INTERNATIONAL JOUNAL OF: AGRICULTURAL RESEARCH AND BIOTECHNOLOGY

TIMBOU-AFRICA ACADEMIC PUBLICATIONS
INTERNATIONAL JOURNAL, NOVEMBER, 2023 EDITIONS
VOL. 15 NO. 1 ISSN: 3438-2901

OPTIMUM LABOR PRODUCTIVITY AND COST ANALYSIS OF POULTRY PRODUCTION IN KADUNA STATE, NIGERIA

DR. UMAR TABARI YERO

Department of General Studies, Nuhu Bamalli Polytechnic Zaria, Kaduna State, Nigeria

ABSTRACT

Poultry production was a source of labor employment as revealed by the study. The optimum productivity of labor employed in poultry production differs between chicken production categories, the optimum productivity of labor in broiler production

Introduction

Poultry production (chicken) in Nigeria was considered as one of the important sub sector due to its relevance in providing employment for the job seekers, creating business opportunities for entrepreneurship and a major source of protein from meat and egg which was considered to be one of the most nutritious food intake and acceptable by the major religions in the country (Ohajianya *et al*, 2014). Apart from generating quick economic return to the producers, the subsector provides direct jobs opportunities to the greater number of Nigerian populace and it also generate substantial income to those working under the sector (Afolabi *et al*, 2013) and (Abiola, 2007). Sahel (2015) described the Nigerian poultry

was1431 birds per labor per farm/year, pullet was 1080 per labor and 1599 layer per labor. The Average Total Cost (ATC) and Marginal Cost (MC) in chicken production decline as chicken output increases; the study also reveals that economies of scale existed in chicken production in the study area. MC, MR relationship revealed a profit maximizing position of chicken producers in the study area. The study recommends that optimum productivity of labor should be adhered to by the chicken producers in order to minimize cost and maximize profit.

Key words: Chicken production, Cost, Optimum productivity, Revenue and Profit

industry as one of the largest in Africa because of the huge capital that involved which was estimated to the tune of ₦80 billion ($600 million), the industry products comprises 165 million birds that produced 650,000 metric ton (MT) of eggs as the largest in Africa and 290,000 MT of poultry meat as the second largest, after South Africa.

Chicken subsector in Kaduna state provides employment opportunities to over 50 percent of the people mostly at subsistence level (Tabari and Abuga, 2017). Commercial chicken production was categorized in to small, medium and large scale enterprises in Kaduna state, but the majority of the chicken producers fall within the category of small and medium scale producers. This subsector has an advantage over other livestock sector in providing income and greater employment opportunities to the good number of people in Kaduna state (Emaikwu *et al,* 2012).

Labor is an important factor input in chicken production, its employment varied according to farm operations, the optimal

productivity of labor determined by the chicken output produced in a given farm. The optimal productivity function of labor employed in chicken production was analyzed in general and later analyzed separately by the category of chicken production such as broiler production, pullet production and layer production. The analysis was based on physical product analysis of chicken production and labor employed per farm. Other parameters used are Marginal Cost (MC) and Marginal Revenue (MR) analysis.

Problem Statement

Chicken production in Nigeria and Kaduna state in particular faces with numerous challenges ranging from inefficiency in production, low profitability, marketing, government policy, infrastructures decay, high cost of feed and other input. Other problems includes poor breed, low eggs and poor weight as a result of diseases and pest, poor quality feeds and inefficiency of management, lack of capital, risk and uncertainty of the business that arises from price fluctuations, unexpected depreciation of investment, unstable supply of quality feeds, others includes optimum productivity of labor to be employed in chicken production, cost analysis and inability of the chicken producers to maximizes profit and minimizes cost. These challenges has affected the productivity and profitability of the business despite the growth in the demand for chicken output. These were the reasons for the subsector's low contribution to GDP over the years (Achoja 2012) and (Heise *et al*, 2015).

Objective of the Study

1. To determine the optimum productivity function of labor in chicken production
2. To determine the marginal cost (MC) and marginal revenue (MR) of chicken production.

Methodology

Study area description: The research was conducted in Kaduna State as one of the 36 state in Nigeria. It has 23 local governments with population 8 million (Kaduna state 2015). The state covers an area of about 48,473.2 kilometres and occupies the central portion of northern Nigeria and lies between latitude 90 and 140 north of the equator. The state extends from tropical grassland (savannah) in the south to Sudan savannah in the north. The savannah region covers the southern part with vegetation and tall trees. The Sudan savannah covers the northern part with veldt grass and short tress. The state has arable land of about 4.5 million hectares and only 2.02 million hectares are in actual cultivation. More than 70 percent of the work force earns their livelihood from the production of food crops, cash crops and livestock (Kaduna State 2010). Commercial poultry production is receiving wider popularity and acceptability by day as a result of the growing demand for poultry meat and egg (KADP 2013). The research considered 9 local government areas where commercial poultry producers concentrated, 3 local governments from zone one (northern zone) which comprises Zaria, Sabon gari and Lere local governments. Four local government from zone two (central zone) which comprises Kaduna North, Kaduna South, Igabi and Chukun. The two local governments from zone three (southern zone) were Kachia and Sanga respectively.

