Socio-economic Determinants of Flock Size in Small-scale Broiler Production in Capricorn District of Limpopo Province, South Africa

U. Luvhengo[1], M.P. Senyolo[2] and A. Belete[3]

University of Limpopo, School of Agriculture and Environmental Sciences,
Department of Animal production and Agricultural economics, Turfloop Campus,
Private Bag X1106, Sovenga 0727, South Africa
Telephone: [1]<+27-72-771-5376>, [3]<053-994-9800>, Fax: [3]<086-762-9504>
E-mail: [1]Abenet.belete@ul.ac.za >

KEYWORDS Flock Size. Food Security. Poultry. Production Problems. Regression Analysis

ABSTRACT This study aimed at determining the impact of socio-economic variables on flock sizes and identifies production problems encountered by small-scale broiler production in Capricorn District, Limpopo province. The study hypothesised that, socio-economic variables are significant determinant of flock sizes. Disproportionate stratified random sampling was used to select 60 farmers out of 330. Collected data was analysed using SPSS. Findings from the analysis reveals age (β_1=-0.741), gender (β_2=-0.807), educational (β_3=0.584), experience (β_4=0.326), credit (β_5=-0.515) and transportation (β_6=-0.854) significantly affect the flock sizes of small scale farmers. However, hired labour and government support were found to be insignificant in influencing flock size. High feed and chick costs, unavailability and inconsistent supply of farm inputs, lack of capital and poor extension support were other constraints. In conclusion, if production constraints mentioned above are properly addressed broiler flock size amongst small-scale broiler producers in the study area will increase.

INTRODUCTION

The challenges of food insecurity in African countries have continued to receive greater attention from Governments worldwide. A number of conferences on human nutrition worldwide have pointed out that the most critical element in African food basket crises is animal protein (FAO 2010). Isika et al. (2006) pointed out poultry production as one of the solutions towards animal protein supply shortage in Southern African countries because of its high fecundity and fast growth rate. In South Africa the poultry industry which consists of layers and broilers has a significant contribution on the national agricultural economy (DAFF 2011). Broiler meat is produced countrywide with four provinces; KwaZulu–Natal, Western Cape, Mpumalanga and North West Provinces combined accounting for approximately 79 percent of the total production whereas Limpopo province accounts for only 2 percent of the total country's broiler production. In Limpopo province, Commercial broiler farmers dominate the industry and constitute approximately 70 percent of the total broiler meat production while small-scale broiler farmers who are located in deep rural areas constitute about 30 percent (DAFF 2011). Kirsten and Zyl (1998) defined small-scale farm-

ers as farmers whose flock size is too small to attract enough investments needed to significantly increase their productivity.

In Limpopo province, small-scale broiler farmers' face challenges with production resources, government support and hence, they produce smaller quantities of broilers especially those under Capricorn District (Baloyi 2010). Belete et al. (1991) also indicated that socio-economic variables such as education are important in agricultural development of small-scale agriculture; however the lack of education amongst most small-scale broiler farmers thereof have results in lower productivity. Several studies have been conducted on poultry production countrywide and in Limpopo province in particular (Louw et al. 2011; Baloyi 2010; Ntuli and Oladele 2013) and most of these studies focused on lack of technical inputs as a major problem to the productivity, especially for large scale poultry farmers. However, they did not focus on the socio-economic challenges that affect small-scale broiler production in Limpopo province.

Objectives of the Study

This study was conducted with the aim of analysing how socio-economic characteristics

affect flock sizes and identifying production problems that affect small-scale broiler farmers in the Capricorn District, Limpopo province. The specific objectives of the study were to: determine socio-economic characteristics that affect broiler flock sizes; determine whether small-scale farmers within the study area are facing production constraints.

MATERIAL AND METHODS

The study was conducted in Capricorn District of Limpopo province. The estimated area of the province is about 12.46 million hectares with the estimated population of 5.454 million in 2011 (StatsSA 2012). In this study the target population was all small-scale broiler farmers within the district. According to Omotosho and Ladele (1998), household poultry farms of 1000 birds/year and less are regarded as small-scale producers. According to DAFF (2011), the estimated number of small-scale broiler farmers was 1564 province wide and of this number, 330 were reported to be located in the Capricorn District. Sixty small-scale broiler farmers within the study area were selected using disproportionate stratified random sampling method to equally represent both males and females even though they were not equal in size. A structured questionnaire that covers production, socio-economic characteristics and marketing questions of the farmers was used to interview individual farmers. A reliability analysis was performed to determine the internal consistency of the variables used in the study using the Cronbach's Alpha coefficient. The Cronbach's Alpha analysis produced a coefficient of 0.70 which is normally considered to be the appropriate cut-off for acceptable reliability or acceptable internal consistency. The variables used demonstrate excellent reliability, as their respective coefficients were all above 0.70. Samples of the questionnaire were pre-tested on the field to identify possible difficulties that might arise during the administration and completion of questionnaires. Difficulties and suggestions identified during the pre-testing processes were incorporated in the final questionnaire. This was to ensure validity of the study. The data used in the study was dichotomous and non-dichotomous.

