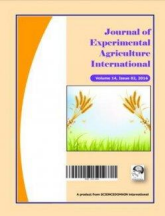

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Profitability and Constraints of Quail Egg Production in Southwestern Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Author SOA designed the study, performed all the analysis, wrote the protocol, managed the literature searches and wrote the first draft of the manuscript. Author OIB supervised the research. Both authors read and approved the final manuscript.

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ABSTRACT

The study was conducted in Southwestern Nigeria, to analyze the profitability and constraints of quail egg production in the study area. A multistage sampling technique was used in selecting 90 respondents used in the study. The data obtained were analyzed using descriptive statistics, likert scale and budgetary analysis. The result indicated that majority (66.7%) of the respondents fall below the age of 50 years, 70% were male, 81.1% of the respondents were married. Considerable number of the quail farmer had post secondary education (86.70%). The result further revealed that 56.7% used cage system of production and 48.9% had between 2-4 years of rearing experience this signify that quail farming is a new enterprise in the area. The result further stated that quails business was profitable with Operating expenses ratio, rate of return to investment, benefit cost ratio and profitability index to be 0.53, 0.84, 1.84 and 0.46 respectively.
Constraints to quails farming in the study area includes: poor marketing, high cost of feeds, poor quality of day old chick/high mortality rate and others. The study recommended that any measures geared toward reducing the cost of feeds will increase their profit margin. Government on her part is advise to assist research institutes to come out with breed of quail that are prolific and disease resistant also a good system of marketing should be established.

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1. INTRODUCTION

In Nigeria, agricultural activities comprising crop production, forestry, livestock and fishery recorded an average annual growth rate of about 5.7% and has remained the dominant sector of the economy with 41% share of the real GDP during the period between 2006-2010. The sector's activities are largely informal and dominated by use of simple technologies [1,2]. In the last two decades it has employed nearly 60% of its workforce because over 80% of the country's population living in the rural areas are directly or indirectly dependent on agriculture, crop production and livestock farming, for their livelihood [1].

Livestock sub-sector plays crucial roles in rural economy and livelihoods because it provides employment opportunities and income for the ever growing Nigerian population. It also serves as a good source of animal protein such as meat, milk and egg that are rich in the essential amino acids required for body functions. Among the various sectors of livestock, poultry production stands as a major sector in the livestock industry in Nigeria [3].

Poultry are domesticated birds kept by humans for their eggs, meat and feathers; sometimes they are kept as pets. Poultry include chicken, turkey, duck, quail and geese. [4] reported that poultry are good converters of feeds into usable protein in meat and eggs, the production cost per unit is low relative to other types of livestock and return to investment is high, thus farmers need just a small amount of capital to start a poultry farm. Poultry meat is very tender. Its palatability and acceptability to consumers is very high. It has a short production cycle (payback period), hence capital is not tied down over a long period. Poultry egg is a major product of poultry production. Chicken egg which is the most nutritious and complete food known to man is more easily affordable by the common man than other sources of animal protein [5]. An average boiled egg cost about ₦20 or ₦30, hence boiled eggs are being sold (hawked) freely at motor parks, railway stations, market places, schools and roadsides in Nigeria [4].

Rearing of domestic chickens has hitherto dominated the poultry sub-sector of Nigeria. In recent times, there are new entrants into the sector; one of the birds slowly gaining prominence is the quail bird. Quail birds are hardy birds which are suited for commercial rearing for meat and egg production under intensive management [6], quail birds are small game birds that are used for eggs and meat [7]. There are two main kinds of quails suitable for breeding namely "Japanese" quail *(Cortunix cortunix japonica)* and the "American" quail (*Coturnix coturnix*). Japanese quail are from pheasant family and are migratory birds which migrate between Asia and Europe. The Japanese quail originally became domesticated around the eleventh century as a pet song bird, but has increased in value as a food animal [8]; [9]. Quail *(Cortunix cortunix japonica)* was introduced to Nigeria in 1992 by the National Veterinary Research Institute of Nigeria [10] in Vom, Plateau State. The consumption of quail eggs and meat, and quail farming in general, has been promoted by this institute, the Nigerian Television Authority (NTA) and some national daily newspapers, especially The Nigerian Tribune.