Source of data collection: This study was cross sectional survey in nature by the used of farm records, questionnaire and supplementary interview administered to the commercial chicken producers in Kaduna state, which also served as primary sources of data. Publications, journals and library materials were used as secondary sources data.

Sample procedure: A stratified random sampling was applied. Where by commercial chicken producers were divided into areas and

randomly selected based on years of chicken production experience (minimum of 10 years) and based in Kaduna state, from the 9 selected local government areas as the study. The questionnaire respondents' rate was 71% as indicated in table1.

Table1 Response Rates of the Distributed Questionnaires

Response Rate	**Frequency**	**Percentage (%)**
Response	166	71
Non Response	84	29
Total	**250**	**100**

Sources: Primary Data, 2015

Table 1 indicated the responses rate of the 250 questionnaire distributed in those 9 local government areas in Kaduna state. The choice of these local governments was due to their population and high concentration chicken farms, nearness to market and availability of resources (KADP 2007).

Table 2 indicated each of the local government responses to the questionnaires as returns by the poultry farms.

Table 2 Returned Questionnaires by Chicken Farms

Local Governments	Frequency	Percentage	Cumulative Percentage
Chukun	14	8.4	8.4
Igabi	21	12.7	21.1
Kachia	16	9.6	30.7
K/ North	25	15.1	45.8
K/ South	24	14.5	60.2

	Lere	18	10.8	71.1
	Sabongari	15	9.0	80.1
	Sanga	14	8.4	88.6
	Zaria	19	11.4	100.0
	Total	166	100.0	

Sources: Primary Data, 2015

Table 3 indicated the types of chicken production in the study area, where broiler production farms constitutes 33.1%, pullet farms 4.2% and layer farms 62.7%

Table 3 Type of Chicken Production

Poultry Production		Frequency	Percent	Cumulative Percent
	Broiler	55	33.1	33.1
	Pullet	7	4.2	37.3
	Layer	104	62.7	100.0
	Total	166	100.0	

Sources: Primary Data, 2015

Method of Data Analysis

This study determined the optimum productivity of labor function in chicken production based on the chicken output and number of labor employed, while cost and revenue determination was obtained by the use of cost and revenue analysis with the used of marginal cost and marginal revenue approach. MC = $\delta Tc/\delta q$ and MR = $\Delta tr/\delta q$

Result and Discussion (Objective one)

The analysis was based on physical product analysis of chicken production and labor employed per farm. Other parameters used are Marginal Cost (MC) and Marginal Revenue (MR) analysis

Table 4 Output, Costs and Revenue Analysis of Chicken Production

Poultry production	Broiler production	Pullet production	Layer production
Total Physical Product (TPP)	40,056	38,933	39,982
Laboe Employed	7	12	25
Fixed Costs (FC)	191,869.20	681,894.67	107,923.89
Variable Costs (VC)	15,995,548.40	27,464,683.33	53,027,673.81
Total Costs (TC)	16,187,417.60	28,146,578.00	53,135,597.71
Average Fixed Costs (AFC)	4.79	17.51	2.7
Average Variable Costs (AVC)	399.33	705.43	1326.29
Average Total Costs (ATC)	404.12	722.95	1328.99
Marginal Cost (MC)	164.82	6,562.64	273.10
Total Revenue (TR)	31,005,213.7	47,778,167	326,895,551
Average Revenue (AR)	774.02	1227	8176
Marginal Revenue (MR)	929	1647	6825

Sources: Primary Data, 2015

Table 4 indicated the physical product analysis of chicken production and optimum productivity of labor employed in each category of chicken production in the study area. Average labor (L) employed per farm in the study area, the Total Physical Product (TPP), average costs and average revenues.

Optimum productivity of Labor Employed in Broiler Production

Table 5 indicates the Total physical product (TPP), average physical (APP), and marginal Physical product (MPP) of the broiler production with the optimum productivity of labor employed per farm per year.

