of i[th] farmer; β_i is the elasticity coefficient of output with respect to the chosen input; and, μ_y is the mean of the output. Following Moscardi and deJanvry (1977), the risk aversion parameter K_s was used to classify farmers into three (3) distinct categories as shown below:

$0 < K_s < 0.4$ = Low risk aversion/ Risk-preference

$0.4 < K_s < 1.2$ = Intermediate risk aversion/ Risk-neutral

$1.2 < K_s < 2.0$ = High risk aversion/ Risk-aversion

Tobit model

The original Tobit model developed by James Tobin a Nobel laureate economist (Tobin, 1958) was adopted for this study and it is given below:

$$Y_i^* = \alpha + X\beta + \varepsilon_i \quad \text{..... (8)}$$

Where Y_i* is censored variable. Now,

$$Y_i = 0 \text{ if } Y_i^* \leq 0$$

$$= Y_i^* \text{ if } Y_i^* > 0$$

$$Y_i^* = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 \ldots\ldots\ldots\ldots\ldots\ldots + \beta_n X_n + \varepsilon_t$$

Where:

Y_i* = Risk index of i^{th} farmer

X_1 = Gender (male =1, female = 0)

X_2 = Marital status (married =1, otherwise = 0)

X_3 = Age (year)

X_4 = Household size (number)

X_5 = Educational level (year)

X_6 = Farming Experience (year)

X_7 = Farm ownership (yes =1, otherwise = 0)

X_8 = Main occupation (farming =1, otherwise = 0)

X_9 = source of capital (own saving = 1, otherwise = 0)

X_{10} = Access to credit (yes =1, otherwise = 0)

X_{11} = Extension contact (yes = 1, otherwise = 0)

X_{12} = Co-operative membership (yes = 1, otherwise = 0)

X_{13} = Farm location (urban =1, otherwise = 0)

X_{14} = Disease outbreak (yes =1, otherwise = 0)

X_{15} = Cost of chicks (₦)

X_{16} = Feed cost (₦)

X_{17} = Labour cost (₦)

X_{18} = Medication cost (₦)

X_{19} = Broiler output (kg)

X_{20} = Economic rent (₦)

X_{21} = Income (₦)

X_{22} = H_2O cost (₦)

X_{23} = Electricity charges (₦)

α = Intercept

β_{1-n}= Parameter estimates

ε_i = Error term

RESULTS AND DISCUSSION

Socio-economic profile of broiler farmers in the studied area

Shown in Table 2 are the socio-economic profiles of the poultry broiler farmers in the studied area. The results showed that most of the labour force that participated in the enterprise were active and economic virile; they maintained fair family size typical to African setting (mean 7 ± 3.9) and have few years of poultry management experience as indicated by the mean age of 35.22 ± 7.34 and mean experience of 5 ± 4.2. Female farmers' participation in the enterprise was very marginal when compared to their male counterpart which may be attributed to economic and religion constraints, and married people were the majority in the sampling population that relied on the enterprise for livelihood sustenance. The literacy level of the farming population was very high, majority possessed the title of ownership i.e. owned the farms they raised their birds in and few were full-time poultry entrepreneurs. The farmers' access to credit, extension contacts and social participation were found to be very poor and most of the farmers used their own savings as the capital for the poultry investment during the period of study. A slight difference in the results was observed between the number of farms located in the rural and urban area and

most of the farms were affected by an outbreak of poultry diseases during the period of study. With the exception of the source of capital, discrepancies were observed in the distribution proportion of each of the socio-economic characteristics considered as evident by their chi^2 statistics which were different from zero at 10% probability level.