The data was sorted and analysed using SPSS 20. In the study the significance of the socio-economic determinants of flock size were analysed using multiple regression while the production constraints faced by small-scale broiler farmers was analysed using frequencies.

The multiple linear regression models were estimated using ordinary least squares (OLS). This model allows estimating the relation between a dependent variable and a number of explanatory variables. The multiple linear regression model assumes a linear (in parameters) relationship between a dependent variable Y_i and a set of explanatory variables (X_{i0}; X_{i1}..., X_{iK}). Multiple linear regression models are most suitable for studies where the dependant variable (Y) is continuous (Gujarati 2004). The general model can be specified as:

$Y = \beta X + u$

Where by:

Y = Quantity of broilers produced

X = A vector of input and other explanatory variable quantities

β = A vector of unknown parameter to be estimated

u = Error term

The functional form was selected based on the values of multiple determinations (R^2), F-value and the signs of the regression coefficients and the t-values of individual parameters (α and β_i) (Gujarati 2004). Out of the four functional forms tested (Linear, Cobb-Douglas, Semi-log and quadratic) the linear functional form provided the best fit for the relationship between the socio-economic factors and broiler flock size of small-scale broiler farmers in in the study area. The priori model for the socio-economic factors and flock size regression analysis was defined as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, e_i)$

Where,

Y = Flock size (Number of broilers produced/9wks/100birds)

X_1 = Age (Years)

X_2 = Gender (Dummy 1 = male; 0 = Otherwise)

X_3 = Educational level (Dummy 1 = educated; 0 = Otherwise)

X_4 = Experience in broiler production (Number of years in broiler production)

X_5 = Access to credit (Dummy 1 = Have Access to credit; 0 = Otherwise)

X_6 = Access to transport (Dummy 1 = Have Access to transport; 0 = Otherwise)

X_7 = Hired labour (Man hours)

X_8 = Government support (Dummy 1 = Government support; 0 = Otherwise)

The linear functional form selected is specified as:

$$Y = \beta + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + u_i$$

Where,

Y = Flock size (Number of broilers produced)

X_1-X_8 = Socio-economic determinants of flock size defined above

β = Intercept (Constant term)

β_i = Regression coefficients

ei= Error term.

RESULTS AND DISCUSSION

The results and discussions were presented under the following sub-headings; determinants of broiler production; production inputs used by small-scale farmers and problems faced by small-scale broiler farmers in Capricorn District of Limpopo province.

Socio-economic Determinants of Broiler Production

The analysis yield an R^{-2} value of 0.661 indicating a 66.1 percent variation observed in the flock size of small-scale broiler producers in the study area and account for all the variables included in the regression equation (Table 1).

According to Table 1 the F- value of 52.611 was significant at 1 percent indicating that independent variables included in the socio-economic model had an overall impact in explaining the variation in the flock size of small-scale broiler farmers in the study area. The results of the regression analysis showed that the age, gender, educational level, experience, access to credit and access to transport showed a significant relationship with flock size. This finding is in contrast with that of a study by Ukwuaba and Inoni (2012) whereby age, gender and marital status were found not to be significant in determining flock size. This could be due the difference in social structure between two countries.

The coefficient of age was found to be negative ($\beta_1 = -0.741$; t = -1.160) but significant at 1 percent, indicating that the age of small-scale broiler farmers contributes negatively to broiler production in the study area. The implication may be that, farmers who are older kept less flock sizes due to the fact that they are less energetic compared to younger farmers since broiler production requires constant attention. This finding is consistent with the results by Ezeh et al. (2012) and Ukwuaba and Inoni (2012) whose results indicated as farmers gets older their productivity in small-scale broiler production decreases. However this result also disagrees with finding by Echebiri et al. (2006) whose results indicated age to be positively related to production and argued that older farmers are more productive because they have experience through learning by doing.

