

## **BREAK EVEN ANALYSIS OF BROILER PRODUCTION IN THE ACCRA-TEMA AND KUMASI AREAS**

*Mahama, E.A.*

Agricultural Research Centre, University of Ghana, Legon

*Andah, E.K.*

*Amegashie, D.P.K.*

*Mensah-Bonsu, A.*

Dept of Agricultural Economics & Agribusiness, University of Ghana, Legon

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### **Abstract:**

The paper examines the profitability of broiler production, using the break even concept. The break even quantities, net present values and internal rates of returns have been estimated for 20 selected poultry farms. Poultry farms located in Kumasi area broke even in the production of broiler while about 38.5 percent of the farms in Accra-Tema area produced below their break even levels. Only 30 percent of the farms registered positive net present value. Under an interest rate scenario of 25 percent about 70 percent of all farms, would be profitable (break even). The results suggest that lower interest rate is essential for more farms to break even (be competitive) and stay in the poultry business.

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**Key Words:** Break even, interest rate, installed capacity, broiler production, Accra – Tema and Kumasi areas

### **Introduction**

Poultry production, especially broiler production is a big business throughout the world today. It has become a standard form and source of cheap protein. It is also a competitive industry in the developed world and fast becoming so in the less developed countries. With continued population growth, urbanization, income growth and changes in lifestyles and food preferences, it was projected that meat demand in the developing world will double between 1995 and 2020 to 190 million tons and increase by 25 percent in developed countries to 122 million tons (Delgado et al, 1999). Demand for meat will grow faster than cereals in the developing world by 2.8 percent per year for meat compared with 1.8 percent for cereals (Pinstrup-Andersen et al, 1997). It has estimated that the demand for poultry meat in the developing world is expected to increase fastest, at an average of 3.6 percent, compared with 2.8 percent for beef and 2.3 percent for pork (pig meat). The demand for livestock products in Ghana is estimated to be increasing at a rate of about 5 to 7 percent per annum (Government of Ghana, 1995).

The early 1970s witnessed the emergency of poultry farming as a major source of meat and profitable enterprise in Ghana (Tachie-Mends, 1992). The poultry industry started to decline in 1981 when prices of inputs began to shoot up and many farmers could not afford the cost of production. By 1987, however, production of poultry had picked up as a result of increased demand due to increase in population (Tachie-Mends, 1992). Most of the current meat import is poultry parts, with a substantial content of turkey tails and chicken wings (Government of Ghana, 1992). Both frozen poultry and beef are imported from European Union countries. These imports are heavily subsidized, in the European Union countries, therefore, depressing domestic prices in importing countries such as Ghana.

Whereas producers are complaining of competition from subsidized imported frozen chicken, high cost of inputs and lack of credit facilities as hindering the local poultry industry, consumers are equally dissatisfied with the expensive poultry meat produced locally. These issues raise the following research questions: Is broiler production in Ghana really profitable? What is the break-even level for broiler production for the firms in the industry? What is the rate of return on the firms' investment?

The primary objective of the study therefore is to assess the profitability of broiler production in Accra-Tema and Kumasi areas. The specific objectives are to determine the break even levels for broiler production and estimate the rate of return on the investment for the poultry firms in the two study areas.

The economy of Ghana depends on agriculture and to ensure growth in the general economy, the agricultural sector needs to be improved. The poultry industry has an important role in this respect. If the broiler meat sub-sector is well developed, it could help the economy conserve foreign exchange used to import poultry products and provide employment for the youth of Ghana. The estimation of the break-even point is useful because it shows at what quantity to produce without losing. If the break-even quantity of birds is close to the installed capacity, then the problems of being able to produce at the most profitable level would be crucial. The two areas have been chosen for the study because a large proportion (about 89 percent) of poultry farms in Ghana are located in these areas (MOFA, 1996), and they provide ready market for poultry products.

