

Profitability of Indigenous Chicken: The Case of Producers in Makueni County, Kenya

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The research is financed by Kenya Agricultural Productivity and Agribusiness Project (KAPAP)

Abstract
Indigenous Chicken(IC) (*Gallus domestica*) is increasingly becoming an essential component of diets in urban centers. This increase in demand is accompanied by an increase in production by smallholder farmers. These farmers rely on the indigenous chicken for food security, household income, employment and quick funds in emergencies. The profit associated with the production of indigenous chicken, constitutes part of the contribution of the Agriculture sector to the Gross Domestic Product (GDP) of Kenya. However, in Makueni County there is little information on the amount of profit from production of IC or its relationship with socioeconomic factors. The objectives of this study was to calculate the profit of IC in Makueni and to determine the relationship between socio economic factors and profit from IC.A total of 130 households were sampled using multi stage sampling after which data was collected using a pre tested questionnaire in a house hold survey. These data was then analysed using budgetary analysis and multiple regression in STATA 11. The results showed that the profit from IC production in Makueni was Ksh. 5347/100 birds (1US$= Ksh86.70).Age, education, access to credit, flock size, price and years in farmer group had a significant relationship with the profit. Therefore it is recommended to form marketing groups that will engage in contractual agreements with final buyers of indigenous chicken.
Key words: Indigenous chicken, food security, profitability, flock size, credit

1.0Introduction

1.1 Background information

There has been an increased consumption of poultry meat in the world (Hazell, 2007).According to Delgado et al. (1999), this increase in consumption is partially attributed to the recent developments in the production, marketing and consumption of Indigenous Chicken (IC) *(Gallus Domestica*).There has been a rise in the demand for IC meat in urban and peri urban areas, where consumers prefer IC meat to red meats (Delgado, 1995; Upton, 2000). The per capita consumption of meat has risen from 14.9 Kg in 1991 to 16 Kg in 2007 and is expected to reach 22 Kg in 2050 (FAO, 2009).The rise in demand for IC meat has been coupled with a switch by farmers to the IC enterprise from other enterprises (Bongani and Masuku,2013). This is due to low capital needs of IC, low operating costs and low level of technical knowhow needed to start the IC enterprise (Okeno et al.,2011;Okitoi et al.,2006).The IC is also a source of income and food security for many households, which are mainly resource constrained (Kitalyi,1998;Meseret et al,2011).Therefore rearing of IC is becoming a common feature in most of the developing countries in the world including Kenya (Nyaga,2007;FAO,2013).

Agriculture is closely linked to the economic development of Kenya (Gitau, 2009).Kenya gets 25% of its Gross Domestic Product (GDP) from the Agriculture sector, with 7% of the GDP from Livestock (RoK, 2010a; RoK, 2010b). Agriculture provides employment opportunities to 70% of Kenyan citizens in the rural areas and 5% in IC sector (Kimani, 2006). The other important roles of the agriculture sector include the provision of food security and incomes to households in Kenya(Rok,2010a;Kingori et al,2007).Therefore it is on this basis that agriculture has been identified as one sector that will deliver the 10% growth in economy of Kenya under the vision 2030(Gitau, 2009).

The livestock sector is a vital component of the agriculture sector in Kenya (Okello et al.,2011; Mailu et al,2012).This sector is made of dairy, beef, poultry, camel, bees and emerging livestock e.g. fisheries(RoK 2010a). The IC constitutes 76% of all poultry in Kenya with a population of 31 million birds and an average of 13 birds per household (Nyaga, 2007).Therefore the contribution of IC to the livestock sector is significant (RoK, 2010a).

Makueni County in Kenya is found in the ASALs (Arid and Semi Arid Lands) areas which are characterised by erratic rainfall (ACF-USA, 2012).This phenomenon leads to cases of crop failure and exposes the residents to cases of food insecurity (RoK, 2012).Consequently there is a need for an alternative strategy to cope with this condition. The IC has been noted to be adaptable to harsh conditions with little input requirements. Secondly, the IC has little space requirements, quick income returns and low diseases incidence .Thirdly IC can easily be sold

off for money during emergencies. Finally IC provides a rich source of protein, which addresses food insecurity .Consequently the IC enterprise provides an exit strategy from poverty and leads to improves livelihoods However, in Makueni County there is little information on the amount of profit from production of IC or its relationship with socioeconomic factors. The objectives of this study were to calculate the profit of IC in Makueni and to determine the relationship between socioeconomic factors and profit from IC.

