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Production of indigenous poultry among smallholder farmers in Tigania West Meru County, Kenya

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The study was conducted to evaluate factors that significantly influence indigenous poultry production among smallholder farmers in Tigania west Mer County using the production function approach. The study relied on primary data collected by administering structured questionnaires to 359 respondents randomly selected from 5 wards using the multi stage stratified random sampling and probability proportionate to size techniques. A cross sectional survey design and primary data on poultry yields, inputs and farmer demographics were collected. A one step Cobb Douglas production function in logarithmic form was used to estimate the frontier production. From the analyses, results showed that over 50% of the deviations in poultry output resulted from production constraints. Further, off farm income, technology adoption, flock size, extension access and gender of respondents positively influenced indigenous poultry production, while land under cultivation had a negative influence. Results revealed a possibility to increase indigenous poultry production using improved feeds and vaccinations since they were the most limiting resources. In addition, policy interventions aimed at enhancing technology adoption and improving provision of extension services would serve as a motivation to persuade farmers increase stock and apportion more credits to poultry production. This would increase output leading to economies of scale thus increased returns among smallholder farmers.

Key words: Indigenous chicken, production, smallholder farmer.

INTRODUCTION

The evolution of poultry production has signified a growing importance among small and medium-scale farmers residing in the rural areas (Milkias et al., 2019). Chickens are the most popular poultry worldwide (Hirwa et al., 2019). The birds are among common livestock species reared in rural areas (Goraga et al., 2018). Milkias et al. (2019) notes that the global poultry population is approximately 16.2 billion, of which 71.6% is found in developing countries. In Africa, village poultry contributes over 70% of poultry products and 20% of animal protein intake (Kejela et al., 2019). In Sub Saharan Africa (SSA), rural chicken production accounts for about 60% of poultry with indigenous chickens constituting 70% of the total chicken population (Kejela et al., 2019). Hirwa et al. (2019) clarifies that in East Africa, over 80% of human population lives in rural areas and over 75% of these households keep indigenous chickens. The population of poultry in Kenya is estimated to be

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about 29 million (Padhi, 2016), of which 75% are indigenous chickens (Delabouglise et al., 2020). Kamau et al. (2018) observed that 80% of the poultry production originates from smallholders with 7.1 and 9.4% of meat and egg products originating from indigenous chickens, respectively.

Poultry production plays a significant economic role and is practiced by about 80% of the rural populations (Moussa et al., 2019). In addition, poultry products are important sources of cheap and quality protein thus reducing malnutrition among rural populations (Njuguna et al., 2017). The poultry enterprise has potential to promote economic growth in developing countries through employment, provision of income and sustenance of rural populations (Mwobobia et al., 2016). In Kenya, poultry production remains a key enterprise among smallholder farmers (Ayieko et al., 2015), with about 70% of the rural inhabitants deriving their livelihood from poultry production (Kamau et al., 2018). Further, the poultry enterprise has been identified as an exit strategy in addressing food scarcity among rural households (Milkias et al., 2019).

In the Kenyan economy, poultry production breeds are well adapted to varied environmental conditions and remains essential among different customs since it promotes asset accumulation (Mbuza et al., 2017). Kamau et al. (2018) illustrated that indigenous chickens are disease resistant, have ability to withstand feed fluctuation and are hardy. Additionally, the poultry enterprise is one of the cluster areas for value chain development in Kenya (Ayieko et al., 2015). Besides, rural poultry enterprises encounter several challenges in production especially among smallholder farmers. These challenges include inadequate institutional support and inefficient management (Kirui, 2014). Further, trade barriers resulting from lack of streamlined market structures hamper rural poultry production (Magothe et al., 2012). As a result, there exists an unmet demand of poultry products since production is below potential levels (Padhi, 2016). This leads to low yields and incomes thus a need to develop policies that support smallholder poultry farmers in rural areas (Kingori et al., 2010).