Previous related studies have given mix conclusion about the performance of the poultry industry. Using the enterprise costing method, Boa-Amponsem (1988) recommended that for efficient broiler production, overhead cost such as management salaries, office expenses and electricity expenses should not exceed 15 percent of the variable cost. Applying the comparative cost analysis for two modern poultry production technologies and implications for policy under Nigeria's Structural Adjustment Programme, Akinyodoye, and Pingpoh (1992) concluded that poultry production in Nigeria is financially but not economically profitable given the prevailing high cost of imported feed. Maham, et al (1990) in an assessment of the cost of producing cockerel and estimating a break-even point in India, observed that the fluctuations in the price of chickens and the unpredictable supply of broiler chicks encouraged broiler farmers in Tamil Nach, India to take up cockerel production.

### **Methodology**

**Data:** The period within which the study was conducted, covered June 1996 to May 1997. In all 20 farms were selected including 13 farms from Accra/Tema area and 7 farms from the Kumasi area. Each farmer provided information on three production cycles. A total of 60 production cycles (3 cycles of 20 farms) were used for the analysis. The data collected included information reported in the income and expenditure statements or the profit and loss accounts, production accounts; and general information on the assets of the farm. Some secondary data collected included the banks lending rates.

**Method of Analysis:** Financial analysis requires identification of all revenues and costs streams over the life of the project. For the present study, the costs include the fixed and variable costs. The fixed costs constitute the capital outlay of the firms. The fixed costs include land, structures and buildings, machinery, insurance, payment on interest and rent. For the fact that fixed inputs decline in value or productivity as the annual use of the machinery, equipment, and buildings increase (or are not used up completely in one season), their annual depreciated values were estimated and used in undertaking the undiscounted break even analysis. The depreciated values of the fixed inputs were summed to give the total fixed cost of a production cycle.

The variable cost can be divided into production cost, overhead costs and in some cases research and development cost. For the purpose of this study, the production cost for broiler production included the costs of feed, veterinary drugs, wood shavings, day old chicks, fuel for vehicles, electricity and water expenses as well as other energy such as charcoal and gas, and salaries of personnel directly involved in the production process. Overhead costs included the costs of indirect materials, indirect labour (management and office staff), office expenses and maintenance of vehicles. These costs were summed up to give total variable cost (TVC). The total cost (TC) of a production cycle therefore is the sum of the total fixed cost (TFC) and total variable cost (TVC).

Total revenue is the cash value realized from the sales of broilers during the accounting period (a production cycle). To arrive at the sales revenue, the total quantity of broilers sold (Q) was multiplied by the unit price (P) of the product. Thus,  $TR = Q \times P$ , where TR is total revenue.

**Break-Even Analysis (Undiscounted):** Break-Even (B/E) analysis normally assists in establishing the relationship between fixed costs, variable costs, sales revenue and profit. The point at which sales revenue and total cost are equal is termed the break-even point. The break-even quantity is derived from the costs and revenue of the farms. It is assumed that poultry farms in Kumasi and Accra areas operate in a competitive local market and therefore they are price takers. At the Break-Even point the total cost of production is equal to the total revenue.

$$\begin{aligned} \text{Thus, TR} &= \text{TC} && (1) \\ \text{At the equilibrium level, TR} &= \text{QE} \times \text{PE} && (2) \\ \text{Therefore QE} \times \text{PE} &= \text{TVC} + \text{TFC} && (3) \\ \text{Then, QE} &= (\text{TVC} + \text{TFC})/\text{PE} && (4) \end{aligned}$$

where, QE is Break-Even output (quantity) and PE is the average market selling price for the area. The break-even analysis was carried out for the individual farms, Accra/Tema farms, Kumasi farms and then for all the farms in the two areas combined. The simple average of the three production cycles for each farm was used for the analysis.