1.1 Literature review

Siyaya et al. (2013) analysed the profitability of indigenous chicken in Swaziland, using cost benefit analysis and Cobb Douglas production function. The results showed that profitability was affected by feeds cost, market price, stock size, number of birds sold and consumed. Kumar et al. (2013) analysed profitability of indigenous chicken in Bangladesh using budgetary analysis. They reported that indigenous chicken were profitable in India and vaccination significantly affected profitability. Oladeebo and Ojo (2012) assessed the profitability of poultry production in Nigeria using a budgetary analysis and ordinary Least squares regression. They found that profit depended on the scale of production and was significantly affected by veterinary costs.

Olasunkanmi et al. (2009) reported that fully integrated poultry had higher gross margin compared to non integrated poultry sector in Nigeria. This study used a number of profitability indicators namely: Value added-sales ratio, Rate of return on investment and Rate of return on fixed costs. All of these indicators were found to increase with vertical integration. Tuffor and Oppong (2012) analysed profit efficiency in broiler production in Ghana using the Cobb Douglas production function. The results showed that price and experience increased profitability, while labour and operating as an individual reduced the profitability. A study by Menge et al. (2005) used a bio economic model to assess indigenous chicken breeding under different production systems. The results showed that free range system was most profitable, while the confined system was the least profitable.

Sumy et al. (2010) assessed the productive performance of indigenous chicken in Bangladesh. The results showed that there was profitability with a Benefit Cost Ratio of 1.60 and 1.61 in two of the study areas. Natukunda et al. (2011) reported that indigenous chicken were profitable in Uganda. The profitability of indigenous chicken was assessed using gross margin analysis and ordinary least squares (OLS).The average cost, distance to the nearest market, access to extension, education level and experience had an effect on profitability. Zeberga (2010) analysed the profitability of poultry in Ethiopia using gross margin analysis and reported that there was profitable enterprise. There was a low input requirement and in the production of the birds. Olasunkanmi (2008) assessed the economic performance of commercial poultry birds in Nigeria. The results showed that profitability was determined by combination of enterprises and the scale of operations.

2.0 Materials and methods

2.1 Study area

Makueni District, found within Makueni County, lies between Latitude 1^0 35′, South and Longitude $37^0$10′ East and $38^0$30′ East. The District covers 8,009 km^2 with an altitude of 600m – 1,900m above sea level. The district has rainfall variability with an annual range of 800 – 1,200mm per year in the hilly areas and less than 500mm per year in the other regions. The annual mean temperature range in the District is 20.2^0C – 24.6^0C (RoK, 2005).The study area has a comparative advantage in the production of IC since it is found in an ASAL area. The ASAL area is characterised by erratic rainfall and crop failures (ACF-USA, 2012).The main economic activities in Makueni district include dairy farming, ranching, mixed crop production. The production of crops is mainly under rain fed systems with patches of irrigation in some areas (RoK, 2005).Approximately (60%) of the population lives below the poverty line (ACF-USA, 2012).

2.2 Data and sampling design

The data collection was done by trained enumerators from Makueni County between April and June, 2013. This was aimed to overcome the challenges in language and also due to their familiarity with the locality. The primary data was obtained from producers of IC in Makueni County covered information for the period April 2012 to April 2013. The pretested structured questionnaires were used to obtain information on socioeconomic characteristics of producers involved in the IC production. Secondary data was also obtained from the Ministry of Agriculture (MoA) and the Ministry of Livestock and Fisheries Development (MoLFD) regarding IC production and marketing in Makueni County in particular. The secondary data provided was also used in description of the study area and for calculating the sample size.

A Focus Group Discussion was conducted to supplement information from the household level. The focus group was made of selected farmers from farmer groups found in Makueni County. These farmers were involved in indigenous chicken production and marketing.

A multistage sampling design was used in the study. This was comprised of three stages. First, a purposive random sampling was used to select Makueni District from among IC producing areas in Kenya. Secondly, random sampling was used to select three regions (divisions) from other divisions in Makueni District. These divisions were Kee, Kaiti, and Wote in Makueni from where households were selected using random sampling technique. A total of 130 households were sampled from Kee (18), Kaiti (62) and Wote (50) based on the

weighted average method.

2.3 Data analysis

2.3.1 Gross margin analysis

Gross Margin Analysis was used to calculate profitability of IC to producers in Makueni. According to Odemenem and Otanwa (2011) gross margin analysis is preferred because it allows for easy enterprise selection, establishment of net farm income and is useful in subsistence enterprises with small fixed income. The gross margin analysis has been used in studies (Kumar et al., 2013; Oladeebo and Ojo, 2012, Olansunkanmi et al., 2009; Menge et al., 2005) to assess the profitability of indigenous chicken.