Globally, the production of indigenous poultry among smallholder farmers encounters several challenges. In Kenya, this includes the rising costs of farm inputs resulting from competition of key raw materials (Abadi et al., 2018). In addition, poultry farmers are unable to control diseases related to poultry as a result of the increasing costs of vaccines and management fees (Milkias et al., 2019). Further, Abadi et al. (2018) indicates that there is limited information regarding both input and output markets which leads to stiff competition within the industry. Besides, increase in prices of poultry products has reduced consumption among low-income rural families to about 7% (Goraga et al., 2018). This is so despite poultry being a key contributor to economic development and vital towards achieving the socio-economic pillars of Vision 2030 (Delabouglise et al., 2020).

Owing to these challenges, there have been Government and Non-Governmental programs that provide support for the poultry industry (Baliyan and Masuku, 2017). These programs intend to increase production and bridge the gap between the increasing demand and low supply of poultry products (Atieno, 2016). In addition, various stakeholders have initiated programs aimed at supporting indigenous poultry farming as an investment to alleviate poverty especially among the young populations in rural areas (Bukunmi and Yusuf, 2015). Despite these concerted efforts, indigenous poultry production in rural areas continues to generate unrewarding returns. Kejela et al. (2019), ascribed this to weaknesses in the management and use of traditional production methods. This presents poultry production as a risky enterprise among smallholder farmers in rural areas (Kirui, 2014).

The low productivity shows the inability of farmers to fully utilize available technologies hence leading to low yields. Ambetsa et al. (2020) argued that though improved technology is one of the strategies for increasing agricultural productivity, optimal productivity can only be obtained when the technology is efficiently used. Besides, the high poverty levels entangled with the limitation of factors of production have made it difficult for farmers to increase production through use of more resources (Tiruneh and Geta, 2016). This constraint implies a need to examine agricultural production particularly among smallholder farmers (Ayinde et al., 2015). Rasha et al. (2018) explains that an analysis of production is vital in selecting cost effective input combinations and determine gains resulting from improving existing technologies. Increased productivity enables farmers increase returns without additional inputs and technologies thus better yields (Kirui, 2014). Due to inadequate knowledge regarding utilization of farm resources, high risk of uncertainties often characterizes the entire process of production among smallholder rural farmers (Ambetsa et al., 2020).

Despite the importance of poultry in rural areas, there is limited information focusing on indigenous chicken farming among smallholders. Further, very few studies have described this enterprise in Meru County.

This is so despite indigenous poultry farming being a major contributor to livelihoods among smallholder farmers in rural areas. Therefore, the objective of this study was to evaluate indigenous poultry production and identify characteristics that influence productivity among smallholder indigenous chicken farmers in Tigania west, Meru County.

THEORETICAL FRAMEWORK

The theoretical framework of this study is grounded on

the CD production function. Ambetsa et al. (2020) explains that production functions express the connection between inputs and outputs. The production function indicates, in either mathematical or graphical form, the quantity of output that can be obtained from a combination of inputs (Kamiyama et al., 2016). In particular, it demonstrates the maximum attainable output per unit of input with the current level of technology (Tiruneh et al., 2017). Besides, Wollie et al. (2018) explain that production functions specify the minimum quantity of input per unit of output given available technology. The CD production function is widely used in economics, to represent the input-output relationship. Kamiyama et al. (2016) notes that the relationship is non-monetary, that is, it only relates physical inputs to physical outputs such that prices and costs are not considered.

The production function is one of the key concepts of main stream neoclassical theories, used to define marginal product and distinguish the defining emphasis of economics (Ntakyo et al., 2019). The primary purpose of the production function is to address the utilization of factor inputs and their corresponding distribution of proceeds in production. This is achievable by hypothesizing the technological estimates of achieving optimal yields (Nwigwe et al., 2016). In agricultural production, efficient allocation of farm resources enables farmers to attain farm objectives. It avails farmers the opportunity of improving their productivity and income. Tiruneh et al. (2017) expounds that at the micro economic level efficient allocation of farm resources such as farm land, credit facilities, fertilizer, labour, among others contributes to food production, employment creation, industrial raw materials and export products for foreign exchange earnings (Kelemu and Negatu, 2016). Though production functions can be expressed in various functional forms, the CD form is commonly used for its simplicity and flexibility coupled with its ability to provide parameters that are easy to estimate and interpret (Wollie et al., 2018).

