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Gross margin analysis of three production modules of broiler enterprise in Obubra local government area of Cross River state Nigeria

***[1] Meremikwu V. N. and [2] Oniah M. O.**

[1]*Department of Animal Science, Cross River University of Technology, Faculty of Agriculture and Forestry Obubra Campus, Cross River State Nigeria.*
[2]*Department of Agricultural Economics and Extension. Cross River University of Technology, Faculty of Agriculture and Forestry Obubra Campus, Cross River State Nigeria.*

Corresponding author: **victoriameremikwu@yahoo.com* ***Phone number:*** *08038701890*

Target audience: *Animal Scientists, Agricultural economists, poultry farmers.*

Abstract

A research was carried out to determine the cost and returns associated with each of three modules of a broiler enterprise. Conventionally, broiler production involves two phases in a cycle, namely: a starter phase from day-one to week four (0-4 weeks of age) and a finisher phase from week four to week eight (4- 8 weeks of age). Three production modules were used as treatments which include: Module one = (production of finisher broilers 0-4 weeks). Module two= (production of market weights broilers 4-8 weeks). Module three = (full cycle production of market weights broilers 0-8 weeks) which served as the control. One hundred and forty four (144) day- old broiler chicks were assigned to each treatment in a completely randomized design. The birds were brooded in deep litter pens using conventional method of brooding broilers. The research was conducted at the Poultry Unit of the Teaching and Research Farm of Cross University of Technology, Obubra Campus Nigeria. Gross margin analysis and returns on investment (ri) were used to determine the profitability of the production modules. The gross margin (profit) was highest for the birds sold at 8 weeks of age but the number of batches produced per year was higher for the four weeks production modules (0 – 4 weeks and 4 – 8 weeks) than the full-cycle production module (0 – 8 weeks). The four weeks production modules had seven (7) batches of production per year, while the full cycle production module (0 – 8 weeks had four (4) batches of production per year. The four week broiler production modules provided quick return to investment and vaccinated broilers to farmers, thereby increasing survivability of the chicks.

Keywords: *Modules, cost, finisher, gross margin, broiler.*

Description of Problem

Broilers production involves two phases in a production cycle of 0-8 weeks namely: a starter phase from day one to week four (o-4) on a starter diet of 21-23% crude protein and a finisher phase from week four to week eight (4-8) on a finisher diet of 19% crude protein (7). Unfortunately, the conventional system of broiler production is beyond the scope of subsistence farmers. According to (9) the problem of subsistence poultry production is that most of the birds raised under this system die off as a result of disease infections (mainly Newcastle and Gumboro disease) and the farmers lack the know-how to protect their birds. Also vaccination programmes are too costly for subsistence farmers who buy only a small number of birds. (6) had attempted to solve this problem by producing brooded broilers 0-4 weeks of age (finisher broiler) which have been vaccinated for distribution to subsistence farmers. According to (6), there

was high survivability of the finisher broilers under subsistence free range system. This finisher broiler concept was designated "started broiler" abinitio by (4). Also (5) had reported marked differences in variable inputs in these two phases of production which affect total production cost. These had led to the idea of modularity in broiler production.

Modular design has been described as an approach that subdivides a system into smaller parts (modules) that can be independently created and used (13). This type of design is practiced in beef production system where the operation is divided into three distinct phases: Phase (1) – Cow – Calf operation; Phase (2) – Stocker operation and phase (3) feeder operation. It is possible to carry on all these phases on a single farm as a successive step in a continuous process. It is also possible to carry out one or two phases to the exclusion of the other (2). Modularity offers the benefit of reduction in cost due to lesser customization and less learning time. One distinct feature of modular production is that each of the modules or enterprise has different resource (production input) as they involve animals of different growth stages.