The first step was to calculate the total the variable costs (TVC) involved in production of IC. The second step was to determine the value of the housing and equipments. Consequently depreciation was calculated at 10% of the respective values to obtain the Total fixed costs (TFC). The total variable costs (TVC) and total fixed costs (TFC) were then added to obtain the total costs (TC).The third step involved the calculation of total revenue (TR) from the sales of eggs and IC. Subsequently, the total variable costs (TVC) was deducted from the total revenue (TR) to obtain the Gross Margin (GM).Finally the profit was calculated by deducting the total fixed cost from the Gross Margin(GM). The gross margin analysis was done for a flock size of 100 birds. The formula that was used for calculating the gross margin was based on Barnard and Nix (1979) Gross margin analysis for crops and livestock. The following were the steps that were followed in calculating the profit of IC:

Total Cost (TC) = TVC + TFC

Gross Margin (GM) = TR-TVC

π = GM – TFC

Where: -π =Profit

Total fixed cost (TFC) =Summation of all fixed costs

Total Variable Cost (TVC) = Summation of all variable costs

Total amount realized (TR) = Total amount from the IC produce

2.3.2Model specification

The data collected from the 130 households was subjected to series of statistical tests. These included tests to detect auto correlation, multicollinearity and heteroscedasicity. The Variance inflation Factor (VIF) was used to detect multicollinearity, while the Durbin Watson test was used in detecting heteroscedasticity. The data was confirmed to have none of the problems that were likely to cause inconsistent estimates or wrong coefficient signs. The choice of the exponential log equation was consequently based on the statistical significance, a priori expectation of the coefficient signs and economic theory.

The effect of the household's socioeconomic characteristics on the profit from production of IC was analysed using multiple regression technique. This was done using STATA software for analysis. The functional form of the model that was used in this study was expressed as: $LnY=f(X_1, X_2....X_{10}) + e_i$.

According to Green (2012) a linear regression model consists of a deterministic part and a disturbance term, which accounts for the factors that cannot be accounted by the independent variables. The model which expressed the hypothesized relationship between the dependent variable and the independent variables was expressed as follows:

$$Ln\ Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\beta_6X_6+\beta_7X_7+\beta_8X_8+\beta_9X_9+\beta_{10}X_{10}+e_i$$

Where Ln Y represented the natural logarithm of profit and $(X_1...X_{10})$ represented the other independent variables as shown in the Table 7.The $\beta_1...\beta_{10}$ represented the coefficients of $(X_1...X_{10})$ respectively, while β_0 represent the intercept and e_i represented the stochastic error term. The coefficients represent the percentage change in Y from an absolute change in X. This can be represented as $\frac{\partial Y}{\partial X}=100\beta$.

3.0 Results and Discussions

3.1 Households socio economic characteristics

The results of the socioeconomic characteristics in the study area are shown in Table 1.The table shows the variable, mean of the variable, standard deviation, minimum and maximum value. The household heads had a mean age of 44 years as shown in Table 1.There were (68%) of these household heads that were male and 46% of them had a primary level of education. However, 24% of them had secondary level of education and 9% had a tertiary level of education. It is notable that 21% of the household heads were illiterate.

The average family size of the sampled households was 6 members (Table 1). The smallest household had 2 members while the largest had 11. The average land size owned by these households was 4 acres. The smallest land size owned was 0.1 acres while the largest was 8 acres. As shown in Table 1 the average amount of credit accessed per household for IC production was Ksh 4,777.The maximum credit accessed by household head was Ksh 70,000 while the some households did not borrow any cash. Out of the sampled households 32% had access to credit while 68% did not have access to credit (Table 2).

The results in Table 2 showed that 31% of the households had access to IC market information. Majority of the households (69%) did not have access to IC market information. The average distance to the market from the households was 6 Km (Table 1). The minimum distance to the markets from the households was 0.5 Km. In contrast the maximum distances to the market were 15 Km. The distance of the household to all weather roads on the other hand was 3 Km while the maximum distance was 11Km.

3.2 Profitability of indigenous chicken

The result in Table 3 shows the main components of the annual IC production costs for 100 birds. The Total cost was Ksh 109, 283, which was constituted of a Total variable costs of Ksh 106,175 and a Total fixed cost were Ksh 3,108(Table 3). Therefore from the results shown in Table 3 the main components of the variable costs were Litter cost (37%), feeds cost (32%), medication costs (15%) and cost of getting a day old chick (9%) respectively. On the other hand the main components of the fixed costs were depreciation on housing (2%) and depreciation on equipments (1%). The housing cost and equipment cost were used to estimate fixed cost and were depreciated at 10% on annual basis. The results in Table 7 show that most production costs had a statistically significant and negative correlation with the profit from IC. Table 4 shows, the Gross profit for a flock size of 100 birds was Ksh 8,455.This was the difference between a Gross income of Ksh 114,630 and Total variable cost of 106,175 shown in Table 3.