Empirical model

To study the effect of socioeconomic and institutional factors on indigenous poultry production among smallholder farmers, the CD production function was used. The model was analyzed in a single-step rather than the two step procedures because it generates estimates which are not biased compared to the ones generated by the two-step method as explained by Kamiyama et al. (2016). Further, the CD production function was applied as a parametric stochastic frontier production approach as explained by Mwangi et al. (2020). The approach is the frequently used and entails the description of the technology which may be restrictive in most cases (Ajibefun, 2008). Further, the stochastic frontier model attributes deviations from the frontier function into inefficiencies and random errors thus accurate and less sensitive to measurement errors in data (Ndirangu et al., 2018). In addition, it allows testing of hypothesis regarding the goodness of fit for the model. This model estimates the production function by fitting observed data and minimizing measures of their distance from the expected frontier (Abdul and Isgin, 2016).

MATERIALS AND METHODS

Description of study area

The study was conducted in Tigania West Sub-County (Figure 1) which is the largest producer of indigenous poultry in Meru County. The County is located along the extensive Mt. Kenya and has altitudes ranging from 3000 to 5,199 m above sea level (GoK, 2018). GoK (2018) elaborates that along the equator, the county lies about 0° 6' North and 0° 1' South and between latitudes 37^0 West and 38^0 East. This predisposes the County to various microclimates and influences its natural settings. Agro-ecological zones (AEZs) vary from upper highlands to lower midlands with a bimodal rainfall pattern (Okoth, 2019), with quantities varying from 300 to 2500 mm annually (Labeyrie et al., 2016). Temperatures range from 8 to 32°C during cold and hot seasons, respectively. Okoth (2019) notes that land is agricultural with livestock rearing being a common enterprise. Poultry production is concentrated among farmers in Tigania West majority being indigenous chicken. Figure 1 shows an illustration of the study area.

Research design and sampling technique

Cross-sectional survey research design was applied in this study since it has a high magnitude of precision and accuracy (Ambetsa et al., 2020). In addition, the design allows researchers to collect data at a single point thus saving on resources and time (Wambua et al., 2019). Ambetsa et al. (2020) further explains that cross sectional survey helps researchers describe populations within the study area in regard to the findings and define the extent to which the results relate to the sampled population. Further, multi stage stratified random sampling technique was used for the study. This approach is reasonable and pledges a perfect depiction of the target population as explained by Wambua et al. (2019). First, purposive sampling was applied to select Meru County and Tigania West sub-county chosen as the study area given the concentration of indigenous poultry farming. Further, Mbeu, Nkomo, Kianjai, Akithi and Athwana wards were used as stratums and probability proportionate to size procedure applied to get the number of farmers from each ward. Systematic random sampling technique was used to select producers using the Watson (2001) formula and applied by Watson and Meester (2015). Additionally, Watson and Meester (2015) clarified that the formula is most preferred for studies that consider populations that are above 10,000.

Data analysis

The study used both qualitative and quantitative data. The Statistical Package for Social Sciences (SPSS) version 13.0 was used for descriptive analysis. The log linearized form of the Cobb Douglas (CD) production function was used in determining factors that affect indigenous poultry production. The CD