Table 2: Socio-economic profile of the broiler farmers

Variables	Frequency	Percentage	Variables	Frequency	Percentage
Age			**Total**	**97**	**100** [$\mathbf{38.36}^{***}$]
≤ 19	1	1.0	**Occupation**		
20-29	27	27.8	Farmer	26	26.8
30-39	39	40.2	Farmer Artisanal	38	39.2
40-49	28	28.9	Farmer/Civil servant (CS)	5	5.2
50-59	2	2.1	Farmer/Artisanal/CS	28	28.9
Total	**97**($\mathbf{35.22 \pm 7.3}$)	**100** [$\mathbf{59.65}^{***}$]	**Total**	**97**	**100** [$\mathbf{23.78}^{***}$]
Household size			**Access to credit**		
≤ 3	8	8.2	Yes	17	17.5
4-6	52	53.6	No	80	82.5
7-9	25	25.8	**Total**	**97**	**100** [$\mathbf{40.92}^{***}$]
≥ 10	12	12.4	**Extension contact**		
Total	**97** ($\mathbf{6.8 \pm 3.9}$)	**100** [$\mathbf{48.86}^{***}$]	Yes	31	32
Experience			No	66	68
≤ 3	49	50.5	**Total**	**97**	**100** [$\mathbf{12.63}^{***}$]
4-6	25	25.8	**Social participation**		
7-9	9	9.3	Yes	22	22.7
≥ 10	14	14.4	No	75	77.3
Total	**97** ($\mathbf{4.9 \pm 4.17}$)	**100** [$\mathbf{39.21}^{***}$]	**Total**	**97**	**100** [$\mathbf{28.96}^{***}$]
Gender			**Farm location**		
Male	84	13.4	Urban	47	48.5
Female	13	86.6	Rural	50	51.5
Total	**97**	**100** [$\mathbf{51.97}^{***}$]	**Total**	**97**	**100** [$\mathbf{0.09}^{NS}$]
Marital status			**Disease outbreak**		
Married	73	75.3	Yes	70	72.2
Single	24	24.7	No	27	27.8
Total	**97**	**100** [$\mathbf{142.79}^{***}$]	**Total**	**97**	**100** [$\mathbf{19.06}^{***}$]
Education			**Source of capital**		
Non-formal	16	16.5	Own savings	92	94.8
Formal	81	83.5	Formal credit	5	5.2
Total	**97**	**100** [$\mathbf{43.56}^{***}$]	Total	97	100[78.03***]
Farm ownership					
Owned	79	81.4			
Rented	18	18.6			

Source: Field survey, 2016 Note: *** NS; are 1% risk level and Non-significant; while values in ( ); [ ] are mean and standard error; and, Chi^2 respectively

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Cost concepts and income measures of poultry broiler enterprise

The poultry farmers, like any other entrepreneurs, would be interested in the profitability of the farm enterprise, and for this purpose, efforts were made to estimate the cost incurred and the accrued revenue to the farmers' efforts.

Presented in Table 3 are the cost concepts and income measures of poultry broiler enterprise in the studied area. The disaggregation figures showed the incurred economic and accounting costs of an enterprise to be ₦225774.20 and ₦163461.80 respectively; and accrued accounting revenue of ₦307327.40. The proportion of incurred total economic variable cost (TEVC) and total economic fixed cost (TEFC) in the economic cost of an enterprise were 53.70% and 46.30% respectively; while the proportion of incurred total accounting variable cost (TAVC) and total accounting fixed cost (TAFC) in the accounting cost of an enterprise were 58.25% and 41.75% respectively.

Furthermore, the profitability decomposition figures revealed an economic gross margin cum net farm income of ₦186091.30 and ₦81553.21 respectively, while the accounting gross margin cum net farm income were ₦212117.60 and ₦143865.50 respectively. The economic and accounting ROIs were 1.54 and 2.23 respectively, implying that for every ₦1 invested in the enterprise, the invested ₦1 was returned, and an economic and accounting profit of ₦0.54kobos and ₦1.85kobos respectively were gained. This profit margin should stimulate financing from the lending institutions because if poultry farmers in the studied area are funded with ₦130000 at the commercial interest rate of 12%, the farmer will return the principal of ₦130000, an interest rate of ₦15600 and still retain ₦161727.40. Therefore, at the enterprise level, it can be concluded that poultry farming is a profitable venture in the studied area because of the remunerative or considerable profit margin. The rate of return per unit of capital invested (RORCI) which indicates what is earned by the business through capital outlay revealed an economic RORCI (36%) and accounting RORCI (88%) that were greater than the prevailing commercial bank lending rate of 12%, implying that if a poultry broiler entrepreneur takes a loan from the bank to finance poultry enterprise, in respect of economic and accounting RORCIs, he/her will be 24% and 76% respectively better off on every one naira spent after paying the loan at the prevailing interest rate.