**Estimation of the Net Present Value and Internal Rate of Return:** The net present value (NPV) is given by the present (discounted) value of benefit minus present (discounted) value of cost (Gittinger, 1982). In calculating the financial NPV, the prevailing bank interest rate of 45 percent per annum during the period of the data collection (1996/97) was used as the discount rate. Each of the farms was expected to generate a positive NPV, denoting the profitability of the broiler operation. The internal rate of return (IRR) method was applied to determine the financial interest rate which will equate the present value of the benefit to the present value of the cost and therefore drives the NPV to zero (a break-even point). The IRR was thus used to estimate the interest rate that would make the firms break even under the given production environment. The annual net income from broilers was calculated for each farm and projected over an assumed project life period of 25 years. The net income was given by the total revenue less the total variable costs.

Also, the economic net present value and rate of return were estimated after adjusting the values used for the financial analysis. Direct transfer payments such as taxes paid by the poultry farmers, direct subsidies and credit transactions including loans receipts and repayments, insurance, interest on loans were omitted when the financial values were converted to economic values. The exchange rate effect for imported inputs were not adjusted because the exchange rate in the economy is determined on a daily basis by the commercial and development banks in a unified manner based on the supply and demand situation. Similarly, the interest rate used to discount the economic values was not adjusted. In relation to labour in the poultry industry, the wages of labour used for the financial analysis were also used for the economic analysis, because of the unemployable nature of unskilled labour in the economy.

### Results And Discussion

The results of the break even analysis are presented in Tables 1, 2 and 3. The estimated mean unit selling price for broiler in the Kumasi area was €6,900 (Table 3). At the estimated mean selling price level, the estimated break even quantity and percentage change in production from the break even level for the different farms in the Kumasi area are presented in Table 1. All farms in the Kumasi area produced at levels above their break even levels, with output ranging between 2.6 percent and 35.5 percent above the break even point. The implication is that the farmers in the Kumasi area broke-even in the production of broilers. Three of the farms, representing 42.9 percent, produced above 60 percent of their installed capacity, while another three (42.9 percent) farms produced below 20 percent of their installed capacity. On the average a farm in Kumasi area produced 20.5 percent above the break even level, while utilizing about 50.2 percent of the installed capacity (Table 3).

**Table 1:** Break-Even Analysis for Broiler Meat Production in Kumasi area

FARM	1	2	3*	4*	5	6	7
Sales (€'000')	4140	2967	34255	29015	3356	3425	5698
Total variable cost(€000)	3614	2608	29524	18820	2772	2958	4429
Total Fixed cost (€000)	54.7	30	9336	3324	38.2	26	40
Installed Capacity(birds)	4000	2000	10000	6000	2500	500	2000
Quantity produced (birds)	625	392	6981	3768	435	475	878
Unit price(€'000')	6.5	7.2	4.9	7.7	8.0	7.2	6.5
Capacity utilized (%)	15.6	19.6	69.8	62.8	17.4	95.0	43.9
Break Even Quantity (birds)	532	382	5632	3209	407	432	648
Percentage increase	17.48	2.62	23.95	17.42	6.88	9.95	35.49

**Source:** Calculated from field data, 1996/97

**Note:** \*Farms 3 and 4 sell dressed birds in kilo weight only.

For the Accra-Tema area, the mean unit price for broiler was estimated as €7,300 (Table 3). The estimated break even quantity and percentage change in production from the break even level for the different farms in the Accra-Tema area are presented in Table 2. Five of the farms, representing 38.5 percent, produced below their break even levels. Five farms, representing 38.5 percent, produced above 60 percent of their installed capacity, seven (53.8 percent) farms produced between 30 and 60 percent of their installed capacity while one farm (7.7 percent) produced below 30 percent of its installed capacity. On the average a farm in Accra-Tema area produced 18.7 percent above the break even level with the utilization of about 59.1 percent of the installed capacity (Table 3). For the two study areas combined, about 55.03 percent of the installed capacity was used to produce 20.5 percent above the firms' break even level (Table 3).