The regression analysis has also found the coefficient of gender to have a negative impact on flock size but was significant at ($\beta_2 = -0.807$; t = -1.56). This indicated that female farmers, who were dominating the respondents by 79 percent, were more involved in broiler production as compared to males. However, their flock sizes are generally smaller compared to their male counterparts due to differences in the conception towards broiler production. Generally, while the males may be more market oriented and kept more

Table 1: Multiple regression estimates of socio-economic factors affecting broiler production in Capricorn District

Variables	Regression coefficient ($\hat{a}_i$)	Standard error	t-value	Level of significance
Age	-0.741	0.637	-1.16	*
Gender	-0.807	0.515	-1.56	*
Educational Level	0.548	0.138	3.97	**
Experience	0.326	0.114	2.86	**
Access to credit	-0.515	0.404	-1.27	*
Access to transport	-0.854	0.199	-4.27	**
Hired labour	0.681	0.173	0.39	**
Government support	0.009	0.115	0.08	**

Source: Field Survey (2013), N = 60, R^2 = 0.713, Adjusted R^{-2} = 0.661, F = 52.612*,** Significant at 1%* Significant at 5% and ns – Not significant

birds, the females may kept broilers purely to ensure household food security, hence differences in flock size ownership between males and females. Furthermore, most females are involved in domestic activities and spend more time at home than males. This reduces the time allocated to broilers by women and large flock size may not be possible to manage.

The coefficient of educational level is significant at 1 percent and positive (β_3 = 0.548; t = 3.97). This finding implies that, the higher the educational status of a small-scale broiler farmer, the larger the flock size compared to small-scale broiler farmers with lower levels of education in the study area. The study have shown that, farmers who have formal education seem to be more willing and quick to adopt new technology, utilise them well, increase efficiency and produce more broilers compared to farmers with no formal education. This result tally with the findings by Ogolla and Mugabe (1996), Ezeh et al. (2012) and Ukwuaba and Inoni (2012) whose research on small-scale broiler production in different countries in Africa have shown that, farmers who are more educated, can be more productive because they can easily adopt new technology and know how to use it to improve production.

The coefficient of experience in broiler production is significant at 1 percent and positive (β_4 = 0.326; t = 2.86). This indicates that experience in broiler production contributes positively to broiler productivity in the study area. This finding is supported by Ugwumba and Lamidi (2011) in a study which shows that, experience in broiler production is associated with learning by doing which in the long run reduces the cost per broiler of the total production, thus improving production. However, one should be careful not to equate age to experience in this study because experience was measured in terms of the number of years an individual broiler farmer has been in operation. Hence the reason why age was found to have a negative but significant impact on small-scale broiler flock size while experience was found to have a and significant and positive impact on small-scale broiler flock sizes in the study area.

Furthermore, the analysis found the coefficient of access to credit to be negative but significant (β_5 = -0.515; t = -1.27) at 1 percent indicating that access to credit by small-scale broil-

er farmers contributes to the small flock sizes by small-scale farmers in the study areas. This result tally with the findings by Ezeh et al. (2012) whose studies have showed that access to credit contributes to efficiency by broiler farmers and argued that access and availability to cheaper credit can improve farmer's liquidity and enable them to afford technical inputs like better housing facilities, medication and feeds that will improve the flock size. The negative coefficient obtained in our analysis is an indication that, small-scale broiler farmers in the study area have got limited access to credit that could be used to purchase the resources needed for increase production. As a result, this has restricted their flock sizes and hinders the possibility of increasing their flock sizes.

This coefficient of access to transport is negative and significant (β_6 = -0.854; t = -4.27) at 1 percent. This is an indication that, the lack of access to own transport is affecting the amount of birds a farmer can keep at any point in time. Furthermore, most small-scale farmers are located in deep rural areas away from input suppliers and collective markets and transporting broilers to and from the market including the much needed feeds supplies negatively affects the flock sizes in the study area. This makes access to transport a very significant input to access inputs and transport broilers to the market. The study found that, 60 percent of the interviewed farmers also indicated that public transport is not convenient mode of transportation and it is expensive while 26 percent of the farmers in the study area indicated that hired transport increases their production cost.

Analysis on hired labour and government support were found to be positive but not significant at 1 and 5 percent respectively. Most interviewed farmers indicated that they do not prefer to hire labour because it comes at an extra cost. This result is similar with findings by Echebiri et al. (2006) who indicated that due to lower production scale, the productivity of hired labour is insignificant and does not contribute to small-scale broiler production. The small-scale broiler farmers interviewed during our survey indicated that, they are not in constant contact with their extension advisors. Some of these farmers said that extension advisors focus more on large broiler projects rather than individual farmers. However, a study by Baloyi (2010) has highlighted the importance of extension services

because it provides small-scale farmers with information and introduces them to technologies that may improve production levels.