Table 3: Cost concepts and income measures of broiler enterprise

Items	Quantity	Unit price(₦)	Amount (₦)	Items	Amount (₦)
Variable costs				Total fixed accounting cost	68252.06
Family labour	52.13 manhours	200	10426.29	Total accounting cost	163461.80
Hired labour	26.45 manhours	200	5289.92	Total variable economic cost	121236.10
chicks	239.64	204.64	49040.33	Total fixed economic cost	104538.10
Feeds	135.87 kg	113.36	15402.17	Total economic cost	225774.20
Liter	1577.37 kg	10	15773.66	Cost A_1	154899.40
H_2O	46.36 litres	1	46.36	Cost A_2	179061.80
Kerosene	6.48 litres	150	971.55	Cost B	203224.30
Electricity	230.32 kw/hr	14	3224.43	Cost C	213650.50
Drugs	1.94 kg	800	1552.93	Cost D	225774.2
Vaccines	-	-	3036.45	**Income measures**	
Veterinary services	-	-	872	Implicit revenue	-
IV of interest on working capital	12 % @ 130000	-	15600	Explicit revenue	307327.40
Total variable cost (TVC)			**121236.10**	Economic revenue	307327.40
Fixed costs				Accounting gross margin	212117.60
Depreciation on capital items			44089.65	Accounting net farm income	143865.50
Economic rent (lease-in)			24162.40	AROI	2.23
Imputed economic rent (owned land)			24162.40	ARORCI	0.88
Imputed managerial cost	10% of TVC		12123.61	Account cost of production	817.31
Total fixed cost (TFC)			**104538.10**	Farm business income	128265.50
Total cost (TC)			**225774.20**	Family labour income	104103.10

Returns				Economic gross margin	186091.30
Manure quantity	732.74 kg	10	7327.37	Economic net farm income	81553.21
Broiler quantity	200 birds	1500	300000	Farm investment income	117839.20
Total revenue (TR)			**307327.40**	EROI	1.54
Cost concepts				ERORCI	0.36
Total variable opportunity cost			26026.29	Economic cost of production	1128.87
Total fixed opportunity cost			36286.01		
Total opportunity cost			62312.30		
Total variable accounting cost			95209.79		

Source: Field survey, 2016 Note: IV means Imputed value

Production determinants of poultry broiler farmers

Of the four functional forms *viz.* linear, semi-logarithm, exponential and double-logarithm fitted into the specified production equation and estimated using ordinary least squares (OLS), the linear functional form performed better but was found to fail the test of homoscedasticity (Table 4). However, the linear functional form was re-estimated using the weighted least square (WLS) and it yielded desirable results, thus, the best fit for the specified equation as its least squares satisfied the specified criteria-economic (size and sign of the least squares), statistical (R^2 and standard error) and econometric (Gauss Markov's assumptions and theorem). In addition, the diagnostic tests results *viz.* normality and multicollinearity exonerated the chosen functional form from the problem of non-normality in the distribution of the residual and collinear or covariance between the predictor variables captured in the model as evident from their test statistics which were not different from zero at 10% degree of freedom (Table 4). Furthermore, the results showed that the predictor variables captured in the model accounted for 85.2% of the variation in the broiler output with random error accounting for the leftover percentage as evident from the R^2 result. All the predictor variables included in the model were found to exert significant influence on the output as evident from their probability levels which were different from zero at 10% risk level, and, with the exception of medication predictor which exhibited indirect-inelastic relationship with the output all the remaining estimated parameters had direct-inelastic relationship with the broiler output in the studied area. The estimated elasticity coefficients of the significant explanatory variables with direct-inelastic relationship with output level *viz.* chicks, feeds, labour, liter, electricity, H_20 and capital depreciation were 0.052 ($p<0.10$), 0.365 ($p<0.01$), 0.145 ($p<0.01$), 0.047 ($p<0.01$), 0.177 ($p<0.5$), 0.267 ($p<0.01$) and 0.064 ($p<0.01$) respectively, and the implication of a unit increase with respect to the above in descending order would lead to an increase in the body weight of the broiler birds (output) by 0.052%, 0.365%, 0.145%, 0.047%, 0.177%, 0.267% and 0.064% respectively. However, the resultant implication of a unit increase in the medication predictor whose estimated elasticity coefficient of 0.044 was found to exhibit an indirect-inelastic relationship with the output level would be a decrease in the body weight of the broiler birds by 0.04%.