Three production modules are possible in a broiler enterprise. These include: Production of finisher broilers of four weeks of age (0-4 weeks); Production of market weight broiler eight weeks of age (4-8 weeks) and a full-cycle production of market weight broiler eight weeks of age(0-8 weeks). The finisher broiler concept had been investigated by (6) as an improvement strategy to subsistence free-range poultry production in Nigeria. This concept ("Finisher-broiler") was designated "started broiler" abinitio (4). Unlike the conventional finisher phase of broiler production, the "finisher/started broiler" concept is a deliberate act of producing brooded broilers (0-4weeks of age) which have been vaccinated for distribution to subsistence farmers. The rationale behind this concept is that most of the birds raised under subsistence free range system die off as a result of disease infections (mainly Newcastle and Gumboro diseases) and the farmers lack the "know-how" to protect their birds, Also, vaccination programmes are too costly for subsistence farmers who buy only a small number of birds.

The aim of this research was to determine the economic efficiency of this system by evaluating the differences in cost and returns associated with each of the modules using gross margin analysis.

Materials and Methods

Experimental site

The research was conducted at the Poultry Unit of the Teaching and Research Farm of Cross River University of Technology, Obubra Campus Nigeria. The study comprised three production modules as treatments .One hundred and forty four day-old broiler chicks were assigned per treatment Each module was replicated three times in a completely randomized design.. The production modules include:

Module one = (Production of finisher broilers 0-4 weeks).

Module two = (Production of market weight broilers 4 – 8 weeks.)

Module three: = (Full cycle production of market weight broilers 0 – 8 weeks) which serves as control.

The birds were brooded in deep litter pens using conventional method of brooding broilers. Feed and water were given *ad libitum,* commercial starter and finisher diets were used. The experiment lasted for eight weeks (56 days).

Data Collection

Data were collected from day-one till the end of the experiment. Costs of variable inputs were chronologically recorded for each production module and these include; cost of day-old chicks, feed, heating oil (kerosene),

vaccination, medication and labour. At the end of the brooding phase (0-4 weeks) the study for module one ended, while the study for module two (4 – 8 weeks) started and module three (0-8 weeks) continued. Performance records were also taken and these include: weekly body weights, body weight gains and feed intake. Mortality was also recorded.

Table1: Costs And Returns Analysis of the Production Modules (Naira/bird)

	TREATMENTS			
Items (Variables Inputs)	**Units/No**	**Unit cost (₦)**	**Module (1) (0-4weeks)**	**Module(II) (4-8weeks)**	**Module (III) (0-8weeks)**
Day-old chicks	144	200=	28,800	-	28,800
Brooding heat (Kerosene litres)	80	150=	12,000	-	12,000
Vaccines (Vials)	3	800=	2,400	-	2,400
Starter Drugs (sachets)	6	800=	4,800	-	4,800
Starter feed (kg)	170	100=	17,000	-	17,000
Labour	1	4,000=	4,000=	-	4,000.00
Finisher boilers	144	600=	-	86,400	-
Finisher drugs(sachets)	12	800=	-	9,600	9,600
Finisher feed (kg)	500	100=	-	50.000	50,000
Labour	1	4000=	-	4,000	4,000.00
TVC	-	-	69,000	150,000	132,000
TR	-	- -	86,400	230,400	230,400
GM(TR-TVC)	-	- -	17,400	80,400	`98,400
Return on investment (RI=GM/TVC)	-	- -	0.25	0.54	0.74
Numbers of batches /years	-	- -	7	7	4
Return on investment / year	-	- -	Ri x7=1.75	Ri x7=3.78	Ri x 4=2.96

Source: Field data, 2017
Ri= Return on every naira invested in the business.
₦ = Nigeria Naira.s

Data analysis

Economic analysis comprised gross margin analysis and return on investment (ri). Gross margin is the difference between the money received from sales and that spent on variable costs (3). Gross margin is therefore used as the profit margin in the short run.

A general model for Gross margin analysis is

expressed thus:

GM = TR – TVC

Where

GM = Gross margin

TR = Total Revenue

TVC = Total Variable Cost.

Gross margin was used to determine the differences in cost and returns associated with each module hence the overhead costs are kept low in broiler production in the developing countries. According to (12), buildings are usually simple and other capital equipment is kept to a minimum. The principal cost of a broiler enterprise in the developing countries is feed which may represent more than 60% of the total production costs. The cost of day-old chicks is also an important factor affecting production cost. Return on investment (ri) is the return on every naira involved in the business and calculated as GM divided by TVC (GM/TVC) (Adinya and Ikpi, 2008).Annual returns to investment were obtained by turning out a number of batches per module per year. Selling price was determined using the current market prize prevailing in the area. Annual ri was calculated by multiplying ri per batch with the number of batches per module per year.

