

# Impact Assessment of Indigenous Chickens Production Interventions in the Semi-arid Regions of Zimbabwe: Case of Chivi District

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**Abstract:** Most communal farmers in Chivi district of Zimbabwe rear indigenous chickens. However, the impact of interventions by government and non-government partners remains unknown. The purpose of this study is to assess impact of indigenous chicken production in semi-arid areas with a focus on Chivi district. The research focused on indigenous chickens as the enterprise has the potential to increase rural population income and in turn improve the nutrition for the rural population. A total of 160 indigenous chicken farmers were sampled from a population of 1240 who received past interventions in trainings, feed and chicks or pullets from development partners and government using a survey questionnaire. Variables such as age, farmer experience, education, type of dwelling, maize, cattle, goats, supplementary feed, type of housing, resting of fowl run, vaccinations and type of hatching method were found to be significantly affecting sales rate. Indigenous chicken production was found to be weakly profitable as a positive gross margin was obtained. The study also revealed that value chain actors in indigenous chicken production had no processors. It was concluded that though indigenous chicken production was profitable, the above stated factors affect impact of indigenous chickens. The value chain map had no processors. Capacitating farmers on poultry management and availing credit to finance production and marketing players is important to improve indigenous chickens among smallholder farmers.

**Key Words:** Indigenous chicken, linear regression, interventions, Profitability, Value chain.

## I. BACKGROUND INFORMATION

There is an upward global trend in meat demand as evidenced by an increase of 109,4 million tons in 1974, 208 million tons in 1997 and is projected to be 327 million tons by 2020 (FAO, 2010b). There is a growing demand in white meat by the increase in population creating high demand for indigenous chickens (FAO, 2003). The increase in Africa's middle class has shifted dietary preferences towards animal products (Tschirley *et al.*, 2015). Through economic development and urbanization, it was seen that protein consumption has increased from 61g per person per day in 1961 to 80g per person per day in 2001 (Sans & Combris, 2016). This opens a market potential particularly for women who are culturally the custodians of indigenous chickens. Indigenous chicken production in Zimbabwe is traditionally produced using natural systems with very little supplementary feeds which have a positive impact on nutrition and health for most of the people.

The production of indigenous chickens provides important benefits in the rural communities in Zimbabwe through provision of eggs, meat and income. This helps in reducing food and nutrition insecurity at household level as the chickens are usually reared for family consumption where they provide a source of high-quality protein and income from surpluses (Kyarisiima *et al.*, 2004). The existence of indigenous chickens despite the introduction of exotic breeds has proved that indigenous chickens can compete with improved breeds in poultry production (Kyarisiima *et al.*, 2004). There is potential to transform subsistence production of indigenous chickens to commercial production levels. A focus towards poultry may be a positive step towards adapting to climate change. Chickens have the potential to supply animal protein better than other livestock animals as they have better conversion efficiencies. It is estimated that 1 kg of chicken can be produced by 2 to 4kg of feed, whilst that of beef may require about 7 to 10kg feed (Al-qamashou, 2014). Despite the potential in indigenous chickens, low-sales rate levels continue to be a common problem in smallholder farming.

The indigenous chickens, unlike other poultry enterprises such as broilers have a unique taste which is preferred by the growing population. Indigenous chicken meat products in comparison with other meat products have been found to be healthier as they are low in total fat and tends to contain more of mono unsaturated fats (FAO, 2010b). Additionally, fish and poultry consumption are not associated with high risk of cancers (Msami, 2008). This has caused demand for indigenous chickens to continue outstripping supply thereby requiring improved production among smallholder farmers.

Very little attention is being given to indigenous chicken production with more effort being given to cattle production (Bwalya & Kalinda, 2014). Indigenous chicken production is still underdeveloped as there are poor linkages between producers and consumers. Information on players or marketers is still lacking thereby depressing growth of the sector. Addressing information challenges will help to improve production of indigenous chickens and consequently improve sales rates for indigenous chickens thereby improving farmer's welfare through increased income from indigenous chickens (FAO, 2010b). Indigenous chicken production has shown to have a positive potential to improve the wellbeing of most rural populations. Nevertheless, the determination of profitability for

free range indigenous chickens remains difficult due to the nature and valuation of some inputs.

In Zimbabwe, attempts to improve indigenous chicken productivity by CARE International under the ENSURE project in 2015 has failed to produce convincing success among the common communal farmers in Chivi district. Lack of holistic approach in addressing factors of production in poultry and dissemination of inappropriate technologies given the production circumstances and market dynamics remain some of the challenges affecting the indigenous chicken production (Magothe *et al.*, 2012). Very often, marketing of agriculture products is blamed for most failure of applied interventions on improving rural livelihoods. The situation continues to persist despite growing demand for indigenous chicken at household, local and national levels. However, despite challenges faced, it was concluded that there is room for improvement of indigenous chicken production on studies done in Kenya, due to availability of physical and genetic resources (Magothe *et al.*, 2012). Therefore, there is need to develop strategies that will increase the productivity of indigenous chicken production without increasing production costs or losing the biodiversity of indigenous chickens.