The estimated RTS value of 1.073 implies that the poultry farmers in the studied area were operating at stage I of the production surface which is an irrational region i.e. increasing return to scale because the resultant corresponding output level to any additional input mix would increase at an increasing rate. Therefore, in order to maximize profit, farmers are advised to increase the use of their inputs mix rationally till they reached the economic production point.

Table 4: Production determinants of broiler output

Inputs	Ordinary least square (OLS)				WLS	Collinearity test
	Linear (+)	Exponential	Semi-log	Double log	Linear (+)	VIF (WLS +)
Constant	-38.36 (63.998) [0. 5995]^{NS}	5.087 (0.165) [30.84]***	-4530.94 (358.18) [12.65]***	-3.310 (0.650) [5.092]***	-37.187 (61.47) [0.604]^{NS}	-
Chicks	0.00013 (8.63E-05) [1.53]^{NS}	3.09E-07(2.22E-07) [1.39]NS	211.95 (31.77) [6.734]***	0.6063 (0.057) [10.62]***	1.79E-05 (9.645E-05) [1.856]*	1.328
Labour	0.916 (0.342) [2.68]***	0.0024 (0.00088) [2.698]***	34.56 (28.67) [1.206]^{NS}	0.0525 (0.0520) [1.009]NS	0.836 (0.3009) [2.777]***	1.401
Feeds	0.934 (0.203) [4.61]***	0.0016 (0.0005) [3.097]***	172.23 (43.28) [3.98]***	0.1855 (0.079) [2.36]**	0.886 (0.186) [4.77]***	1.472
Liter	0.011 (0.002) [4.59]***	9.84 (6.105E-06) [1.613]^{NS}	66.40 (21.77) [3.05]***	-0.0099 (0.040) [0.249]^{NS}	0.0098 (0.0024) [4.058]***	1.256
H_2O	1.721 (0.486) [3.54]***	0.0033 (0.00124) [2.646]***	34.01 (39.98) [0.851]^{NS}	-0.0039 (0.073) [0.054]^{NS}	1.899 (0.366) [5.19]***	1.280
Electricity	0.254 (0.142) [1.785]*	0.00045 (0.00037) [1.23]^{NS}	83.69 (52.69) [1.588]^{NS}	0.091 (0.096) [0.949]NS	0.254 (0.125) [2.039]**	1.333
Medication	-11.493 (7.832) [1.467]^{NS}	-0.0022 (0.0202) [1.107]^{NS}	-31.66 (33.29) [0.952]^{NS}	0.0072 (0.0604) [0.119]NS	-7.497 (4.02) [1.867]*	1.328
Depreciation	0.00016 (3.92E-05) [4.18]***	2.1058 (1.009E-07) [2.086]**	36.977 (14.63) [2.528]**	0.0585 (0.0265) [2.203]**	1.2E-05 (2.58E-05) [4.698]***	1.689
R^2	0.749	0.552	0.784	0.809	0.851	
Adjusted R^2	0.726	0.512	0.764	0.792	0.838	
F-stat	32.80***	13.58***	39.93***	46.65***	62.95***	
Heteroskedasticity (B-G)	[30.43] {0.0002}	-	-	-	-	
Normality test	[0.745] {0.689}	-	-	-	[0.745]^{NS}	

Source: Field survey, 2016

Note: * ** *** ^{NS} significance at 1%, 5%, 10% and Non-significant respectively.