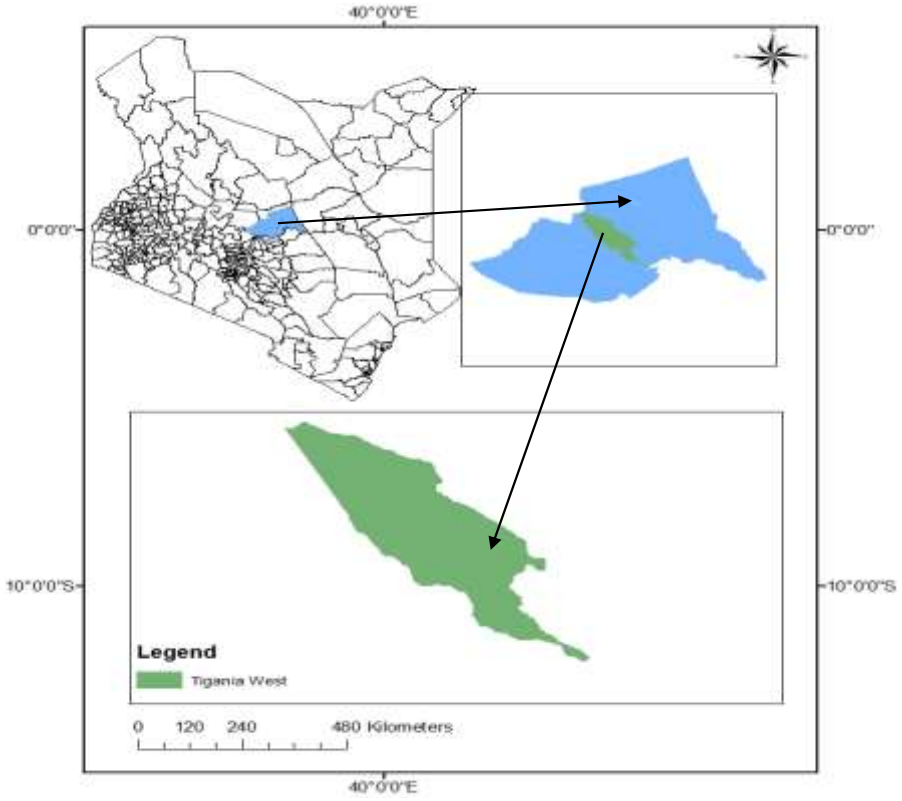

Figure 1. Study area.

Table 1. Descriptive analysis of socioeconomic characteristics of the respondents.

Description of variables		Mean	Mode	Std.	Min.	Max.
Age	Years	46.55	60	11.08	21	82
Experience	Years	20.02	20	10.44	1	50
Education	Years	9.98	8	3.54	0	18
Household size	Number	5.62	5	1.97	1	12
Farm size	Acres	1.75	1.0	1.70	0.01	20
Annual IC income	KES	25300	20000	22000	0	200000
Annual Off farm income	KES	8900	5000	12200	0	80000
Market distance	KMs	5.0	3.0	4.7	0	40

IC is indigenous chicken; KES IS Kenyan Shilling; KMs is kilometers.

production function was analyzed in single step regression to ensure that the estimated parameters were not biased (Ogolla, 2016). To achieve this, production inputs were transformed into log form and the selected factors were regressed against the poultry output. Data were collected in one season covering the year 2020 among smallholder farmers who own landholdings less than 2 ha.

RESULTS AND DISCUSSION

Socioeconomic characteristics of respondents

Table 1 illustrate descriptive analysis of socio-economics characteristics of smallholder poultry farmers. From the results (Table 1), the average age of household heads was 46.55 years ranging from 21 to 82 years. The wide variation in age indicates the predominance of old farmers noting that indigenous chicken farming in the study area was perceived as a reserve for the aging population. The average years of indigenous poultry production were 20.02 ranging from 1 to 50 years. This elucidates that majority of the smallholders were highly experienced thus informed on matters regarding indigenous poultry farming. Further, the results imply that the farmers had adequate skills in

Table 2. Descriptive analysis of institutional characteristics of the respondents.

Variable description		No	Percentage
Gender	Male	225	62.7
	Female	134	37.3
Extension access	Yes	172	47.9
	No	187	52.1
Group membership	Yes	337	93.9
	No	22	6.1
Credit access	Yes	285	79.4
	No	74	20.6
Contract markets access	Yes	5	1.4
	No	354	98.6
Land tenure	With title	225	62.7
	Without title	134	37.3
Market participation	Yes	266	74.1
	No	93	25.9

poultry management, a key element in achieving a profitable enterprise.

