

*Full Length Research Paper*

# **Economics of egg poultry production in Khartoum State with emphasis on the open-system- Sudan**

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The main objective of this paper was to study the economics of poultry egg- production in the open-system in Khartoum State. Specific objectives were to study the socio-economic features of poultry egg producers, investigate the main factors contributing to the production cost and compare between production costs, total returns and gross margins in different farm types and sizes. A questionnaire was prepared in order to obtain information on quantities and costs beside socio-economic questions such as level of education. The farms were stratified into strata according to the size of the flock to increase the homogeneity of sampling units. The data were subjected to descriptive statistical analysis to analyze socio-economic characteristics of egg poultry producers. Also, quantitative technique tools were used to measure the profitability of the farms. The study revealed that 58% from egg poultry producers whose main job are poultry breeding, and 60% of poultry producers have experience of more than five years. The feed cost was the main cost item in the egg farm in open-system that, it represented 90.2, 89.7 and 92.7% of total production cost in small, medium and large farm sizes of egg production, respectively, and about 75.8% in (4 - 5 months old) pullet farm. Also, the study revealed that the other factors of production such as price of day-old chicks, price of (4 - 5 months) hens, mortality cost, vaccines and drugs and labor cost represented the most total cost of production. The total cost of production and cost per dozen were lowest in large farm sizes than other farm sizes and type. Highest gross profit was obtained in large farm sizes, while the lowest ones were observed in pullet farms. However, all farms have CPP greater than unity. The study concluded that: feed cost was the main cost item in different farm types and sizes. High percentage of mortality cost and price of day-old chicks and (4 - 5 months) hens were also high. Also, it concluded that, the large size farm was more efficient than other sizes and type of the farms.

**Key words:** Egg production, pullet farm, open-system farms.

## **INTRODUCTION**

The importance of the poultry industry is that it concentrates in providing employment not only to those engaged in production directly, but also for the hatchery operations, feed dealers, manufactures of incubators, building materials, processors of egg and poultry products and all dealers engaged in the marketing of egg and poultry from the time they leave the producer until they are in hands of consumers (Morly, 1982).

Commercial poultry production in Khartoum State is

divided into three farms systems namely: the modern closed system, the semi-closed system and the open-system. The modern closed system poultry production is practiced by large companies under controlled environment and advanced managerial standards, while the closed system secures the optimum circumstances for the birds. The closed system is managed more scientifically than the other system, and the flocks are intensively reared in closed houses using air conditioners or ventilation fans to regulate the weather inside the houses, beside artificial day-length regulation using electricity.

The laying pullet starts lying at (4 - 5) months depending on the breed type, environment and management. The laying duration may reach 16 months with the productivity

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**Table 1.** Needs and production of egg in Khartoum State (1000 tonnes).

Year	Needs	Production	Gap (%)
2001	10200	9300	9
2002	10260	9800	5
2003	10600	9700	9
2004	11000	9900	11

Source: Data collected and calculated.

of about 26 dozen of eggs per layer. In the semi-dosed system of poultry production, the poultry house has a simple cooling system and the management processes are done by labor. Also, there may be temporary walls that are removed when there is no need for cooling the poultry house. Most of the private poultry farms of the open-system in Khartoum State have different scales of poultry production.

The characteristics of the open system are the open-sided house and baladi roof with gable-shape, usually made of corrugated metal. The walls are constructed of bricks and the rest is covered with meshwork. There are different types of farms in the open-system, where some farms purchase one-day chick and others purchase (4 – 5) months pullet.

The open-system has the biggest percentage share in poultry production in Khartoum State, where it represents 96% from the total number of farms in the state (Ministry of Agriculture, Khartoum State, 2005). In spite of the increasing investment in this industry, there is an obvious gap between the production of poultry egg and its needs (Table 1). Although there is an increase in poultry production, still the prices are increasing, and it is not well known whether this is due to the increase in demand or to the high cost of inputs.