Values in ( ); [ ]; and { } are standard error, t-statistic and probability value

Risk attitudes of poultry entrepreneur and their determinants

The results showed H_2O to be the most significant input in the production cycle, thus, used in determining the risk attitudes of the poultry entrepreneurs in the studied area (Table 5a). Based on literature review, similar research identified stock density (Amaefula *et al*., 2012) as the most important input in broiler production in their studied area and subsequently was used to measure risk aversion while studies of related enterprise used feeds (Ajetomobi and Binuomote, 2006; Salman *et al*. 2010) to determine the risk attitudes of the poultry layer farmers since it was found to be the most important inputs in the production processes in their studied area. A cursory review of the results showed that the entire poultry farmers were highly risked aversive as all had their risk aversion coefficients hovering around mean of 1.859 ± 0.0056: greater than 1.2 and less than 2.00; with none falling within the low-risk aversion category nor intermediate risk aversion category. Therefore, it can be inferred that the broiler farmers in the studied area were aversive to risks and this may be due to the reason that profit maximization is not their sole goal as they relied on the enterprise as a source of livelihood sustenance. In addition, apprehension of capital loss due to their poor economic capital may be a major drawback that makes them risk aversive.

Table 5a: Risk attitude categorization of farmers

Category	Frequency	Percentage
Risk-preference ($0 < K_s < 0.4$)	-	-
Risk-neutral ($0.4 < K_s < 1.2$)	-	-
Risk-averse ($1.2 < K_s < 2.0$)	97	100
Total	**97**	**100**

Source: Field survey, 2017

Presented in Table 5b are the Tobit MLE results of the factors determining risk attitudes of poultry entrepreneurs in the studied area. The empirical LR chi^2 value of 298.45 was found to be significant at 1% risk level, implying that the parameter estimates in the model were different from zero, and also the model is the best fit for the specified equation. In addition, the diagnostic test *viz.* multicollinearity exonerate the predictor variables from the problem of collinear relationship as evidenced by their variance inflation factors (VIF) which were below 10.0 while the test for normality of the residual showed non-normality in the distribution of the error term as evidenced from chi^2 value which is different from 10% probability level. However, non-normality in the distribution of residuals is not considered serious problems as in most cases data are not normally distributed. The variables found to have significant influence on the risk attitudes of the entrepreneurs were age, household size, ownership title, disease outbreak, income, labour cost, economic rent, H_2O cost, electricity charges and broiler stock density as indicated by their respective t-statistic values which were different from zero at 10% degree of freedom. With the exception of age, ownership title and electricity charges which had a direct relationship with risk attitudes all the remaining significant variables were inversely related to risk attitudes.

Table 5b: Factors determining risk attitudes of broiler farmers in the studied area

Variables	Coefficients (MPP)	Standard error	Elasticity	t-stat	VIF
Constant	1.863	0.00311	-	599.1***	-
Gender	-4.280E-05	0.00101	-0.000086	0.042^{NS}	1.432
Marital status	-0.00044	0.000094	-0.000195	0.463	2.139
Age	0.000114	6.1683E-05	0.002354	1.853*	2.629
Household size	-0.000235	0.00013	-0.00086	1.779*	1.885
Education	0.000116	0.00092	0.00007	0.126^{NS}	1.447
Experience	-0.000103	9.3194E-05	-0.00030	1.104^{NS}	1.913
Farm ownership	0.00384	0.00093	0.001717	4.114***	1.704
Occupation	-0.00109	0.00079	-0.00016	1.381^{NS}	1.587
Source of capital	-0.000175	0.00167	-0.00018	0.104^{NS}	1.778
Access to credit	-5.7846E-05	0.0010	-7.53E-06	0.058^{NS}	1.876
Extension contact	0.000236	0.00069	0.000022	0.340^{NS}	1.352
Co-operative mem.	0.001211	0.00080	0.000154	1.515^{NS}	1.451
Farm location	0.000389	0.00069	0.000089	0.562^{NS}	1.534
Disease outbreak	-0.002319	0.00079	-0.000836	2.926***	1.633
Chick cost	7.9380E-10	3.5421E-09	0.000044	0.224^{NS}	1.663
Feed cost	5.6349E-08	4.9522E-08	0.000733	1.138^{NS}	2.409
Labour cost	7.70455E-08	3.8696E-08	0.000763	1.991**	1.870
Medication cost	-2.9868E-08	7.3989E-08	-0.000156	0.404^{NS}	1.388
Broiler output	-1.6279E-08	3.1693E-06	-0.002799	5.135***	3.821
Economic rent	-4.1499E-08	1.2586E-08	-0.00093	3.297***	2.005
Income	-2.1418E-09	1.2570E-09	-0.00061	1.704*	2.336
H_2O cost	-4.34118E-06	5.0057E-07	-0.00382	8.672***	1.600
Electricity charges	5.50255E-07	2.5087E-07	0.001590	2.193**	2.379
LR chi^2	**298.45*** **				
Normality test				**23.87*** **	