Production Inputs Used by Small-scale Farmers Under Capricorn District

The study analyses the production inputs used by small-scale broiler farmers in the study area and presented the findings in Table 2.

From the analysis, besides other supporting inputs, most participants indicated that four most basic and important inputs in smallholding broiler production are day-old chicks, water, medication and feed. The participants further indicated that they are not concerned with the breed of day-old chicks but medication and feed. It was found during our analysis that, there are four main types of medications used by farmers in the study area: Stress pack, Lasota, Gumboro and Virukill. Stress pack is given to day old chicks upon arrival to the farm. The purpose of this medication is to help chicks combat leg weaknesses and help them adjust to the new environment, especially after long delivery trips. However, other farmers stated that they use brown sugar mixed with warm water instead of stress pack. Lasota strain is given to chicks one day after arrival. It is a vaccine against new castle disease. Gumboro vaccine is also used for vaccination against flu and other breathing-related infections. Other farmers also pointed out that they use Virukill as a disinfectant in order to avoid cross infections.

The study further reveals three main types of feed used by broiler farmers in the study area and they include; starter pallets, grower and finisher. They are used for different purposes as follows: Starter pallets are given to chickens less than 2 weeks, grower feed is given to chickens between 2 to 5 weeks. Only 85 percent of farmers agreed that they use finisher feed which is given to broilers after the 6th week in production. Some farmers (42%) indicated that they use their own transport to collect feed from retailers. Fifty-eight percent of farmers rely on hired transport. Most farmers within Capricorn District indicated that they purchase their feed in Polokwane (Engel fish). This basically confirms the farmer's assertion that they do not have any problems with input suppliers' availability however, high transport cost and high chick mortality rate upon arrival remain the main problems as confirmed by the regression analysis.

Production Problems Faced by Small-scale Broiler Farmers in Capricorn District

The production problems faced by small-scale broiler farmers in the Capricorn District were identified and their frequencies including percentages were computed as shown in Table 3.

Table 3: Production problems faced by small-scale broiler farmers in Capricorn District

Problems	Frequencies	Percentage
High input cost and irregular supply	11	18
Lack of finance	10	17
Diseases	11	18
Inadequate government support	5	8
Distance from input suppliers	13	22
Marketing	10	17
Total	60	100

Source: Field Survey 2013

From the table, lack of finance (33%) and diseases (18%) were the main problems affecting broiler production by small-scale broiler farmers in the study area.

Table 2: Medication and feed types used in smallholder broiler production

Input type	Name	Purpose
Medication	Stress pack	To prevent weak leg and reduce stress
	Lasota	To prevent new castle disease
	Gumboro	Vaccination against flu and other breathing infections
	Virukill	Disinfectant, to avoid cross infections
Feeds	Starter Pallets	To supply chicks with necessary nutrients during the first two weeks
	Grower	Provide enough nutrients for growth between 2 to 5 weeks
	Finisher	To maintain the weight of broilers after 6 weeks.

Source: Field survey 2013

During the study, interviews conducted with farmers indicated that, access to credit (17%) from formal institution is a serious challenge and they have resorted to borrowing from informal sources "mashonisas" (informal or unregulated money lenders who charge exorbitant interest rates for small loans given to members of their communities) thus increasing their production costs. This finding is consistent with that of Ntuli and Oladele (2013) who found that most of the small-scale farmers are unemployed and lack collateral to acquire credit from formal institutions restricting these farmers access to credit to buy inputs such as medication, day-old chicks and proper housing that can help expand production. Thus they also indicated that their flocks are more sensitive to diseases (18%) such as fowl pox, chronic respiratory sickness and Newcastle.

Furthermore, the second most important production problem faced by small-scale farmers was distance from input supplier centres and because most of the farmers did not own transport and they had to hire or use public transport. For instance, some respondents (18%) indicated that high input cost and irregular supply is one of the challenging problems affecting small-scale broiler production within the study area. From the study, 17 percent of the farmers indicated that they cannot increase their flock size because they only sell to local individual consumers and do not have access to larger markets. According to Dinello et al. (2000), marketing is the most important element in the profitable production of agricultural enterprises and any increase in output without a corresponding increase in demand will lead to price decreases and profitability loss. Hence, the flock sizes of the small-scale broiler producers in the Capricorn district of Limpopo province of South Africa is a respond to the type of market these farmers access, other factors remaining constant.