Indigenous chicken production requires holistic approach to address factors of production such as feed, veterinary drugs and vaccines, financing and a well-coordinated marketing system. Indigenous chicken production needs to remain a preserve for the poor communal farmer as the birds have shown great potential to survive harsh conditions where improved breeds may fail thereby making indigenous chicken a viable option for the resource constrained rural population (Chisango, 2017). This will enable commercialization of indigenous chicken production to improve thereby improving farmer's income. Farmers are encouraged to produce more of the indigenous chicken products if the enterprise is profitable to the farmer. Addressing profitability challenges of indigenous chicken through cost reduction may help improve production of indigenous chicken thereby improving commercialization levels. Profitability of indigenous chicken production under smallholder sector remains unknown as farmers' rear indigenous chicken for family consumption. Analysis of enterprise gross income and average variable costs in indigenous chickens will help to reveal profitability levels in indigenous chicken thereby enabling farmers to consider the enterprise as a commercial enterprise. Stakeholders in the value chain actors are not clearly seen, resulting in failure in taking advantage of opportunities in the indigenous chicken production.

#### *Statement of the problem*

Despite availability of indigenous chickens in 95 percent of households (Mbiriri *et al.*, 2011), low resources requirements for indigenous chickens' production which seems to be affordable by most households and a wealth of experience in rearing indigenous chickens by the small holder farmers, consumption of poultry and eggs in Zimbabwe have shown a decline in annual growth rate from 8,3 and 4,3percent to 3,8

and 2 percent respectively (FAO, 2010a). There is very little improvement on commercialization of indigenous chicken production so as to scale up livelihoods for the rural poor despite a potential growing demand for the indigenous chicken. The stakeholders for indigenous chicken remain unknown for farmers commercializing indigenous chicken. Little information is available on the profitability of indigenous chicken for the farmers to begin commercializing the enterprise of indigenous chickens. Low commercialization rates of indigenous chicken by smallholder communal farmers are a challenge which is affecting farmers in times of income distress and droughts.

The decrease in consumption rate of poultry has an effect on food diversity to be consumed as it will limit choice of food to be consumed. This may affect food and nutritional security of the households thereby exposing the populations to conditions of malnutrition. The district has stunting rates of 26.9 for children below 59months (NNS, 2018), a figure which represents moderately high malnutrition for the district. Improved indigenous chicken production may play a crucial role in reducing the stunting problem in smallholder farmers as meat and eggs will provide rich source of protein thereby improving dietary diversity. In addition, indigenous chickens provide income to smallholder farmers and manure to support diversified nutrition gardens and feed to animals during drought periods.

Farmers mainly sell their indigenous chickens within their community (farmer to farmer), designated market points, traders, retail shops, roadside and distant market. However, despite the above outlets, commercialization levels remain very low. Hence by addressing input market, production, trading, processing and retailing processes of indigenous chicken aspects, commercialization of indigenous chickens may improve in smallholder sector.

## II. METHODOLOGY

This study was conducted in Chivi district of Masvingo Province in Zimbabwe. The district is in natural region IV and V of Zimbabwe where rainfall is erratic and averages at about 350- 500mm per annum (Mugandani *et al.*, 2012). The rainfall is usually received from early December to late March. The research was carried out in ward 12, 17, 18 and 19. These wards received some past interventions in indigenous chicken production by Care ENSURE program in 2014 through provision of indigenous chickens, sorghum, and cowpeas to improve food and nutrition security. In addition, these wards received intervention in extension training through Zimbabwe Extension Support Programme (ZEST) on poultry production through Sustainable Agriculture Trust (SAT) from 2013 to 2016 period.

The research made use of cross-sectional survey research design but making use of the quantitative method. The cross-sectional survey was used because it allowed gathering of information for a specific point in time and also contains multiple variables of indigenous chicken to be gathered at the time of data collection. The design however has some

limitation in that it cannot be used to analyse behaviour over time. Sales rate was then regressed with socio economic factors suggested to be affecting indigenous chicken impact. Gross margin analysis was used to assess profitability of indigenous chicken production while value chain map was used to analyse value chain for indigenous chicken.

The study was conducted through personal interviews which were conducted through a tested structured questionnaire administered to all sampled households. Primary and secondary data sources were used to obtain the information and cross checking. Observation was also used to record other practices being done in the area. Primary data obtained through the use of household questionnaire with sections on social and economic sections which affect communal farmers in indigenous poultry production. The primary data sources were cross checked with secondary data sources. The study made use of stratified simple random sampling in which the administrative wards were used as strata. Simple random sampling was then used to generate 40 interviews from the list of indigenous chicken farmers in the wards. The size of sample was limited to 160 respondents due to financial resource constraints.