The rearing of indigenous chicken in Makueni was found to be profitable as shown in Table 4. These results showed a profit of Ksh 53 per bird. The gross margin of Ksh 8,455 shown in Table 4, gave a gross profit of Ksh 85 per bird. These results unlike those of Sumy *et al*. (2010) did not apply a Benefit Cost Ratio (BCR) but similar to it showed that rearing of IC was a profitable enterprise; however the same approach used by Sumy *et al.* (2010) in analysing profitability of local chicken was adopted.

3.2.2 Effect of Socioeconomic characteristics on profitability

The age of the household head was found to have a significant effect on profitability ($p< 0.05$).As shown in Table 6, an increase in the age of household head by one year l leads to an increase in profit by 17% (Table 6).However this interpretation is made considering the law of diminishing returns after the mid forties (Luong and H□bert, 2009). This result agree with those of a study by Olumyowa and Abiodan(2011) which showed that experience had a significant and positive effect on the profitability of broilers. Age is also used as a proxy for experience in most studies (Luong and H□bert, 2009).

The Education level of the household head had a significant effect on the profitability of IC ($p< 0.05$).Those house hold heads that were literate increased profit by 55% (Table 6).The increase in profit may have been due to the ability of educated house hold heads to interpret and use cost effective production techniques. Consequently there was reduced production costs and increased their profit levels. This result agree with those of Natukunda et al. (2011) that showed education had a positive effect on profitability of IC in Kamuli, Uganda.

Access to credit by households had a positive and significant effect on the profit from IC ($p<0.05$).The households that had access to profit increased their profits by 39% (Table 6).This increase in profit may have been due to ability to buy and use efficient inputs that reduced on wastages and production costs. This result agrees with those of Ashaoulu et al. (2011) that showed credit access resulted in higher productivity and profits for the farmers in Nigeria.

The flock size had a positive and significant effect on the profitability of IC ($p< 0.05$) .This indicated that an increase in flock size by one IC caused an increase in profit by 50% (Table 6).The increase in flock size may have lead to an increase in profit due to economies of scale. A study Olasunkanmi (2008) showed that commercial poultry production in Nigeria that increasing the flock size increased the profit.

The market price had a significant and positive effect on the profit of IC ($p< 0.05$).This showed that an increase in the market price of IC by Ksh.1 lead to an increase in profit by 140% (Table 6).This may have been due to the fact that the market price was high compared to the unit cost of producing an IC. Therefore this resulted in a surplus which was the profit. This result agrees with those of Bongani and Masuku (2013) that showed a positive effect of market price on profitability of IC in Swaziland.

The number of years that a producer belonged to a farmer group had a positive and significant effect on the profitability of IC ($p<0.10$).The results showed that increasing the number of years that a producer had belonged to a group by one year lead to an increase in profitability by 27% (Table 6).This increase may have been due to collective marketing by groups that lead to economies of scale which reduced some production costs. This result agrees with those of Tuffor and Oppong (2012) which showed that farmers who operated poultry business alone had less profit efficiency compared to those that operated as partnerships.

4.0 Conclusion and Recommendations

The production and marketing of indigenous chicken provides food security, employment and income to households in Makueni County. However the income from the indigenous chicken production and marketing has not been quantified .In addition the socio economic characteristics that affect it were unknown. The results of the study showed that the household heads had an average of 44 years, 68% were male and 46% had primary

education. These households had an average of 6 members, owned 4 acres, were located 6 Kms from the nearest market and received a credit of Ksh.70, 000.There were only 31% of the household that had access to market information.

The production of IC in Makueni was profitable to the households. The main component of the production cost were litter cost (37%), feed cost (32%), medication cost (15%), housing cost (2%) and equipment cost respectively. These costs had a significant effect on the profit and were not sustainable at the current levels. The Age, education, access to credit, flock size, price of IC and years of belonging to a farmer group had a positive and significant effect on profit. Therefore an increase in each of these independent variables leads to an increase in profit. These also mean that the current levels of these independent variables are favorable to the profitability.

Therefore it is recommended that, in order to enhance this profit, the use of collective marketing should be adopted. The collective marketing should be done through farmer groups which will assemble IC from the producers and channel it to the high value markets through contractual agreements. These agreements will enhance profit of farmers and ensure that the producer will be insulated from problems associated with untimely production, credit access, price fluctuations and inconsistent supply.