Quails have early sexual maturity resulting in a short generation interval, high rate of lay, much lower feed and space requirements than the domestic fowl [11,3]. *Coturnix cortunix japonica* make excellent quail for beginners because they start laying eggs at a young age of approximately six weeks [12] and reach table size by five weeks of age. They thrive well in small cages and can be reared at a cheaper cost within a relatively short time [13]. Quails have no known morbid diseases and are resistant to most poultry diseases except respiratory disorder with very low mortality rate. Hence they require less vaccination, they have a high rate of egg production, between 200 – 300 eggs in 360 days [14]. Japanese quail have the capacity to lay 24 eggs each in one month and 288 eggs in a year, their meat and eggs are renowned for their high quality protein, high biological value and low fat content. thus choice meat for hypertensive patients, people with stress problems, digestive disturbance, gastric ulcer, liver problems, bronchitis, depression, panic and anxiety illness, for a greater positive effect [15,16]. They are tastier than chicken,

The average egg from mature female weighs about 10grams and contains 158 calories of energy, 74.6% water, 13.1% protein, 11.2% fat and 1.1% total ash. The mineral content includes 0.59 mg calcium, 220 mg phosphorous and 3.8

mg iron [17]. The vitamin content is 300 iu of vitamin A, 0.12 mg of vitamin B1, 0.85 mg of vitamin B2 and 0.10 mg nicotinic acid. Quail eggs are very rich in Vitamin D, antioxidants which according to [18] improve the quality of food from animal origin in terms of colour, oxidative stability, tenderness and storage properties. The nutritional value of quail eggs is 3 to 4 times greater than that of chicken eggs [19]. Quail eggs are also known to stimulate growth, increase sexual appetite, stimulate brain functions which improve intelligence quotient and generally rejuvenate the body. Consumption of quail eggs fortifies the woman's body during pre and post-natal periods as well as after surgery and radiotherapy [20]. It also improves the quality of breast milk. Furthermore, quails are used as experimental animals for biological research and for producing vaccines against many diseases in large scale [21].

With the characteristics of quails, there are some challenges facing its production. [22] revealed some constraints facing quail egg production which include stock procurement, high cost of feeding, pest and diseases, poor market, among others. Since the introduction of modern poultry in Nigeria decades ago, it has passed through many stages of development, each with its problems [23]. Inadequate information and background knowledge on the primary determinants of market supply and demand of eggs make many prospective poultry farmers skeptical to venture into the business [24].

This was affirmed by the findings of [25] that the several problems such as high cost of feed, other production costs, diseases and marketing problems plaguing the poultry production industry made it difficult for existing firms to expand while new ones were reluctant to go into the business. [26] observed that the price of egg does not vary proportionately with the rise in prices of feed and the cost involved in commercial poultry production enterprise. Moreover, in line with [27] and [28], some of the major problems of poultry production in Nigeria is that of low productivity and inefficiency in resource allocation and utilization. Improvement of efficiency and productivity can be some of the most effective methods to achieve increase in poultry production. Costs and returns are important considerations as they are used to evaluate the efficiency or performance of the business. [29] suggested that poultry farmers should pay particular attention to major cost components by seeking a way of maximizing effectiveness, quality, method and utilization of materials.

With the profitability potentials and health benefits of quail birds and its products, a lot of poultry farmers are yet to spring up with intensified husbandry while those in it are contemplating whether to continue or not. Therefore, there is need to fill this knowledge gap and widen the scope of study on quail egg production by analyzing the actual costs and returns of this relatively underutilized poultry species called quail with the constraint associated with its production.

It is against this background that this study examined the profitability of quail egg production with factors that affect it in the southwestern part of Nigeria. This study was designed to provide answers to the following research questions: what are the socio-economic characteristic of the quail egg producers? what are the costs and returns of quail egg production? and what are the constraints facing quail egg production?

The objectives of the study are to: describe the socio-economic characteristics of the quail egg producers in the study area; describe the constraints that face quail egg enterprise in the study area and to estimate the costs and returns of quail egg production.