Education has been regarded as acritical element among rural populations in developing countries since it equips people with skills and knowledge necessary in poverty eradication. Results in Table 1 show that respondents had an average of 9.98 years of schooling. A possible explanation is that access and enrolment to formal education in the study area was low with majority of the farmers having spent 8 years while schooling which is equivalent to primary education. Further, results show that some respondents had no form of formal education while the most educated smallholder farmer spent 18 years in formal education. This implies that a sizeable proportion of smallholders were unable to understand basic information regarding markets and contemporary innovations. Concerning the size of household, sampled farmers had an average of 5.62 members with the smallest household having 1 member and 12 members for the largest. Most of the households had 5 members signifying that respondents had sufficiently large households to offer family labor thus reduced production costs. On average, respondents had 1.75 acres of land ranging from 0.01 to 20 acres with majority measuring 1 acre denoting that respondents were smallholder farmers Besides, land fragmentation in the study area was common and poultry production encountered competition from other enterprises such as crop production.

Farmers earned an average income of KES 25,300 per year from indigenous chicken with the highest returns being two million shillings while majority managed to earn KES 20,000. Compared with off farm activities, farmers earned an average of KES 8,900 annually with the highest off farm employment generating KES 80,000. Majority of the respondents who engaged in off farm employment earned utmost KES 5,000. This implies that indigenous poultry production was more lucrative than off farm employment while the latter enabled farmers generate extra income for use in procurement of critical farm inputs and technologies. Moreover, respondents engaged in non-farm activities concentrated less in farm operations with limited resources and time allocated for poultry production consequently reducing their working capital. From the results, proximity to poultry markets averaged 5 KM with farmers spread approximately 4.7 KM from the mean market distance. This indicates that respondents received firsthand market information and were able to derive market benefits such as subsidized inputs and extension services. In addition, respondents had a better access to information regarding input and output markets thus empowered to identify markets that offer auspicious output prices consequently generating adequate returns.

Institutional characteristics among respondents

Table 2 describes institutional characteristics among respondents. The results reveal that majority (62.7%) of the households were male headed while 37.3% of the households were female headed. This indicates that smallholder poultry production in Tigania West was

Table 3. Result of Cobb Douglas regression on the effect of farm inputs on poultry production.

Variable	Parameter	Coefficient	Std. error	z	P>/z/
Constant	β_0	6.472129	0.6013218	10.76	0.000***
Credit	β_1	0.2989679	0.0396618	7.54	0.000***
Labour	β_2	-0.0954435	0.1317903	-0.72	0.469
Land	β_3	0.0810764	0.0501495	1.62	0.106
Feeds	β_4	0.3764175	0.1463357	2.57	0.010**
Vaccine	β_5	0.3577402	0.089883	3.98	0.000***
R^2	0.913		**Gamma (γ)**	50.548	
Adjusted R^2	0.826		**Sigma squared (σ^2)**	0.638	
Return to scale	1.019				
F-value	95.97***				

*** Significance at 1% level, ** significance at 5%.

dominated by males owing to its lucrative nature to generate extra income for households.

Majority (52.1%) of the respondents had limited access to training and extension regarding poultry production. This implies that most of the farmers were not adequately informed on current and emerging issues in poultry production. In regard to group membership, 93.9% of the respondents were engaged in at least one organized group. This implies that farmers had enriched bargaining powers in both input and output markets. In addition, farmer groups can be used as channels for provision of information regarding modern innovations, appropriate production and marketing.

From the results in Table 2, 79.4% of the respondents had access to financial credits while 20.6% had no access to financial aid. This implies that most of the smallholder farmers were financially empowered to timely procure inputs and adopt technologies that boost production. This was achievable owing to the fact that 62.7% of the farmers had guaranteed tenure for their farms thus can use the title deeds as collateral to acquire loans. Contract markets for poultry products were available but only 1.4% of the respondents engaged in this avenue. This was possibly due to unfair contractual obligations and unrewarding product prices offered by participants in this market.