Acknowledgement

The authors appreciate the funding provided by the Kenya Agricultural Productivity and Agribusiness Project (KAPAP).In addition we would like to acknowledge the technical support from the District Livestock Production Officer (DLPO) and staff in Makueni, Director of Veterinary Services (DVS) in Nairobi. Finally we appreciate the technical input from the ICVC team, School of Agriculture and Enterprise Development at Kenyatta University and enumerators at Makueni.

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Appendix

Table 1: Socioeconomic characteristics of households

Variable	Mean	Std. Deviation	Minimum	Maximum
Age of Household head (years)	43.89	13.77	21.00	86
Education of household head (0=Illiterate 1=literate)	0.80	0.40	0	1
Family size (Number)	6.07	2.17	2	11
Land size (acres)	4.00	2.22	0.1	8
Total indigenous chicken owned (Number)	13.03	9.15	0	50
Distance to main road (Kms)	3.24	2.33	0.30	11
Distance to market (Kms)	6.45	3.43	0.50	15
Cash borrowed for IC production (Ksh)	4,776.54	6,828.05	0.00	70,000

Source: Survey Data (2013)

Table 2: Socioeconomic characteristics of households

Variable	**Percentage of households**
Sex of Household heads	
Male	68%
Female	32%
Age of Household heads(years)	
22-31	12%
32-41	26%
42-51	33%
52-61	22%
>=62	7%
Access to market information	
Yes	31%
No	69%

Source: Survey Data (2013)

Table 3: Production costs (Flock size of 100 birds)

Item	**Gross Cost (Ksh)**	**Depreciation (10%)**	**Total Cost (Ksh)**
Day old chick	10000	-	
Litter cost	40000		
Feed cost	35053	-	
Labour cost	4430	-	
Medication cost	16692	-	
Total variable cost	**106175**	**-**	**106175**
Housing cost	25154	2515	
Equipment cost	5931	593	
Total Fixed Cost		**3108**	**109283**

Source: Survey Data (2013)

Table 4: Profit calculations

Item	**Total (Ksh)**
Selling eggs	24000
Selling chicken	90630
Gross income	114630
Less Total variable costs (Table 3)	106175
Gross margin	**8455**
Less Total fixed cost (Table 3)	3108
Profit	**5347**

Source: Survey Data (2013)

Table 5: The independent variables used in the regression

Variable	Expected sign	Units
Profit		
Age of household head	+/-	Years
Sex of household head	+/-	0=female 1=Male
Education level of household head	+	0=Illiterate 1=Literate
Access to credit	+	Kenya Shillings
Distance to nearest market	-	Kilometer
Flock size	+	Number
Market price	+	Kenya Shillings
Years in group	+	Years
Distance to main road	-	Kilometer
Other livestock units	+/-	Number

Table 6: Effect of socioeconomic characteristics on profit

Variable	Coefficient	Std. Err.	T	P>t
Age of household head	0.017449	0.008473	2.06	0.042**
Sex of household head	0.225465	0.200278	1.13	0.263
Education level of household head	0.551268	0.24785	2.22	0.029**
Access to credit	0.22414	0.106844	2.1	0.039**
Distance to nearest market	-0.01173	0.027644	-0.42	0.672
Flock size	0.50009	0.246059	2.03	0.045**
Market price	1.403104	0.669817	2.09	0.039**
Years in group	0.266784	0.154655	1.73	0.088*
Distance to main road	-0.00766	0.048881	-0.16	0.876
Other livestock units	-0.00181	0.001256	-1.44	0.154
Constant	-0.46465	3.97203	-0.12	0.907

Source: Survey Data (2013) * significant at 10%, ** significant at 5%, *** significant at 1%

Table 7: Partial and semi partial correlation of profit with variables

Variable	Partial Corr.	Semi partial Corr.	Partial Corr.^{2}	Semi partial Corr.^{2}	Significance Value
Breeding stock	-0.1779	-0.0985	0.0316	0.0097	0.0618*
Equipment cost	-0.19	-0.1055	0.0361	0.0111	0.0458**
Feed cost	-0.2108	-0.1175	0.0444	0.0138	0.0264**
Labor cost	-0.1065	-0.0584	0.0113	0.0034	0.266
Losses death	-0.1796	-0.0995	0.0323	0.0099	0.0593*
Housing cost	0.2071	0.1154	0.0429	0.0133	0.0292**
Medication cost	-0.2776	-0.1575	0.077	0.0248	0.0032**
Total cost	0.0434	0.0237	0.0019	0.0006	0.6513

Source: Survey Data (2013) *significant at 10%, **significant at 5%, *** significant at 1%

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