2. CONCEPT OF PROFITABILITY

Profit is an excess of revenues over associated expenses for an activity over a period of time. Terms with similar meanings include 'earnings', 'income', and 'margin'. Lord Keynes remarked that 'Profit is the engine that drives the business enterprise'. Every business should earn sufficient profits to survive and grow over a long period of time. It is the index to the economic progress, improved national income and rising standard of living. No doubt, profit is the legitimate object. Thus, profit is not just the reward to owners but it is also related with the interest of other segments of the society. Profit is the yardstick for judging not just the economic, but the managerial efficiency and social objectives.

Profitability is the ability to make profit from all the business activities of an organization, company, firm, or an enterprise. It shows how efficiently the management can make profit by using all the resources available in the market.

However, the term 'Profitability' is not synonymous to the term 'Efficiency'. Profitability is an index of efficiency; and is regarded as a measure of efficiency and management guide to greater efficiency. Sometimes, the terms 'Profit' and 'Profitability' are used interchangeably. But in real sense, there is a difference between the two. Profit is an absolute term, whereas, the profitability is a relative concept. However, they are closely related and mutually interdependent, having distinct roles in business [30].

Profit refers to the total income earned by the enterprise during the specified period of time, while profitability refers to the operating efficiency of the enterprise. It is the ability of the enterprise to make profit on sales. It is the ability of enterprise to get sufficient return on the capital and employees used in the business operation.

The Agricultural Marketing Resource Centre (AMRC) on its analysis of agriculture and rural development defined profit as the excess of income over costs. Profitability was described as the measure of the returns a business creates after deducting operating costs and other expenses from income divided by inputs. Though determining profitability may be the most challenging task, it is also a very rewarding part of a new agricultural enterprise. The use of the income statement and sensitivity analysis helps to determine profitability of an enterprise. An income statement measures profitability by recording the costs of production and the value of production for a set period of time, usually a year [31]. Chase [32] noted that producers often try to maximize their income by selling produce directly to consumers, a situation where the highest price of the product can be received. Even though this strategy may allow producers to achieve the highest gross revenue, it may not yield the highest profit because of the differences in transaction costs.

Profitability analysis is a common tool used by many managers of different enterprises to make decisions on whether to embark on an enterprise or not. Many studies have been done concerning profitability of different enterprises in different fields. Few studies were done on profitability of quail egg production in Nigeria; For example, a study that was carried out on the profitability of quail bird and egg production in Imo state by [20] suggested quail bird and egg production is a profitable business and greater profits could be achieved by enlarging the scale of operation, also [22] revealed quail egg production as a profitable business in Bauchi Local Government Area, Bauchi State, Nigeria

2.1 The Challenges of Quail Production in Nigeria

In spite of the exceptional attributes and advantages of keeping Japanese quail, its production in Nigeria is still comparatively rudimentary. Among the major challenges of quail production in Nigeria are high cost of concentrates, non-readily available market when the farmers are to sell their stock and inadequate knowledge and information about the advantages of eating quail meat and egg. Domesticated quail do not have the tendency for brooding and hence eggs must be incubated under broody hen or by artificial incubation [33]. However, because of their short generation interval and an average production of 250 – 280 eggs per bird yearly, artificial incubation is the surest choice for commercial farmers. The high proportion of eggs discarded due to infertility and embryonic mortality in hatcheries have been associated with low quality facilities and poor incubation techniques [34]. Little is known about the factors that affect the fertility and hatchability of quail eggs [35]. However, it is reasonable to expect that many of the common factors known to influence incubation success in eggs of commercial poultry may likely affect quail eggs hatchability [36].

3. METHODOLOGY

The study was carried out in the southwestern region of Nigeria. The southwestern Nigeria comprises of Oyo, Osun, Ogun, Ondo, Ekiti and Lagos States. The zone lies between longitude 2° 42' and 6° 03' East of Greenwich meridian and latitude 5° 49' and 9° 17' North of the Equator [37]. The region is bounded in the North by Kwara and Kogi States and in the East by Edo State. In the West, the study area is bounded by the Republic of Benin and in the South by the Atlantic Ocean. The four main agricultural zones in the region are the swamp on the Atlantic coast, tropical rainforest, the derived savannah in the middle and the guinea savannah in the North. Quail egg production is new in the region. The study employed multistage sampling technique with the first stage involving the purposive selection of three States from the study area based on prior survey on their quail egg production potentials through the Poultry Farmers Association and the National Veterinary Research Institute (NVRI)

Ikire, Osun State. At the second stage, six Local Government Areas (LGAs) were purposively selected from each State based on their quail egg production. At the third stage, five quail egg farmers were selected from each LGA using snowball technique to have a total of ninety respondents.