Linear regression model was used to assess the factors affecting commercialization of indigenous chickens. The analysis was conducted through Statistical Package for Social Sciences (SPSS). The model made use of dependent variables (sales rate) and independent variable (socio economic factors) to explain the level of impact of indigenous chicken intervention by the smallholder farmer. The above sales rate can be computed as:

Sales rate =Quantity sold/Quantity produced X 100%. The model showed the nature of relationship that existed between the dependent and the independent variables.

The Linear regression model that follows was used determine factors.

$$\hat{Y}_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \mu$$

Where  $\mu$  is the error term,  $\beta_0$  is the intercept for  $\hat{Y}$ :

$\hat{Y}_i$  = sales rate; used to estimate the level of commercialization for indigenous chickens by farmers. It was calculated as highlighted above.

$X_i$  = independent variables ( $X_1$ =Farmer education (years),  $X_2$ =age (years),  $X_3$ =gender,  $X_4$ =farmer experience (years),  $X_5$ =type of dwelling,  $X_6$ =housing,  $X_7$ =size of farmland (ha),  $X_8$ =maize (tons),  $X_9$ =sorghum (tons),  $X_{10}$ =cattle, goats,  $X_{11}$ =supplementary feed,  $X_{12}$ =farm income,  $X_{13}$ =vaccinations,  $X_{14}$ = hatchery type mortalities,  $X_{15}$ =chicken slaughtered,  $X_{16}$ =radio,  $X_{17}$ =car  $X_{18}$ =water source and  $X_{19}$ =scotch cart).

Gross margin analysis was used to test for profitability and viability of indigenous chickens among the farmers. Income and expenditure were compared to determine the extend in viability of the enterprise. Variables in expenditure involved vet costs, feed costs, transport costs, fire wood, repair and maintenance and labour, whilst income involve income from egg sales and chicken sales.

Stakeholder value chain mapping was used to determine an insight on indigenous chickens by stakeholders. This provides highlights by the market sectors on their contribution in indigenous chickens. The linkages provide will help to determine areas of improvement so as to have an efficient indigenous chicken value chain. Stakeholders involved included input suppliers, financiers, aggregators and of takers.

### III. RESULTS

#### *Determining socio-economic factors affecting sales rate of indigenous chickens*

The results were tested at 5 percent significance level thereby showing that age, education, farming experience, type of dwelling, maize, cattle, goats, supplementary feed, type of housing, resting of fowl run, vaccination, type of hatching could significantly affect commercialization (sales rate) of indigenous chickens. The table below showed a negative relationship on variables such as age, education level, farming experience, and number of cattle with sales rate.

#### *Regression results for indigenous chickens*

Regression coefficients for indigenous chicken sales rate:Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-1.694	.615		-2.755	.033	-3.198	-.190
	Gender of household head	-.114	.063	-.317	-1.816	.119	-.269	.040
	Age in years	-.012	.003	-.817	-3.589	.012	-.020	-.004
	Household labour size	-.068	.043	-.423	-1.584	.164	-.172	.037
	Education Level in years	-.114	.024	-1.860	-4.721	.003	-.173	-.055
	Size of farming land in hectares	-.052	.035	-.364	-1.499	.185	-.136	.033
	Farming experience in years of head	-.014	.004	-.827	-3.840	.009	-.023	-.005
	type of dwelling	.206	.040	.992	5.121	.002	.107	.304
	Level of maize production	.557	.145	1.691	3.837	.009	.202	.912
	Level of sorghum production	.184	.077	.381	2.387	.054	-.005	.372

Number of cattle	-.071	.017	-1.573	-4.258	.005	-.112	-.030
Goats number	.047	.010	1.800	4.530	.004	.022	.072
Supplementary feed provision	.114	.034	1.157	3.303	.016	.029	.198
Type of housing	.446	.110	1.189	4.068	.007	.178	.715
Resting of fowl run	.881	.196	2.202	4.487	.004	.401	1.361
Vaccination of indigenous chickens	.359	.134	.507	2.681	.036	.031	.687
Type of hatching method	.344	.141	.486	2.447	.050	.000	.689
Total deaths of Indigenous chickens	.005	.006	.145	.914	.396	-.009	.020
Chicken slaughtered	.002	.008	.049	.261	.803	-.017	.021
Source of income	.009	.016	.096	.537	.611	-.031	.048
Radio/ TV	-.167	.113	-.400	-1.481	.189	-.443	.109
Car ownership at household	.003	.008	.070	.412	.695	-.017	.024
Water source at home	.015	.061	.041	.246	.814	-.134	.164
Scot cart present	-.064	.071	-.170	-.902	.402	-.237	.109

a. Dependent Variable: total sold/total chickens

There was a positive relationship between commercializing and variables such as type of dwelling, level of maize output, number of goats, supplementary feed, and type of poultry housing, resting of fowl run, vaccinations and type of hatching method. Variables such as age, level of education, farming experience, type of dwelling, maize production, number of cattle, goats, supplementary feed provision, housing of chickens and resting of fowl run were shown to be significant on sales rate of indigenous chickens.