The main objectives of the study are to analyze the economics production of poultry egg in the open-system in Khartoum State during 2006. The specific objectives are to assess the socio-economics features of poultry egg producers, investigate the main factors contributing to the production cost of egg poultry, estimate the gross return, gross margin and profitability for different farms sizes and pullet (4 - 5 months) and then make a comparison between them.

## METHODOLOGY

### Methods of data collection

The study depended mainly on primary data, secondary data were also collected. Primary data were collected through a questionnaire so as to obtain information on quantities, costs of inputs related to poultry egg production and yield, beside socio-economic characteristics of egg poultry producers.

In order to increase the degree of precision of the results, poultry farms were stratified, on the basis of the flock's size, into three

strata: small-sized farms with less than 5000 birds, medium-sized farms with 5000 - 10,000 birds and large-sized farms with more than 10,000 birds. Due to the limited resources and difficulty of transportation among the poultry farms in the three areas of Khartoum State, the sample was chosen to include 55 poultry farms in the three strata (29 small, 10 medium and 5 large - sized farms) and 6 pullet's farms. However, random samples were taken from each stratum.

### Methods of analysis

Descriptive statistical analysis method was used to explain socio-economic features of poultry egg producers. It also used quantitative analysis tools such as net returns, gross margin, benefit cost ratio and return per dinners invested.

### Quantitative analyses techniques (Emokaro, 2010)

#### Net returns

This was determined by the following equation:

$$\text{Net returns} = \text{TR} - \text{TC}$$

Where;

TR = Total returns

TC = Total cost

#### Gross margin analysis

Gross margin is the difference between total returns and total variable cost and was determined using:

$$\text{GM} = \text{TR} - \text{TVC}$$

Where;

GM = Gross margin

TVC = Total variable cost

TVC = TC – TFC

TFC = Total fix cost (cost of nests and housing)

#### Returns per Sudanese dinners invested

Returns per Sudanese dinners invested:

$$\text{Returns / Sudanese dinners invested} = \text{GM} / \text{TVC}$$

#### Coefficient of private profitability (CPP)

This is used to measure the profitability of the farm. If CPP is less than unity, then it is unprofitable to produce the product at the present productions level and / or the present price level.

$$\text{CPP} = \text{TR} / \text{TC}$$

## RESULTS AND DISCUSSION

### Socio-economic characteristics of egg poultry producer in Khartoum State (open system)

#### Occupation

Table 2 shows that about 58% of the poultry egg producers were specialist, that is, their main job was poultry breeding.

**Table 2.** Percentage of egg poultry producers according to their main job.

Farmers' main job	(%)
Farmers	58.0
Others	42.0
Total	100.0

Source: Data collected and calculated.

**Table 3.** Percentage of egg poultry producers according to their age.

Age of producer (year)	(%)
< 25	14.0
26 – 35	24.0
36 – 45	34.0
> 46	28.0
Total	100.0

Source: Data collected and calculated.

**Table 4.** Percentage of egg poultry producers according to their experience.

Farmers' experience (year)	(%)
< 5	40.0
6 – 10	26.0
11 – 15	18.0
> 16	16.0
Total	100.0

Source: Data collected and calculated.

### Age

Table 3 shows that about 72% of the farmers' age range between less than 45 years. This means that majority of the farmers are younger.

### Experience

Table 4 indicates that about 60% of egg poultry producers have experience of more than 5 years and this means that the egg poultry production is practically done by well experienced farmers.

### Education

From Table 5, the bulk of the farm egg poultry producers were educated (92%) and only 2% of them were illiterate,

**Table 5.** Percentage of egg poultry producers according to their education.

Farmers' level of education	(%)
Illiteracy	2.0
Read and write only	6.0
Khalwa	12.0
Primary	12.0
Intermediate	18.0
Secondary	16.0
Graduate	24.0
Post-graduate	10.0
Total	100.0

Source: Data collected and calculated.

while 6% of them read and write only. Upton (1987) reported that education has an important influence in managerial ability and decision making; therefore, it may be concluded that producers with higher level of education were able to adopt new technologies.