Pretested structured questionnaire was used to collect data from the quail farmers, data collected included socio-economic characteristics of the farmers, price and quantity of inputs used and output produced and also problems associated with quail egg production. Data were collected from April to September 2015. Descriptive statistics was used to describe socio economic characteristics and also identify production constraints, likert scale was used to rank the constraints in the order of importance. The score of 5 was given to the most affecting constrain and 1 to the least affecting constraint and the farmers were asked to rank. A budgetary analysis was used to determine the profitability of production.

4. RESULTS AND DISCUSSION

The mean age of the farmers was about 45 years of a standard deviation (11.86) with minimum age of 22 years and maximum age of 70 years. The age distribution showed that about 66.7% of the respondents were below 50 years of age implying that the respondents were not too old to face the challenges which quail egg farming in a developing country like Nigeria requires (Table 1). This finding agrees with the findings of [38] and also with that of [39]. About 81.1% of the respondents were married, 13.3% single and 5.6% widowed, the finding is almost in consonance with that of [22]. Majority (70.0%) of the quail egg farmers were male, this agrees with [39] who reported that more male was involved in poultry egg production. The heavy participation of male could be due to the rigor and stress which many female farmers might not be able to cope with. Majority (62.2%) of the farmers had less than or equal to five persons (≤ 5) in their household, with mean household size of 5 persons. Majority (86.70%) of the respondents had post-secondary education, while those who had only secondary and primary educations were 5.60% and 7.80% respectively. The mean level of education was 16.90; this indicated that majority of the farmers were literates, this agrees with the findings of [39] which indicated that high literacy is evident among poultry farmers in Ogun State. Civil servants with 37.8% had the highest frequency of 34 of the respondents while those without off-farm occupation, artisans, retirees, traders, clergy men and politicians have 31.1%, 12.2%, 8.9%, 5.6%, 2.2% and 2.2% respectively, this is similar to the result of [22] where it was shown that 66.67% of the sampled farmers are civil servants majority (48.9%) of the farmers having between 2 and 4 years of experience which shows that the enterprise is still new in the study area.

Majority (86.7 %) of the farmers in the study area sold their quail egg and spent layers through individual contacts while 12.2% and 1.1% of the respondents sold their quail eggs and spent layers through open market and farm gates respectively. Cage system was commonly used in the study area. It had the highest percentage (56.7%) This was also confirmed by [38].

4.1 Constraints

With the aid of a likert scale poor marketing/unstable pricing system is identified as the major problem facing the quail egg production enterprise in the southwestern region of Nigeria; this is supported by [40] in their study on Japanese Quail (*Coturnix coturnix japonica*) Husbandry, followed by high cost of feed, this is another important constraint that bore into farmers' profit and their coping strategy for this problem is formulation of local feed. Poor quality of day old chick/high mortality rate is another important problem that is managed with good brooding system; inadequate funding, Campaign against quail egg by medical practitioners, Poor awareness, Short egg shelf life, Wild nature of the birds and Early stoppage in laying.

4.2 Costs and Returns (₦) to Quail Egg Enterprise

The mean value of the total variable and fixed costs were ₦459,382.12 and ₦11,738.37 respectively while the mean value of the total cost was ₦471,120.49. Net income was ₦394,463.43 which was measured by subtracting total cost from total revenue indicating that the enterprise is profitable. Subtracting the total variable cost from total revenue, the gross margin equals ₦406,202.23. The value of sales from egg accounted for 92.73% of the total revenue while spent layers covered 7.27%.