*Gross margin*

The results were computed from the averages as shown on the table below. Revenue contribution from eggs sales was shown to be accounting to 5 percent of the total revenue of the indigenous chickens whilst chicken sales constitute the rest of income.

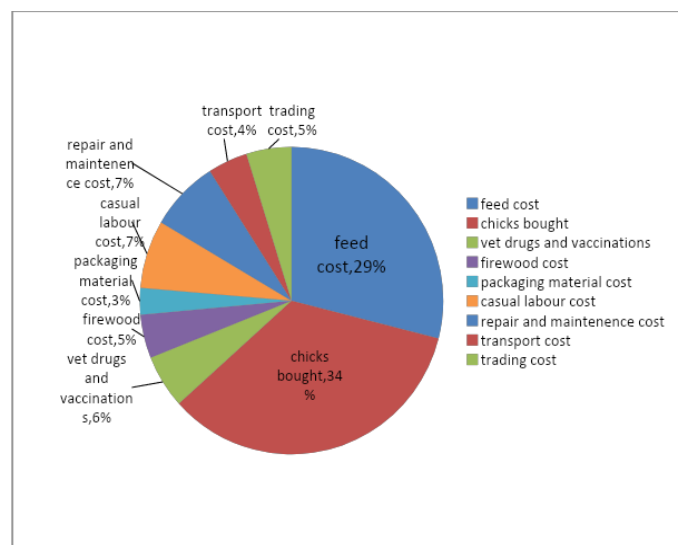
*Gross margin analysis for indigenous chicken*

	Mean	Cost RTGSS
Eggs sold @ 0.3\$	46.6667	14.00
Total sales @ \$RTGS12	21.6500	259.80
<b>Gross income</b>		<b>273.80</b>
<b>LESS VARIABLE COSTS</b>		
Feed cost	74.6729	
Chicks bought	88.5719	
Vet drugs and vaccinations	14.5185	
Firewood cost	11.8333	
packaging material cost	7.2500	
Casual labour cost	18.5000	
Repair and maintenance cost	19.1688	
Transport cost	10.9193	
Trading cost	12.4000	
<b>Total Variable Costs</b>		<b>257.83</b>
<b>Gross margin</b>		<b>15.97</b>

The results above showed that there was a positive gross margin of RTGSS\$ 15.97 dollars when variable costs were compared to the gross income obtained from the sampled farmers. This suggests that the indigenous chicken production can be profitable under smallholder setup.