## Comparison of egg poultry production costs

### *Different farm sizes (one day-old chick)*

Table 6 shows that the feed cost was the most important cost item for all farm sizes and it constituted 90.17, 89.73 and 92.73% of total production costs for small, medium and large size farms, respectively. However, this result was confirmed with the previous study (Sharabeen, 1996). He revealed that, feed cost is the main cost item in poultry production and it constitutes about 67.5% of the total production cost in open system farms. From the table, the second cost item was mortality cost for small (4.01%) and medium farm sizes (5.14%), but for large farm, the second cost item was chick cost (3.61%). Vaccines and drugs cost constitutes about 0.86, 0.71 and 0.60% of total production costs for small, medium and large farm sizes, respectively. This reduction, in the percentage of vaccines and drugs according to the size of the farms, reflects to the fact that large size farms have better management towards diseases control and benefit more from economies of scale. With reference to the comparison of total production cost among the different farms sizes, the results indicated that the large farm size ranked at the lowest production cost, followed by medium and small, respectively.

### *One-day old chick and pullet farms*

Table 7 shows that the main cost item is feed cost, and it constituted about 90.82 and 75- 83% of total production

**Table 6.** Comparison of production cost (dinner/bird) between different farms- sizes of one-day old chick farms.

Cost items	Type of farm (one-day old chick farms)					
	Small size farm		Medium size farm		Large size farm	
	Dinner/unit	(%)	Dinner/unit	(%)	Dinner/unit	(%)
Day-old chick	208	3.63	196	3.23	192	3.61
Feed cost	5167	90.17	5444	89.73	4933	92.73
Vaccine and drugs	49	0.86	43	0.71	32	0.60
Labour	28	0.49	9	0.15	9	0.17
Mortality cost	230	4.01	312	5.14	93	1.75
Feeder and drinker	16	0.28	17	0.28	16	0.30
Nest cost	12	0.21	24	0.40	22	0.41
Housing cost	16	0.28	17	0.28	16	0.30
Other cost	4	0.07	5	0.08	6	0.11
Total cost	5730	100	6067	100	5319	100

Source: Data collected and calculated.

**Table 7.** Comparison of production cost (dinner/bird) between one-day old chick and pullet farms.

Cost items	Types of farms			
	One-day old chick farms (average for different farms' size)		Pullet farms (4 - 5 months)	
	Dinner/unit	(%)	Dinner/unit	(%)
Day-old chick cost	198.67	3.48	1233	19.58
Feed cost	5181.33	90.82	4776	75.83
Vaccine and drugs cost	41.33	0.72	27	0.43
Labor cost	15.33	0.27	86	1.37
Mortality cost	211.67	3.71	79	1.25
Feeder and drinker cost	16.33	0.29	22	0.35
Nest cost	19.33	0.34	36	0.57
Housing cost	16.33	0.29	33	0.52
Other cost	5.00	0.09	6	0.10
Total cost	5705.32	100	6298	100

Source: Data collected and calculated.

costs for one-day old chick and pullet farms, respectively. This result indicated that the feed cost in the old chick farms had less than two one-day old chick and this may be due to the one-day period of rearing (rearing and production periods), while in pullet farms, it had production period only. This was assured by the study of Abdalla (1999).

The study confirmed that the feed cost constitutes about 72.6 and 59.8% of the total production cost in the open system of one-day old chick and pullet farms, respectively. Also, Intsar (1995) stated that feed cost comprises the highest share (76.0%) in the total cost of egg poultry production. In one-day old chick farms, the second cost item was mortality cost followed by chick cost, while for pullet farms, the second and third cost items were (4 – 5) month chick cost and labour cost, respectively.