Analyses of poultry production among smallholder farmers

The microeconomic theory assumes that producers engage in production to maximize profits and minimize costs (Mwangi et al., 2020). The conventional econometric approaches tend to build on this standard by estimating production, cost and profit function parameters (Atieno, 2016). In this study, the Cobb Douglas production function as used by Najjuma et al. (2016) and Ambetsa et al. (2020) was estimated and applied to determine factors that affect production among smallholder indigenous poultry farmers. The gamma parameter (γ) shows that 50.548% of the deviations in poultry production resulted from production constraints. Besides, sigma squared (σ^2) had a value of 0.638 that was significant at 1% level denoting a perfect goodness of fit.

The coefficient of multiple determination (Table 3) was 0.913 denoting that 91.3% of the variation in poultry production was explained by the explanatory variables included in the model. In addition, the remaining 8.7% was accounted for by the error term and variables not considered in the model. The results revealed an F-value of 95.97 which was highly significant at 1% level signifying that all variables in the model were paramount in explaining the variation of indigenous poultry production. The study revealed a return to scale of 1.019, this shows an estimated constant return to scale implying that a proportionate increase in input use, would increase output in indigenous chicken production in the study area by the same proportion.

The input-output analyses (Table 3) revealed that amount of credit borrowed, quantity of feeds and frequency of vaccination were significant determining factors of indigenous poultry production in the study area. From the results, a 1% increase in amount of credit would increase indigenous chicken production by 0.29%. Further, 1% increase in quantity of feeds would increase production by 0.37% while a percentage increase vaccination dosage would increase production among respondents by 0.35%. These results concurred with Bukunmi and Yusuf (2015). Besides, results revealed that output was highly responsive to feeds, frequency of vaccination and amount of credit.

Effect of selected factors on indigenous chicken production

The assessment of variations in production is important

Table 4. Results of Cobb Douglas regression on effect of selected factors on poultry production.

Variable	Coefficient		Std. err	t	P>/t/	VIF
Age	α_1	0.0035	0.0259	0.776	0.438	1.052
Education	α_2	0.0949	0.0649	1.463	0.145	1.932
Gender	α_3	0.1969	0.0966	2.040	0.042**	1.211
Experience	α_4	0.0589	0.0861	0.686	0.493	1.986
Off farm income	α_5	0.3694	0.1362	2.175	0.005**	1.646
Technology adoption	α_6	0.2919	0.1121	2.604	0.001***	1.667
Market distance	α_7	0.0120	0.0098	1.223	0.222	1.092
Household size	α_8	0.0374	0.0266	1.409	0.159	1.095
Group membership	α_9	0.1741	0.1974	-0.882	0.378	2.689
Extension contact	α_{10}	0.0941	0.0504	1.874	0.062*	2.702
Flock size	α_{11}	0.0143	0.0022	6.757	0.000***	1.153
Land ownership	α_{12}	0.0391	0.0949	0.413	0.680	1.036
Land size	α_{13}	-0.1451	0.0277	-5.244	0.000***	1.052

Source: Survey data 2020; Significance at ***p<0.01, **p<0.05, *<0.1.

since it helps in making recommendations on policy review since the degree of efficiency alone is inadequate. To test whether socio-economic and institutional factors had any significant contribution in explaining farm production among smallholder indigenous poultry farmers, one step Cobb Douglas production function was used and results illustrated in Table 4.

Gender of the household head had a positive and significant coefficient related to indigenous poultry production at 5% level of significance. Results shows that when the gender of household head was male, the marginal effect of increasing production among respondents increased by 19.69%. This result coincided with the findings by Honfoga et al. (2017) who found out that if the gender of head of the household was a male, agricultural productivity would easily increase compared to households headed by female. This is attributed to ease of resource access by the males as compared to females as described by Ndirangu et al. (2018).