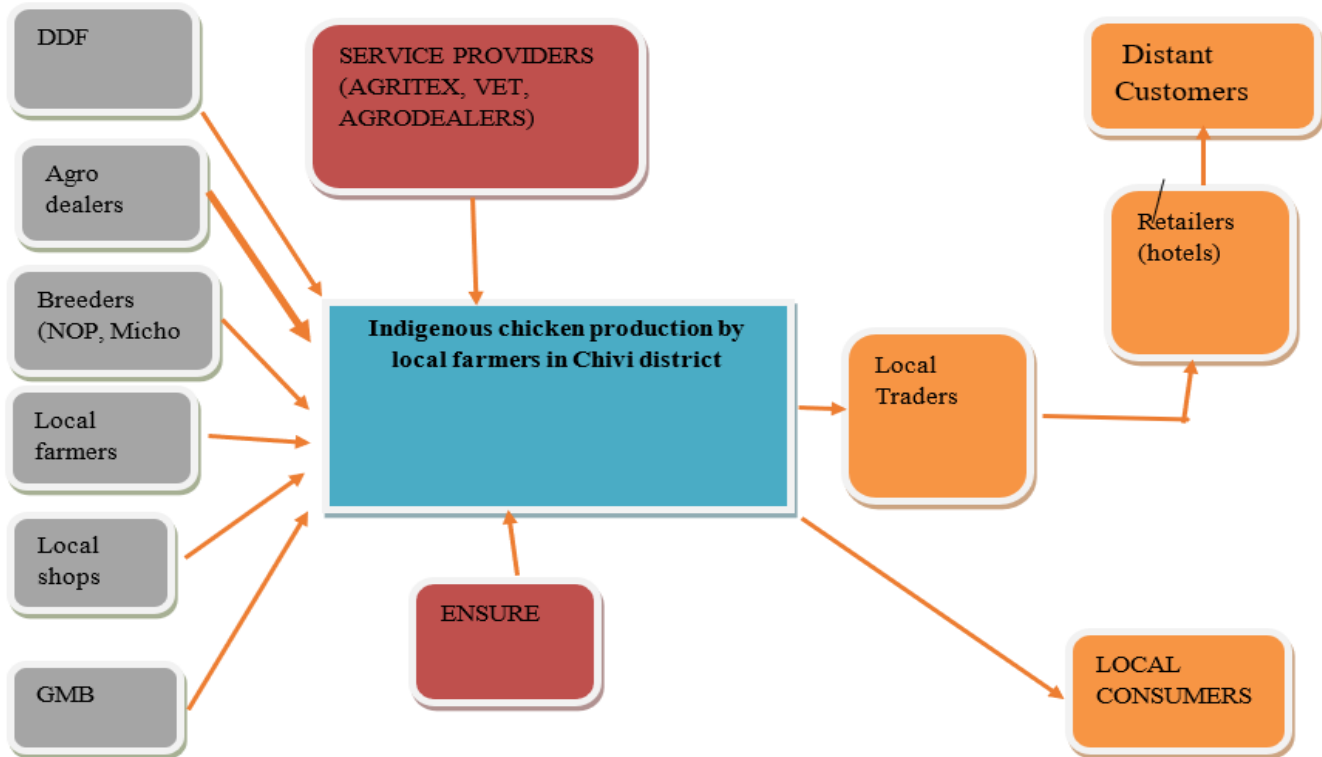
The results showed that variable costs were mainly constituted by feeds, chicks, casual labour, repair and maintenance as shown in figure 5.1. Chicks constitute about 34 percent of the total variable costs. This may imply that there are more willing to buy chicks as they will be used in the production process.

*The proportion of Variable Costs in production of indigenous chickens.*



There results conform that feed costs and costs of chicken contribute a greater proportion in taking a greater expenditure percentage as illustrated by the diagram above.



*Value chain mapping for indigenous chicken*

The above map show that indigenous chickens can be traded locally and on distant market thereby displaying the potential to also create income on intermediary industries as they provide services to the indigenous chicken value chain. Extension support through private and public extension system has the potential to help promote indigenous chickens in smallholder farmers.

#### IV. DISCUSSION

There was a negative relationship between age and sales rate. As age increase sales rate will decrease by 0.012. Hence, age has an important role to play in indigenous chicken commercialization in Chivi district. Dlova *et al.*, (2004) states that age is one of the factors that may affect farmer's probability of being successful in farming. The study shows that older farmers are less capable of carrying out strenuous activities required in selling indigenous chickens as compared to younger farmers. Similar findings have also been found by Maumburudze *et al.*, (2016) who found that age significantly decreases with commercialization of indigenous chickens. Dlova *et al.*, (2004) has concluded that younger farmers are more willing to explore new technology. This suggests that age is one of the influencing factors in indigenous chicken commercialization. It was also found that as farmers get older, they may become conservative and reluctant to accept some risks, while they also prefer to work fewer hours and have fewer nonfarm employment opportunities (Bembridge, 1984). From the above analysis it may be more beneficial to focus on younger people when commercializing indigenous chickens as they are more willing to commercialize indigenous chicken

than older farmers. A focus towards younger people may also help to improve rural areas which have been reported to become dissolute due to lack of desirable job opportunities, poor education facilities as youth migrate to cities to acquire relevant skills (Yusuf, 2014). The negative relationship between age and sales rate may also suggest that past poor perception by older farmers as indigenous chickens were viewed as a non-commercial enterprise.

Education level showed a significant negative effect on sales rate. The result obtained was not expected as higher education was expected to decrease risk aversion behaviour and increase the likelihood of commercialization. Hence the results suggest that as farmers get more educated the more, they get interested in other enterprise which might be paying. Past perceptions on indigenous chickens where the enterprise was only kept for meat may also cause the negative relation between education and sales rates. The above findings are also in disagreement with findings that higher education is advantageous for adoption of farm innovations thereby making the farmer responsive to agricultural extension programs (Agwu, 2015).

Farming experience has shown to be negatively contributing to commercialization of indigenous chickens. The findings were unexpected as knowledge with farming helps in improving management of indigenous chickens. Though farmers were experienced in indigenous chicken production, results suggest that farmers might not yet be convinced that indigenous chickens can be commercialized. This suggest that indigenous chickens are kept for subsistence by most farmers only selling when they have surplus or when the family is in need of cash

(Tarwireyi & Fanadzo, 2013). There is need to train and convince farmers to improve sales rates so as to take advantage of their experience in farming of indigenous chickens. The above relationship may point to constraints in the value chain of indigenous chicken that hinder demand of the enterprise as they communicate with different customers thereby resulting in farmers becoming less willing to sell indigenous chickens. Farmers tend to learn more about a technology through their own experience as the scale of adoption increases (Beshir *et al.*, 2012). The above contradicts the negative relationship between the farming experience and sales rate for commercialization of indigenous chickens. This suggests that more need to be probed to determine why farmer's experience is negatively related to indigenous chicken sales rate.