These results are consistent with the findings of previous studies, but are focused more on marketing. Kaudia and Kitalyi (2002) reported high mortality rates and transport costs as major constraints of chicken trade in Kenya. However, the high mortality rates can be attributed to poor modes of transport for live chickens. Also, according to Tabbaa and Alshawabkeh (2000), high mortality rates in birds during transit are a function of factors which include stress and spread of disease infections during mass transportation of birds.

#### Quantitative analysis technique results

The average yields of the open system in Khartoum State were found to be 23.0, 24.8 and 26.0 dozens/bird in small, medium and large size farms, respectively.

**Table 8.** Quantitative analysis results for the one-day old chick (different sizes) and pullet farms (egg poultry production).

	Types of farms			
	Farm size (one-day old chick)			
	Small size (bird cost)	Medium size (bird cost)	Large size (bird cost)	Pullet farms (4 – 5 month old chick)
Average yield (dozen/bird)	23.0	24.8	26.0	24.0
Price/dozen	300.0	300.0	300.0	300.0
Total return (dinner/dozen)	6900.0	7440.0	7800.0	7200.0
Total cost (dinner/bird)	5730.0	6067.0	5319.0	6298.0
Cost of production/ dozen (dinner/ dozen)	249.1	244.6	204.6	262.4
Total fixed costs (nests and houses' costs)	28.0	41.0	38.0	69.0
Total variable cost	5702.0	6026.0	5281.0	6229.0
Gross margin	1198.0	1414.0	2519.0	971.0
Returns/dinners invested	0.21	0.23	0.47	0.15

Source: Data collected and calculated.

**Table 9.** Coefficient of private profitability in egg production farms.

Farm sizes and type	TC (dinner/bird)	TR (dinner/bird)	CPP (TR/TC)
Small size farm	5730.0	6900.0	1.20
Medium size farm	6067.0	7440.0	1.23
Large size farm	5319.0	7800.0	1.47
Pullet farm	6298.0	7200.0	1.14

Source: Data collected and calculated.

In pullet farms, the yield was found to be 24.0 dozens/birds and the average price was found to be 300 dinner/dozen. Table 8 records that cost of production per dozen was lower in the large farm size (204.6 dinner/ dozen), followed by medium (244.6 dinner/ dozen), small (249.1 dinner/ dozen) and pullet farms (262.4 dinner/ dozen). This result was assured with the study of Hayat (1981). She recorded that, the large scale farms have the lowest cost of production per dozen, followed by the small and medium farms, respectively.

The table shows that total returns equal to 6900, 7440 and 7800 dinner/bird in small, medium and large farms, respectively; while in pullet farms, the total return equals to 7200 dinners/bird. The high total return was recorded in the large farm size, which may be due to economies of scale, while the lowest total return was found in the small size farm. From the table, gross margins were recorded at about 1198.0, 1414.0 and 2519.0 dinner/bird for small, medium and large size farms, respectively. In pullet farms, the gross margin was found to be 971.0 dinner/ bird. The highest gross margin was obtained in the large size farm, which reflects the fact that it is higher in productivity and lesser in total production cost than other farm sizes. However, the lowest gross margin was observed in pullet farms and this may be due to the high production cost. The table shows that returns per dinners

invested were higher in larger farm sizes followed by medium sizes, small sizes and pullet farms.

### Results of coefficient of private profitability measure (CPP)

According to the results in Table 9, all farms size and pullet farms were profitable at the production level and/or the present price level. All farms have CPP greater than unity. When ranking such results, they are higher in large size farms followed by medium size, small size and finally pullet farm.

### Conclusion

In conclusion, feed cost was the main cost item in different farm types and sizes. Besides, high percentage of mortality cost and prices of day-old chicks and (4 - 5 months) hens were also high. Also, it concluded that, the large size farm was more efficient than other sizes and type of farms.

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