CONCLUSION

From the regression analysis the F-value indicated that the variation in flock size produced by small-scale is due to the combination of all socio-economic determinants. The result further showed that age, gender, educational level, and experience in broiler production, access to credit and access to transport were all significant but affects flock sizes of small-scale broiler farm-

ers either positively or negatively at 1 and 5 level of confidence. However hired labour and government support were found to be insignificant in influencing flock size. The study also revealed that high input cost, irregular supply and diseases remains the main production problems faced by small-scale farmers in the study area. However, other problems that the farmers are facing include, lack of finance, inadequate government support, distance from input suppliers and access to larger markets.

RECOMMENDATIONS

The study recommends that access to subsidized finance should be made available to small-scale farmers and this requires intervention by the government. The government should also support small-scale broiler farmers through frequent extension advice to improve production and to reduce production costs. Through its development institutions the government should assist the small-scale broiler farmers with information regarding the marketing of broilers as this action would assist farmers to increase their flock size.

ACKNOWLEDGEMENTS

The authors are grateful to the small-scale broiler farmers who participated in the study.

REFERENCES

Baloyi JK 2010. *An Analysis of Constraints Facing Smallholder Farmers in Agribusiness Value Chain: A Case Study of Farmers in the Limpopo Province.* PhD Thesis, Unpublished. Pretoria: University of Pretoria.

Belete A, Dillon J, Anderson F 1991. Development of agriculture in Ethiopia since the 1975 land reform. *African Journal of Agricultural Economics*, 6: 159-175.

DAFF 2011. Broiler Value Chain Profile 2011/2012. From <www.daff.gov.za> (Retrieved on 3 March 2013).

Dinello F, Hall C, MacFachern G, Dreesen L 2000. Agricultural Marketing Series, United States Office of Personnel Management in Cooperation with the Department of Agriculture, Washington DC: Position Classification Standard for Agricultural Marketing Series, *Discussion Paper* GS-1146 (December).

Echebiri RN, Igwe KC, Okwun AK 2006. Analysis of Technical Efficiency of Urban Broiler Production in Umuahia Metropolis of Abia State. *Proceedings of the 40th Annual Conference of Agricultural Society of Nigeria*, Umudike Umuahia, pp. 203-206.

Ezeh CO, Anyiro IO, Obioma NQ 2012. Gender issues on poverty alleviation programmes in Nigeria: The case of the National Fadama 1 Development Project in Abia State, Nigeria. *Agris On-line Papers in Economics and Informatics,* 4(3): 15-20.

FAO 2010. *Poultry Value Chain Study: Consultant Report.* Unpublished Paper. FAO, Rome.

Gujarati DN 2004. *Basic Econometrics.* 4th Edition. USA: McGraw-Hill.

Hardwick P, Khan P, Langmead J 1988. *An Introduction to Modern Economics.*UK: Longman, Herlow.

Isika MA, Agiang EA, Okon BI 2006. Palm oil and animal fats for increasing dietary energy in rearing pullets. *Journal of Poultry Science*, 5: 43.

Kirsten JF, Van Zyl J 1998. Definition of small-scale farmers in the South African context, South Africa. *Agrekon*, 37: 45-55.

Louw A, Geyser JM, Schoeman JJ 2011. Pork and Broiler Industry Supply Chain Study with Emphasis on Feed and Feed-related Issues. *NAMC Report*, University of Pretoria, South Africa.

Ntuli V, Oladele OI 2013. Constraints facing small-holder broiler farmers in Limpopo province. *Journal of Life Science*, 10: 2990-2996.

Omotosho OA, Ladele AA 1998. Management problems in large-scale poultrybusiness in Nigeria. *Nigerian Journal of Farm Management,* 3: 27-35.

StatsSA 2012. Statistics South Africa, Population Data Bulletin. From<http://www.statssa.gov.za/publications/populationstats> (Retrieved on 8 June 2013).

Ogolla BD, Mugabe JW 1996. Land Tenure System and Natural Resource Management in Land We Trust. *Paper Presented In Seminar on Environment, Private Property and Constitutional Change*. Zimbabwe, October 12 to 16, 1996.

Ugwumba F, Lamidi AI 2011. Profitability and economic efficiency of poultry local government area of Anambra State. *Journal of Poultry Science*, 10: 106-109.

Ukwuaba I, Inoni OE 2012. *Resource-use Efficiency in Small-holder Broiler Production in Oshimili North Local Government Area, Delta State*. Department of Agricultural Economics and Extension, Asaba Campus, Asaba. Delta State, Nigeria: Delta State University.