**Table 2: Break-Even Analysis for Broiler Meat Production in Accra-Tema Area**

FARM	1	2	3	4	5*	6	7	8	9	10	11	12	13
Sales(¢0000	23756	2529	6408	4083	27044	3667	15656	12296	2970	28033	6383	3040	2721
TVC (¢000)	15563	2078	6476	3555	23400	2863	9136	10959	2878	20198	4677	2774	2352
TFC (¢000)	239.3	39	982	83	3894	189	140	250	38	2356	100	35	55
Installed capacity	4000	700	3000	1000	5000	1500	4000	3500	500	5000	2000	1000	500
Qty produced	2852	281	961	578	3698	380	2037	2049	398	3781	890	467	380
unit price (¢000)	8.3	9	6.7	7.3	7.4	7.7	9.8	6	6.3	7.7	7.2	6.5	5.1
Capacity utilized (%)	71.3	40.1	32.0	57.8	74.0	25.3	50.9	58.5	79.6	75.6	44.5	46.7	76.0
B/E Quantity	2165	290	1019	498	3739	418	1271	1535	399	3090	654	385	330
Percentage increase (%)	31.73	-3.10	-5.69	16.06	-0.10	-9.09	60.27	33.49	-0.25	22.36	36.09	21.30	15.15

**Source:** Calculated from field data, 1996/97.

\* Farm 5 sells dressed broiler in kilo weight only.

**Table 3: Break-Even Analysis for Broiler Production, Mean Values for Study Areas**

VARIABLE	ACCRA-TEMA	KUMASI	All Farms
Sales (€'000')	10,660	11,837	11,072
TVC (€'000')	8,224	9,246	8,582
TFC (€'000')	646	1,836	1,067
Installed capacity(birds)	2438	3,857	2935
Qty Produced(birds)	1442	1936	1615
Unit price (€'000)	7.3	6.9	7.1
Capacity utilized (%)	59.1	50.2	55.0
B/E Quantity(birds)	1215	1606	1359
Percentage increase on: B/E Quantity (%)	18.68	20.55	18.84

**Source:** Derived from Tables 1 and 2.

The capital outlay per farm and the calculated expected annual net income, the net present value and the internal rate of return for each of the farms in Accra-Tema and Kumasi areas are presented in Table 4.

**Table 4: Capital Outlay, Net Income, Net Present Value (NPV) and Internal Rate of Return (IRR) for Broiler Meat Production in the Study Areas**

F A R M	Capital Outlay* (€'000)	Net Income (€'000) /Year	NPV at 45% (€'000)	IRR (%)
<b>ACCRA-TEMA</b>				
1	10,000	24110	43,572.42	241.14
2	3,800	1256	(1,009.17)	33.20
3	9,800	(5888)	(22,883.14)	-
4	7,000	2341	(1,798.30)	33.58
5	191,600	13439	(161,738.54)	4.92
6	12,000	3655	(3,878.59)	30.48
7	40,000	10501	(16,666.78)	26.34
8	25,000	8240	(6,690.72)	33.11
9	3,500	(1508)	(6,850.78)	-
10	11,500	12650	16,608.30	110.00
11	6,000	6263	7,916.39	104.40
12	7,000	1952	(2,662.66)	28.04
13	3,900	1316	(975.85)	33.86
<b>KUMASI</b>				
1	10,800	1540	(7,378.12)	13.95
2	6,300	1020	(4,033.56)	15.95
3	42,800	(5030)	(53,976.66)	-
4	15,000	31360	54,681.92	209.05
5	6,800	4492	3,181.22	66.12
6	3,000	2800	3,221.60	93.39
7	11,000	3780	(2,600.84)	34.42

**Source:** Calculated from Field Data, 1996/97.

\* The capital outlay of each farm was revealed to reflect 1996/97 prices.

NPV = (Annuity Factor x Net Income per year) – Capital outlay

where, Annuity Factor =  $[(1 + r)^t - 1] / r(1 + r)^t$ ; r = interest (discount) rate and t = 25 years

Net income per year = total revenue per year less total variable costs per year

IRR =  $r_L + [(r_H - r_L) * NPV^+ / (NPV^+ + |NPV^-|)]$

where,  $r_L$  = the (low) discount rate that gives the positive net present value (NPV<sup>+</sup>)

$r_H$  = the (high) discount rate that gives the negative net present value (NPV<sup>-</sup>)

To reduce estimation error and obtain a more accurate IRR the interval  $r_H - r_L$  was not more than 5.