The coefficient off farm income was positive and significant at 5% level. This implied that off farm income was directly related to poultry production thus a unit increase in off farm income would increase poultry output by 36.94%. This infers that farmers who earned more income from non-farm activities were more productive in indigenous poultry than those who had no income from non-farm activities. This result upheld those of Wabomba (2015), Shettima et al. (2015) and Abate et al. (2019). The explication of this impression is that off farm employment empowered poultry farmers to timey procure inputs by ensuring a consistent flow of income and eliminating financial constraints (Aheisibwe et al., 2018). Conversely, Ndirangu et al. (2018) explained that off farm employment had a negative influence on agricultural production. The researchers claimed that the involvement of farmers in off farm occupations reduced the time and resources devoted to the farm operations hence low productivity.

Adoption of modern technologies had a positive and significant coefficient. This coincided with prior anticipations and inferred that by smallholder farmers embracing modern innovations, indigenous poultry production increased by 29.19% compared to use of traditional production techniques. The likely explanation is that since technologies improves the quality of factors of production, it is possible for smallholder farmers to expand the production frontier through utilization of same quantity of output. In addition, technologies enable farmers attain a given output level with fewer resource as discussed by Ambetsa et al (2020) and Mwangi et al. (2020). Besides, the findings coincided with Mukhtar et al. (2018) who observed that producers who embraced modern innovations in Kano state of Nigeria had higher levels of farm production.

Concerning contact with extension agents, the coefficient was directly related to poultry output and significant at 10% level. This implies that an increase in extension contacts would increase poultry production by 9.41%. This is attributed to that extension serves as a source of information thus educating farmers on emerging production technologies that promote production. In addition, farmers with more access and increased contacts with extension experts were well enlightened with trending issues in both input and output poultry markets. This result coincided with the findings of Ntabakirabose (2017) who found that training in agriculture had a positive and significant impact on technical knowledge which equips farmers with technical skills and practical knowledge in adoption of improved technologies hence increasing levels of

production. In regard to the flock of indigenous chicken, the coefficient was positive and statistically different at 1% level of probability. This implies a unit increase in the flock size would increase indigenous chicken production 1.43%. A possible explanation is that a large flock enabled farmers derive the benefits of economies of scale thus reduced costs and increased returns. This enables farmers produce optimally due to reduced production constraints and enhanced empowerment as expounded by Mwangi et al. (2020).

In regard to size of land under poultry production (land size), the parameter was negative and significant at 1% level. This explains that high levels of poultry output were recorded among farmers who had allocated small portions of their farms for indigenous chicken production compared to their counterparts with large land sizes. This inferred that poultry yield decreased with increase in land under indigenous chicken production in Tigania West Sub-county. These results substantiate that farmers with small land sizes were more productive contrary to their associates with large plots of land. The reasonable justification is that, farmers with small land sizes could be part of the farmers who depend on their farms for occupation. This therefore inspires them to give farming greater attention for higher yields hence more resourceful despite the size. This result was in agreement with the findings of Chepng'etich et al. (2015) and Mwangi et al. (2020). Folorunso and Adenuga (2013) and Dessale (2019) argued that the inverse relationship between land size and production in agriculture was attributable to the decrease in management aptitudes among smallholders which reduces the efficacy of production.

Conclusions

The results of the current study reveal that improved feeds and vaccination were the most limiting resources in indigenous poultry production in the study area. This implies that a possibility existed to increase production through efficient utilization of these inputs. The study further showed that in indigenous poultry farming, production was influenced by size of the flock, adoption of technologies and engagement in nonfarm employments. These enabled farmers acquire essential inputs leading to improved output hence economies of scale and better returns. Besides, results revealed that access to extension services increased level of production while output was high among respondents who allocated small portions of their farms for indigenous chicken farming. From the findings, this study finds that enhanced accessibility of extension services would educate smallholder farmers on emerging innovations and technologies.

In addition, the study noted a need to develop policy interventions geared towards subsidizing the costs of modern production innovations in poultry farming while promoting efficient distribution and availability of poultry vaccines since this input was found to be an important component towards increased poultry production. Farmers need to apportion more of acquired credits for indigenous chicken production since this will enable them acquire improved feeds and enlarge their stock thus benefiting from the economies of scale. Besides, this will reduce costs per unit of production leading to increased returns thus improving the farmers bargaining power in both input and output markets.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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