Table 5 TPP, APP and MPP of Broiler Production and Labor Employed

Poultry products	Broiler birds
Total Physical Product (TPP)	40,056
Labor (L)	7

TIJARBT
ISSN: 3438-2901

Average Physical Product (APP)	5722
Marginal Physical Product (MPP)	747

Source: Primary Data 2015

Table 5 indicates that the TPP of average broiler production was 40,050: the APP of labor was 5722 birds per farm, per year. This corresponds to about 1431 birds per labor per farm, since most of the broiler producers in the study area had 4 batches of broiler production in a year. This finding contradicted Mnimekalai (2010) and TNAU (2009) on optimum productivity of labor to a 1000 chicken birds per labor and contrary to Pawaria and Jheeba (2015) where 3117 birds per worker The MPP is 747 for 1 additional labor. Broiler MPP was lower than the APP and therefore, suggests that the optimum productivity of labor employed in broiler farms was 12 labor in the production of 50,000 broiler output.

Optimal productivity of Labor Employed in Pullet Production

Table 6 indicated the Total physical product (TPP), average physical (APP), and marginal Physical product (MPP) of the pullet production and the labor employed per farm / year.

Table 6 TPP, APP and MPP of Pullet Production and Labor Employed

Poultry products	Pullet birds
Total Physical Product (TPP)	38,933
Labor (L)	12
Average Physical Product (APP)	3244
Marginal Physical Product (MPP)	1773

Sources: Primary data, 2015

The TPP of labor was 38,933 pullet birds per farm per year, produced by 12 labors or workers. The APP of labor in pullet production per farm

was 3,244 in a year, which is 1,081 birds per labor which is in line with Aboki *et al* (2003), since the pullet producers has 3 batches per year in the study area. The MPP of labor on the other hand was 1,773 pullet birds per added labor force as indicated in table 6.

Optimal Productivity of Labor Employed in Layer Production

Table 4.4 indicated the (TPP), average physical (APP), and marginal Physical product (MPP) of the layer production and labor employed per farm within a year.

Table 7 TPP, APP and MPP of Layer Production and Labor Employed

Poultry products	Layer birds
Total Physical Product (TPP)	39,982
Labor (L)	25
Average Physical Product (APP)	1599
Marginal Physical Product (MPP)	1163

Sources: Primary Data, 2015

The TPP of layer was 39,982 layer birds per farm per year produced by approximately 25 workers. The APP value showed that each worker was able to produced 1,599 layer birds per farm per year and this is above the suggested range of 1000 birds per labor. The additional output for an additional worker MPP was 1163 which is less than the APP, implying that optimal level of production exists (Kakade *et al*, 2011)

Objective two

Table 5 indicated the cost and revenue analysis of chicken production in Kaduna state. The analysis was based on the category of chicken

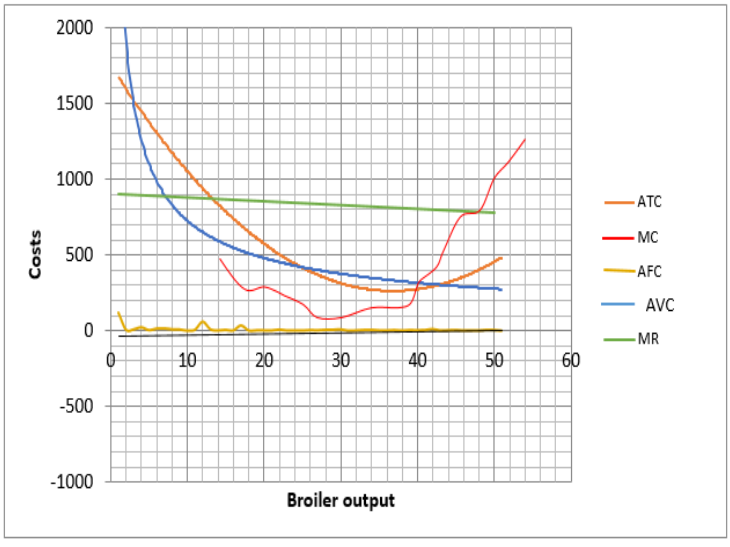
TIJARBT
ISSN: 3438-2901

production. ATC, MC, AR and MR was discussed with the used curves respectively.

ATC, MC, AR and MR Analysis of Broiler Production

Figure 1 indicated the nature of ATC, AVC, AFC, MC and MR of broiler production in the study area which is downward sloping. This showed that as more broiler birds were produced reduces the cost of production. At 8,000 broiler production, the cost of producing one broiler bird was as high as N1700. At 40,000 broiler output the ATC is at its minimum (ATC ≈ MC) and therefore, this is the optimal level of production, where one unit of broiler was produced at lowest MC and additional production attracts zero cost. Beyond this optimal point, production is characterized with increasing MC and increasing ATC. The AVC was also declining as production of broiler output is increasing, while AFC was almost the same throughout the production period. Profit was attained at a point where MR=MC at 49,000 broiler output.