A significant positive relationship has been shown to be associated between type of dwelling and commercialization of indigenous chickens. As the farmers improve type of dwelling, the more they also want to commercialize indigenous chickens. This may suggest that as people standards of living improve, the more they will want to have more household items, hence an improvement also in the sales rates for indigenous chickens as they seek additional incomes.

Level of maize output produced by the farmer was found to be significant and positively related to sales rate. An increase in maize output by one unit was found to have an increase in sales rate of 0.557. This relationship was expected as improvement in maize output may result in provision of grains which could be used for supplementary feeding thereby helping in improving in indigenous chicken production. Maize grains was observed to be the most supplement given to indigenous chickens by communal farmers (Mapiye *et al.*, 2008).

The study showed a negative relationship between number of cattle owned by the household and the sales rate of indigenous chickens. The results suggest that as number of cattle increases, farmers become more focused on cattle production and become less focused on indigenous chicken production. When resources are prioritized to cattle production, very little resources will be left for indigenous chicken production. Cattle are valued most by communal farmers as compared to indigenous chickens which are mainly produced for consumption (Maumburudze *et al.*, 2016). The above results also agree with Jaleta *et al.*, (2012) who found that livestock ownership was negatively associated with commercialization of indigenous chickens. Hence, this help to validate that farmers keep indigenous chickens for prestige and wealth with very little contribution to household livelihood.

An improvement in numbers of goats has shown to significantly result in the increase in sales rates by 0.047. Goats are regarded as one enterprise which can easily be sold at household level, hence when increased they will provide a complimentary source of income to the households. This leaves the family with an allowance to sell more chickens. Income obtained from goats can be used to buy indigenous chicken production inputs thereby resulting in improved productivity which will improve commercialization rates. Access to goats

by households may act as leverage to possible investment in commercial related enterprises (Nandi & Gowdru, 2017). Availability of sources of income has shown to positively affect the commercialization of indigenous chickens. The variable though not significant may suggest that off-farm income may be used by households in improving indigenous chicken's production.

Supplementary feed provision had shown to have a positive but significant relationship with sales rate. When chickens are given supplementary feed, indigenous chicken tend to increase output since the feed given makes chicken reproduce more. An increase in supplementary feed will result in an increase in sales rate by 0.114. This finding contradicts Siyaya and Masuku (2013) who found that supplementary feed had a negative but a significant effect on sales rate in their study on constraints and opportunities of village chicken production systems in the smallholder sector of Rushinga districts of Zimbabwe. Supplements given to chicken contributed to increased flock size, high growing and fertility rates and made them less vulnerable to disease and parasites (Adeniyi, 2011). A positive correlation between number of chickens and type and frequency of supplementation indicated that giving quality supplements increased production. This relation was expected as feed supplementation of proteins is associated with increase in survival rates and disease tolerance (Maumburudze *et al.*, 2016). Mapiye *et al.*, (2008) also had similar observations since supplementation of feed mainly rely on cereal grains; supplementation to indigenous chickens will depend on grain availability (Yusuf, 2014). This calls for cropping programme which includes protein crops to enable good grain harvests so as to feed indigenous chickens. There is need for correction of nutrient imbalance through incorporating feeds rich in protein which can be locally available or grown so as to minimize costs. Indigenous chickens are perceived to have slow growth rate and mature body weight, however when given protein supplementation, they may attain similar growth rate and mature body weights like commercial chickens (Kingori *et al.*, 2010). This suggest that there is need for more training in indigenous chicken supplementation so as to enable farmers to take indigenous chicken enterprise as an equally important enterprise which can improve in growth rate and mature weights.

Poultry housing was found to have a significant positive relationship with sales rate. An improvement in housing will result in an increase in sales rate by 0.446. Most farmers rearing indigenous chickens are using traditional poultry, which are mainly poorly built. Most indigenous housings have poor roofs, floors, ventilation, and lighting materials. This makes indigenous chickens susceptible to diseases and weather conditions. Predators may also take advantage of poor housing to destroy chickens. Kugonza *et al* (2008) reported that construction of proper housing structures is important to reduce theft of indigenous chickens by communal farmers. Petronilla (2013) dictates that construction of predator proof for indigenous chicken may help reduce chicken losses. Indigenous chicken production requires chicks, pullets,

breeding stock to be protected in order to have improved sale rates in indigenous chickens.