Profitability ratios included in this study are profit index which gives a value of 0.46 indicating that

from every ₦1.00 generated from the enterprise, a net income of ₦0.46 is earned; the rate of return gives 0.84 which implies that from every ₦1.00 invested into the enterprise, a net income of ₦0.84 is realizable and the operating expenses ratio whose value is 0.53 shows that from every ₦1.00 generated from the enterprise ₦0.53 is invested as a running cost into the

Table 1. Socio-economic characteristics of quail egg farmers in the study area

Characteristics	Frequency	Percentage	Mean
Age (years)			
≤ 30	13	14.5	
31-40	20	22.2	45.36
41-50	27	30.0	
51-60	19	21.1	
> 60	11	12.2	
Marital status			
Married	73	81.1	
Single	12	13.3	
Widowed	5	5.6	
Sex			
Male	63	70.0	
Female	27	30.0	
Household size			
≤ 5	56	62.0	4.82
6-10	32	35.6	
>10	2	2.2	
Level of education(year)			
< 6	5	5.6	
7-12	7	7.8	16.90
13-18	52	57.8	
19-24	26	28.9	
Off-farm occupation			
No off-farm occupation	28	31.1	
Artisan	11	12.2	
Civil servant	34	37.8	
Clergy	2	2.2	
Politician	2	2.2	
Retiree	8	8.9	
Trading	5	5.6	
Quail production experience			
<2	30	33.3	
2-4	44	48.9	3.32
4-6	11	12.2	
>6	5	5.6	

Source: Field survey, 2015

Table 2. Production system and marketing of quail eggs' in the study area

Characteristics	Frequency	Percentage
Production system		
Cage	51	56.7
Deep litters	39	43.3
Method of marketing		
Open market	11	12.2
Individual contacts	78	86.7
Farm gate	1	1.1

Table 3. Results of likert scale analysis- constraints in quail egg production

Constraints	Sum	No	Mean	Rank
Poor quality of day old chick/high mortality rate	227.00	90	2.52	3rd
High cost of feeding	248.00	90	2.76	2nd
Inadequate funds	224.00	90	2.49	4th
Poor marketing	347.00	90	4.69	1st
Short egg shelf life	25.00	6	0.27	7th
Poor awareness	51.00	11	0.57	6th
Wild nature of the birds	12.00	4	0.13	8th
Early stoppage in laying	12.00	3	0.13	9th
Campaign against quail egg by medical practitioners	90	30	1.00	5th

Source: Field survey, 2015

Table 4. Enterprise budget (₦) for the production of quail egg for a cycle production (10 month) period

S/N	Item	Mean amount (₦)	Percentage of revenue/costs
1	**Revenue:**		
i	Eggs (1459.321 @550 per crate)	802,626.55	92.73
ii	Spent layer (170 @ 370.34 per bird)	62,957.80	7.27
a	Total Revenue (TR)	865,584.35	100
2	**Variable costs:**		
i	Stocking	97,143.78	20.62
ii	Feeding	290,466.70	61.65
iii	Labour	57,291.11	12.16
iv	Transport	2,096.74	0.45
v	Medication	4,305.54	0.91
vi	Utility and other costs	8,078.25	1.72
b	Total Variable Costs (TVC)	459,382.12	97.51
c	Gross Margin (GM) = (TR – TVC)	406,202.23	
3	**Fixed costs:**		
i	Rent on building	6,273.33	1.33
ii	Depreciation on cage	3,790.74	0.80
iii	Depreciation on other fixed inputs	1,674.30	0.36
d	Total fixed costs (TFC)	11,738.37	2.49
e	Total costs (TC) = (TFC + TVC)	471,120.49	
f	Net Farm Income (NFI) = (TR – TC)	394,463.43	
g	**Rate of return on investment (ROI)=f/e *100**		0.84
h	**Operating Expenses Ratio (OER) = b/a**		0.53
i	**Benefit Cost Ratio (BCR) = a/e**		1.84
j	**Profitability index (PI) = f/a**		0.46

Source: Data analysis, 2015

investment. Also, there is a benefit cost ratio of 1.84, implying that for every ₦1.00 invested on quail egg production, ₦1.84 is realizable as income. All these ratios confirm that quail egg farming is a profitable enterprise.

5. CONCLUSION

Quail-egg production was a profitable in the study area and most of the farmers identified poor marketing system as the major problem

followed by high cost of feeding, poor quality of day old chick/high mortality rate, inadequate fund and so on. There is need for farmers to reduce their cost of feeds by compounding their feed because doing this will increase their profit margin, government on her part is advise to assist research institutes to breed quail birds that are prolific and disease resistant. The government should provide loan with no or very low interest for the farmers to solve the problem of funds and also a good system of marketing should be established.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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