Figure 1: The ATC, AVC, AFC, MC and MR of Broiler Production Curve



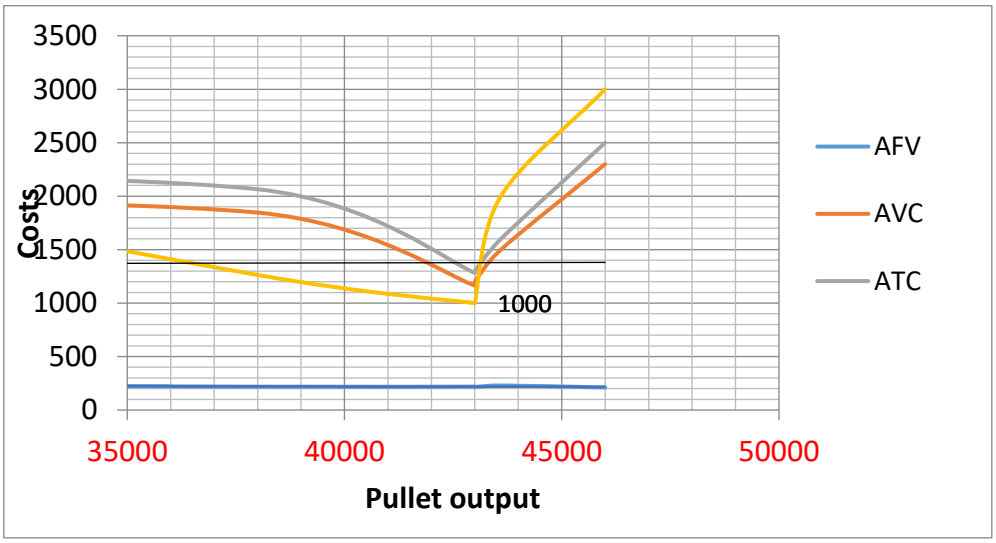
Sources: Primary Data, 2015

ATC, MC, AR and MR Analysis for Pullet Production

The ATC, AVC curves for pullet production were downward sloping which implies that an increase in the level of pullet bird production decreases the ATC and AVC, thus a reduction in the cost of production. The MC curve for pullet production on the other hand rises at first to a maximum level and later falls.

The MC in pullet production was above the MR curve at below 36,000 pullet birds' production, and the MC was less than the MR which implies that the pullet farms were able to make profit at production above 36,000 birds. All the cost curves: MC, AVC, ATC fall continuously until production reaches 43,000 birds, beyond that, the cost curves began to rise. The optimal level where MC = ATC was also a profit maximizing point MR = MC at 43,000 birds, but additional cost adds revenue. Beyond the profit maximization point, the production costs rise sharply above the revenue curve. Farms must sell off all their production by the 18th to 20th week to the layer farms. If the available market is unable to absorb the production, the pullet farm will incur extraordinary costs that can greatly affects its profits as indicated in figure 2.