Result

The gross margin analysis for this study is presented in Table 1. The costs of variable inputs for the different modules were expressed as the percentage of total production cost for each module.

Costs and returns

The result showed variations in the cost of production modules. Generally, the cost of feed and birds were the most costly inputs in broiler production. The gross margin was higher for the birds sold at eight weeks of age (4-8 and 0-8 weeks) than that sold at four weeks. However, the number of batches produced per year were higher for the four weeks production modules (0-4 week and 4-8 weeks) than for the full cycle production module (0-8 weeks). The four week production modules have seven (7) batches of production per year including three (3) week cleaning period per batch before restocking. The full cycle production module (0-8 weeks) has four (4) batches of production per year including three (3) weeks cleaning period. Returns on every naira investment (RI) were positive for the three modules of production.

Performance of the experimental birds

The performance record of the experimental birds is presented in Table 2. Average daily weight gain was significantly higher ($P<0.05$) in modules 2 (4-8 weeks) than in module 3 (0-8 weeks) and significantly lower ($P>0.05$) in module 1 (0-4 weeks) than the other two modules or treatments. Mortality was Zero for module 2 (4-8 weeks).

Discussion

The variation that occurred in the cost of production between the different productions modules was due to the fact that some variable inputs were essential in some production modules but not needed in other production modules. For example, the cost of brooding heat was completely non-existent in module 2 (4-8 weeks), while it is inevitable in the other two modules (0-4weeks and 0-8 weeks) as reported by (5). The higher number of batches produced per year by the four weeks production modules (0-4 and 4-8 weeks) agrees with the report of (10) which stated that production modules with shorter cycles tend to generate quick return to investments. Shorter duration of four weeks in a broiler enterprise will result to two turnovers in a production cycle. The positive return on every naira investment (ri) for the three modules was an indication of profit from the business. This agrees with the report of (1) who obtain a positive (ri) of 0.14 during a study of the production efficiency of catfish.

Table 2: Performance of the experimental birds.

Parameters	Treatment			
	Module (i) 0-4 weeks	**Module (ii) 4-8 weeks**	**Module (iii) 0-8 weeks**	**SEM**
Initial Average body weight (g)	50.00[b]	850.65[a]	50.00[b]	355.84
Average of final body weight (kg)	0.85[b]	2.65[a]	276[a]	0.83
Average daily feed intake (g)bird/day)	66.6[b]	207.86[a]	274.00[a]	77.72
Average daily weight gain (g)	28.60[c]	64.26[a]	48.40[b]	12.32
FCR (g of feed/g of weight gain)	2.31[b]	3.24[b]	5.66 [a]	1.28
Feed efficiency (Fe)	0.43[a]	0.31[b]	0.21	0.077
Mortality (%)	4.70[a]	0.00[b]	4.70[a]	2.09
Cost /kg of feed (₦)	112.00	112.00	112.00	-
Cost of feed / kg weight gain (₦)	258.72[b]	362.88[b]	633.92[a]	143.61

Source: Field data
Means with different superscripts are significantly ($p<0.05$) different.
FRC = Feed conversion ratio
₦ = Naira

The significant difference ($P<0.05$) noted in daily weight gain between the treatment modules agrees with the report of (5) whop observed variations in the growth rate of broilers at different stages of growth. The increased survivability observed in module 2(4-8 weeks) was due to the fact that the birds had received all the necessary vaccinations before stocking. This agrees with the report of 6 which stated that providing farmers with brooded, vaccinated broiler increased the survivability of the birds under subsistence production instead of the day-old chicks that are conventionally purchased.

Conclusion and Application

From the results of this trial, it can be concluded that:

1. Four week production modules (0-4 and 4-8 weeks) tend to generate quick returns to investments.
2. The three production modules were profitable.
3. Use of brooded vaccinated broilers (4-8 weeks old) increased survivability of birds.

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