The estimated results show that at an interest rate of 45 percent that prevailed during the survey time in 1996/97 only six farms, representing 30 percent of the farms, registered positive net

present value. This means that most of the farms were likely lose their invested capital and would find it difficult to continue their operation. Consequently, farms that continue to record negative net present value would either go in for more bank loans or fold up. A rise in product price relative to input price would help struggling farms to recover production cost. The farms that recorded positive net present value included 42.9 percent and 23.1 percent of farms located in Kumasi and Accra/Tema, respectively, suggesting that a farm located in Kumasi is more likely to record positive profit than one located in Accra/Tema area.

The internal rate of return (IRR) analysis, similarly, shows that only the six farms (30 percent of the farms) registered IRR above the interest rate of 45 percent (Table 4). The summarized results for the estimated IRR presented in Table 5 shows that if the banks' interest rate was reduced from 45 percent to 33 percent, then 25 percent additional farms, made up of 30.8 percent and 14.3 percent of farms in Accra-Tema and Kumasi, respectively, would break even. The estimated IRR results suggest that should the interest rate drop further to about 25 percent, then about 76.9 percent of farms in Accra-Tema area would be breaking even. Under the 25 percent interest rate scenario about 70 percent of all farms would be profitable (break even). The results suggest that lower interest rate is essential for more farms, particularly those located in Accra-Tema area, to become competitive and stay in the poultry business.

**Table 5:** Possible Interest Rate Charges and Percentage of Farms Breaking Even

Interest Rate (%)	Percentage of farms breaking even at the specified rates		
	Accra/Tema	Kumasi	All Farms
45	23.1	42.9	30.0
33	53.8	57.1	55.0
25	76.9	57.1	70.0

**Source:** Deduced from Table 4

### Economic Rate Of Return

The estimated economic net present value and the economic rate of return are presented in Table 6. Though the necessary economic adjustments were carried out, the economic net present values were estimated at the commercial and development banks' interest rate of 45 percent.

**Table 6:** Net Present Value at 45 percent and the Economic Rate of Return Accra-Tema and Kumasi Areas

Area	Capital Outlay	Income/Year	NPV at 45%	ERR (%)
Accra-Tema	331,700	99,200	(76,900)	29.9
Kumasi	95,700	86,200	65,860	90.1
All Farms	427,400	185,400	(15,441)	43.5

**Source:** Calculated from Field Data, 1996/97.

Table 6 shows that generally the farms in the Kumasi area recorded a positive economic net present value, while farms in Accra-Tema area recorded a negative economic net present value. The overall net present value for the economy was negative, suggesting that broiler production is not economically viable in the country. The estimated economic rates of return suggest that, economically it is worth investing in the broiler meat production in the Kumasi area but probably not in the Accra-Tema area. The estimated economic rate of return suggests that if broiler meat production is to be economically viable, then a reduced economic interest rate of about 30 percent must be available and accessible to the poultry farms.

### Conclusions

The study attempted to examine profitability of broiler production, using the break even concept. Farms located in Kumasi area broke even in the production of broiler with about 42.9 percent producing above 60 percent of their installed capacity, while about 38.5 percent of the farms in Accra-Tema area produced below their break even levels. About 38.5 percent of the farms in Accra-Tema area produced above 60 percent of their installed capacity. Only 30 percent of the farms, including 42.9 percent and 23.1 percent of farms located in Kumasi and Accra-Tema, respectively, registered positive net present value. The implication is that a farm located in Kumasi is more likely to record positive profit than one located in Accra-Tema area. Under an interest rate scenario of 25 percent about 70 percent of all farms, including 76.9 percent in Accra-Tema area and 57.1 percent in Kumasi area, would be profitable (break even). The results suggest that lower interest rate is essential for more farms to break even (be competitive) and stay in the poultry business.

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