Figure 2: The ATC, AVC, AFC, MC and MR of Pullet Production curve

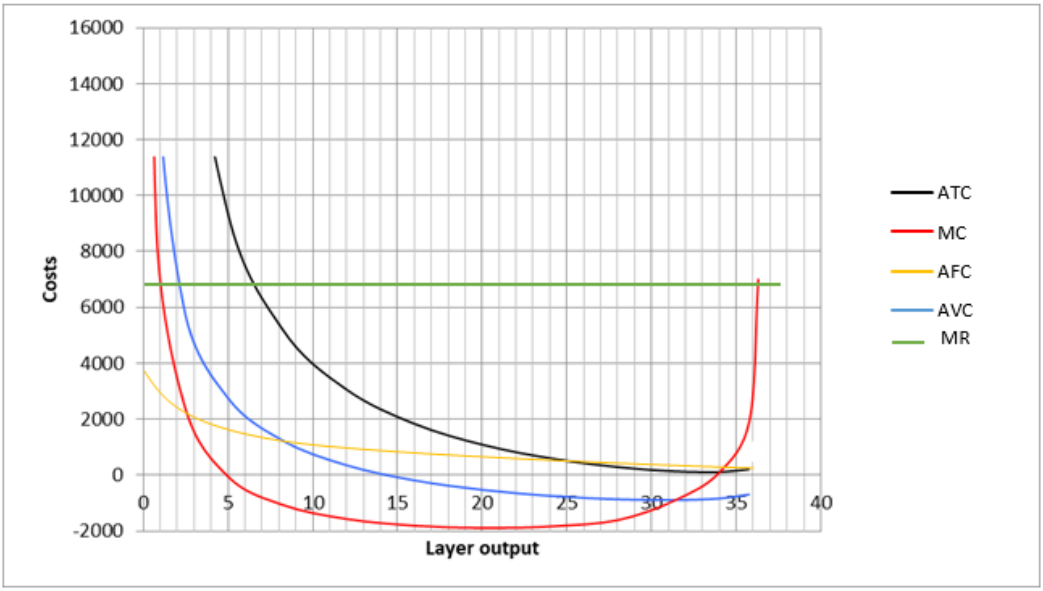


Source: Primary Data 2015

ATC, MC, AR and MR Analysis of Layer Production in Kaduna state

The ATC, AVC and MC in layer production indicated in Figure 3 showed downward sloping, implying that the cost reduces with the growth in layer production to a point where MC was at minimum of 34,000 layer output, at this point farms can increase output at no extra cost. On the hand MR was 6,800 at 36,300 layer output which is point where farms maximize profits, production beyond that point is characterized by profit decline because MC curve is above the MR.

Figure 3: The ATC, AVC, AFC, MC and MR of Layer Production Curve



Sources: Primary data, 2015

Conclusion and Recommendation

The research established that the optimum productivity of labor employed in chicken production differs by the categories of chicken production farms. The productivity of labor employed in pullet farms was 1,080 pullet birds per labor per batch, 1,431 broiler birds per labor in broiler farms per batch and in layer farms were 1599 layer birds per labor per year in the study area. Additional labor employed above those levels leads to diminishing returns and declined in output as well

as loss of profitability as indicated by the curve, but at the same time the chicken producers in the study area have exceeded the average number of 1000 birds per labor. The chicken farms in Kaduna state were economic performing farms because they maximize profit at point where MC=MR.

The optimum productivity function of labor in farms should always consider productivity of labor employed. Low labor in a large flock size may lead to neglect of the birds which may serve as a serious setback in chicken production. The chicken producers should observe the cost and revenue trend with keen interest in order to avoid losses.

References

Abiola, S.S. (2007). Poultry Farming a Veritable tool for employment Generation and Poverty Alleviation. A Seminar Presentation at University of Agriculture Abeokuta, Nigeria

Achoja, F.O. (2013).Allocative Efficiency of Feeds among Poultry Farmers in Delta State, Nigeria, Russian Journal of Agricultural and Socio-Economic Science 2 (14), PP26-33.

Afolabi, O.I.,Adegbite, D.A., Ashaolu, O.F. and Akinbode., S.O (2013).Profitability and Resources-Use Efficiency in Poultry Farming in Ogun State, Nigeria. African Journal of Business Management, 7 (16) PP 1536-1540

Emaikwu, K.K.,Chikwandu, D.O. and Sanni, A.S. (2011).Determinant of Flock Size in Broiler Production in Kaduna state Nigeria. Journal of Agricultural extension and Rural Development Vol.3 (11) PP 202-211

Heise, H.,Crisian, A. and Theuvsen, L. (2015).The Poultry Market in Nigerian. Market Structures and Potential for Investment in the Market International Food and Agricultural Management Review Vol 18 special issue A

KADP, (2013 and 2014).Sector by Sector Contribution to State Economic Development, Ministry of Agriculture, Kaduna State, Nigeria

Kaduna, (2015).Kaduna state Government index of Economic activities, Ministry of Economic planning Kaduna, Nigeria

Mnimakalai, R. (2010). Poultry Farming Employment potential. Indian Council for Agricultural Research, India (ICAR) PP 37-39

Ohajianya, D.O., Mgbada, P.M. and Onu, P.N. (2013).Technical and Efficiency in Poultry Production in Imo state Nigeria. American Journal of Experimental Agriculture, Science domain international 3(4), PP 927-983

Paweriya, V. and Jheeba, S.S. (2005).Economic Analysis of Cost Returns Income and Employment in Poultry Enterprises in Jaipur District of Rajasthan State India International Journal of Agricultural Science and research Vol 5(1) PP 73-80.

Kakade, V.B.,Surgavashi, S.S. and Shikalga, A. (2011).Employment and Income Generation under Contract Farming.A Case Study of Poultry Production Kolhapuv, India. Paper Presented at the Department of Economics, University of Shivaji, India

Tabari, U. Y and Abuga, I., (2015). Technical Efficiency of Poultry Production in Kaduna state, Nigeria. Kampala International University Journal of Social Science 3 (2), pp: 269-275