Resting of fowl run was also found to have positive relationship with sales rate. Resting of fowl run is important in chicken management as it helps to control parasites and diseases thereby help in improving survival rates for indigenous chickens. Hence this may result in improved sales rates. Parasitism cause major problems which may cause economic losses to poultry production resulting in retarded growth, reduced weight gain, diarrhoea, poor feathers and intestinal problems (Kusina *et al.*, 1999). Dube *et al* (2010) asserts that stress from parasites could affect blood picture and cause anorexia. The above suggests that resting of fowl run is important in reducing diseases incidence thereby positively contributing to survival rates.

Hatching method practiced was found to be significantly contributing to increase in sales rates. An improvement in hatching method contributes to high hatchability of chicks thereby increasing indigenous chickens. This suggests that investment in hatching method may help to produce more chickens for communal farmers thereby improving farmer's income. Vaccination significantly affected sales rate positively. The result was expected as vaccination of diseases help to reduce disease outbreaks. Similar findings were also obtained by Maumburudze (2016), where they found that vaccinations were significantly positively related to commercialization of indigenous chickens in Makoni District, Zimbabwe. Many diseases and outbreaks are caused by failure to vaccinate and poor hygiene (Tarwireyi & Fanadzo, 2013). Protection of diseases such as Newcastle requires three vaccinations during the 6-month growing period for pullets and cockerels (Mlambo *et al.*, 2011). To improve sales rate through vaccinations, the limited or under funding of veterinary services makes it necessary to build networks for private veterinarians so as to provide vaccinations in indigenous chickens.

However, findings of cost of medication vary greatly with findings by Counties *et al.*, (2017) who revealed a higher percentage of 14 percent on economic analysis of indigenous chicken production. Repair or maintenance and casual labour constitute about 7 percent on total variable costs. Most housing for indigenous chickens consists of traditional fowl run which are periodically repaired as they are normally constructed of poor-quality material which will be obtained from the area.

The results above conform with results obtained by Omondi, (2016). However, the narrow gross margin of RTGSS\$ 15.97 may be improved if cost of feed is made affordable or through provision of subsidies in feeds thereby improving the gross margin. Feed constitutes the second largest share of total variable costs of indigenous chicken production as shown in table 5.1 above. The cost of drugs or chemicals do not contribute much to the total variable cost of indigenous chicken production due to the use of traditional medicines in controlling some parasites and diseases. Indigenous chicken groups may also help in lobbying and marketing of indigenous chickens thereby improving the prizes of indigenous chickens. The

reduced gross margin can be attributed to smaller flock size and poor pricing of indigenous chickens. The sold indigenous chickens were sold or prized based on per bird rather than basing on price per given mass. This may reduce income for the farmer who might have high chicken output.

Feed has shown to be another major contributor in variable costs as it constitutes about 29 percent of the variable costs. The high contribution will therefore imply that feed costs contribute greatly to the profitability of indigenous chickens. The above findings are also in agreement with findings which were done by Maoba (2016) and Siyaya & Masuku (2013) who found that feed input was one the main input accounting for higher cost of the total variable costs.

Variable costs such as veterinary drugs and vaccinations contributed about 6 percent as shown in the table below. This implies that less preference by farmers to invest in potential pest and disease control. The proportion of the cost of medication is in line with findings done by Padhi (2016) who revealed that medication constituted about 2 percent of the total variable costs in the production performance of indigenous chickens.

#### *Value chain mapping for indigenous chickens in Chivi*

The value chain mapping for indigenous chicken has grouped stakeholders who provide agricultural inputs as agro-dealers as shown in figure 5.2. Feed and other inputs such as chemicals used in indigenous chicken production were being supplied by N Richards, Imbayavarimi, and farm supplies. Transport cost to obtain the inputs is a challenge as they are not locally located. Local shops available provide some feed, but however they seem to stock fewer chemicals and feed as customers try to buy from distant agro dealers.

Major input suppliers of indigenous chickens involve local farmers or villagers as they will be supplying feed and chicks to the farmers. The information on input stakeholders is shown on the table below. Other players mentioned include N Richards, Imbayavarimi and Farm supplies which are mainly agro dealers which are involved in supplying feed and chemicals. Local shops have shown to play an important role as they were mentioned by about 12, 5 percent of the respondents in providing inputs such as feed and chemicals.