Source: Field survey, 2016

The marginal and elasticity implications of a unit increase in the age ($p < 0.05$) of the poultry farmers, labour costs ($p<0.05$) and electricity tariff ($p< 0.05$) would increase the farmers' risk attitude by 0.0001 and 0.0024%; 7.71E-08 and 0.0076%; and, 5.5E-07 and 0.0016% respectively. In addition, the marginal and elasticity implication of farmers who possessed farm ownership title would be 0.0038 and 0.0017% respectively. As farmers

advanced in age they may likely become apprehensive to take a risk because profit maximization would not be their sole goal as they may be interested in the future continuity of the business as a source of livelihood earning for themselves and their farm family. More so, old farmers are likely to relapse into conservatism when compare to youthful farmers who are full with the vigour of innovativeness. The current hyper electricity pre-paid tariff can make them be risk aversive as it is likely to narrow their profit margin, thus affecting the going concern of their business. Also, farmers who own their farms are likely to be cautious as a colossal loss can push the farm into credit deadlock. The marginal and elasticity implications of an increase in the household size ($p<0.10$), income ($p<0.10$), broiler stock density ($p<0.01$), economic rent ($p<0.01$) and cost of H_2O ($p<0.01$) would reduce farmers' risk apprehension by 0.00024 and 0.00086%; 2.14E-08 and 0.00061%; 1.63E-05 and 0.0028%; 4.15E-08 and 0.00093%; and, 4.34E-06 and 0.0038%, respectively. The implication of large household composed of able-bodied people with streams of multiple income sources would motivate the entrepreneurs to have a preference for risk. In addition, the behaviour of the income coefficient justified the aforementioned result. The implication of large broiler stock density implies low mortality rate and this would motivate the farmers to have a preference for risk as they are likely to expand their scale of production in the next production cycle. Furthermore, increase in the cost of working capital will motivate the farmers to take a risk in an attempt to defray the incurred costs *via* profit maximization which is essential for the going concern of the business. The marginal and elasticity implication of minimal or absence of disease outbreak will reduce risk apprehension of the farmers by 0.0023 and 0.00084%. A poultry business environment devoid of disease outbreak will reduce the risk apprehension tied to colossal stock lost.

CONCLUSIONS AND RECOMMENDATIONS

The farming population was economically virile, majority been literate with fair household size, and most of the farms been their personal asset. However, they faced some limitations *viz.* access to credit, extension service delivery and poor social participation; and, the farming population is skewed towards male gender. The enterprise was found to be profitable in the studied area despite that all the farmers were found to be risk aversive, an indication that the objective of the broiler farmers is not limited to profit maximization. However, the major factors discouraging farmers from having the preference for risks were old age, a title of ownership, cost of labour and volatile electricity tariff. Therefore, the study recommended that women in the studied area should be encouraged to co-opt into the enterprise in order to ease them from the vicious cycle of poverty; social security programmes should be created to cater for older ones so that they will not be apprehensive of future consumption difficult if eventually, their enterprises run into credit deadlock; public-private partnership should be explored so that the sub-sector should be a joint responsibility. The government should prevail on the Bank of Industry (BOI) to provide soft infrastructure loan devoid of unnecessary bureaucracy at a single interest rate and should be insured so that poultry housing facilities will not be beyond the reach of the farmers. Also, the government should review the current tariff charges or make policy on subsidizing electricity, petrol and diesel charges for small-medium poultry entrepreneurs in order to enable them to survive and compete favourably in the business environment. Doing so will help in balancing the existing wide gap between the supply and demand, which in most cases is balanced by smuggled imported products which drained the country national income.

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