#### *Input stakeholder suppliers*

Input supplier	Input supplied	Percent respondents who bought
N Richards	Feed, vet drugs	19
Local Shops	Vet drugs	12,5
Imbayavarimii	Vet drugs	5
DDF	Water	1.9
Local farmers	Feed, chicks or pullets	52.9
NOP	Chicks, troughs	2.5
Farm supplies	Vet drugs	2.5
GMB	Feed grain	0.6
ENSURE	Chicks	2.5
Micho supplies	Chicks	0.6

D.D.F was mentioned in supplying water being used in indigenous chicken through drilling and maintenance of boreholes so as to allow good supply of water. The studied area also receives chicks from indigenous chicken breeders such as N.O.P and Micho chick suppliers. The breeders are distant away from the studied area but their mentioning in the studied area point to a very important role in the near future as they will supply better quality chicks. ENSURE organization also supplied chicks to the farmers so as to increase indigenous chicken production in the communal area. The chicks supplied through ENSURE Organization were mainly obtained from breeders such as N.O.P, and these were mainly targeting the underprivileged families so as to increase their level of indigenous chicken production as they will be getting the chicks on a flexible term of payments.

G.M.B was also found to be contributing to feed input supply as they were supplying grain for feed. Farmers bought pearl millet mainly to feed chickens from G.M.B. However, it was reported by only one respondent. This may imply that though pearl millet was used for indigenous chicken feed production for home-made feed formulation, most farmers use the grain from G.M.B for food.

DDF was mentioned as one stakeholder that provides water for indigenous chicken production. The above calls for continued strengthening of water provision to farmers for it to be used productively in indigenous poultry production. Shortage and poor-quality water may cause reduced growth and diseases in indigenous chicken production. Grain availability from local farmers and GMB is one input which should be promoted as it can produce cheaper sources of supplementary feed. Communal farmers are resource constraint, (Nyamadzawo et al, 2013) hence use of grain may produce cheaper homemade feed which can be used as supplementary feeding. Figure below shows players involved in the value chain of indigenous chicken production.

## V. RECOMMENDATIONS

Low commercialization levels by farmers in indigenous chickens require farmers to be capacitated in indigenous poultry management so as to improve commercialization of indigenous chickens. Extension provision in developing countries tends to become low for both men and women, however women tend to make less use than men of extension services (Meinzen-dick *et al.*, 2010). The low sales rate means more extension work on trainings should be done to make men and women improve sales rate for indigenous chickens thereby helping to improve family and national incomes. This will also help in creating employment in the indigenous chicken value chain system. Low sales rates often imply that small scale producers like communal farmers are excluded from lucrative markets as lucrative markets often require high quality and quantity which are supplied constantly. There is need for extension and development partners to establish functional groups through training of farmers to enable constant supply of indigenous chickens.

Poor linkage between producers and retailers needs to be improved in the value chain to enable more income in the value chain. There is need for farmers to realize the changes in demand for indigenous chicken as this present a way of providing opportunities to smallholder farmers as this will provide income to the farmers. The study support recommendations that policies should be introduced in communal areas so as to allow linking of farmers to High paying markets (HPM) (Counties *et al.*, 2017). There is need to avail credit so as to enable producers to access the finance thereby improve production. Access to credit at all marketing levels will help all actors in value to improve services. Small numbers of indigenous chickens being sold by farmers continue to discourage buyers of indigenous chickens, hence there is need to form strategies which are cost effective in marketing of indigenous chickens, and hence there is need to form strategies which are cost effective in marketing indigenous chickens. Farmers have to take advantage of group marketing (buying and selling), as this have found to improve bargaining power for indigenous chickens which enable farmers to have higher prices. Indigenous chicken meat was found to be 13% and 27% higher in market and supermarket compared to prices of meat from commercial chickens like broilers (Padhi, 2016). Farmers may also benefit through reduced transport costs on marketing search.

There is also need to form model of policies that help to insure the production of indigenous chickens by communal farmers as this forms basis for most rural poultry enterprises. Insuring indigenous chicken production will enable farmers to remain resilient in times of disasters such as drought and disease outbreaks.

High feed costs require more effort to be done on increasing feed so as to avail feed to farmers at affordable prices. This can be done through supporting farmers cropping programmes which include crops for poultry feed. This allow feed to be available at cheaper cost to farmers as the feed will be locally produced hence less costs will be incurred on transportation of feed. Indigenous chickens have been found to be profitable under smallholder sector (Maumburudze *et al.*, 2016). Indigenous chickens contribute to food security through income generation, consumption of eggs and meat. Hence encouragement or support of indigenous chicken through vaccinations on diseases like Newcastle and feed provision will help reduce importation of meat products thereby saving foreign currency for the country (Mukaratirwa & Hove, 2009). Low production performance may be improved through improvements in husbandry practices, better healthcare and providing supplementary feed during periods of inadequate feed (Padhi, 2016). Addressing low productivity will in turn enable the farmers to commercialize indigenous chicken enterprise.

There is need for draft policy framework that focus on providing feed inputs at affordable prices to enable farmers to realize more income. Development partners should aim to open markets for indigenous chickens so as to allow farmers to realize better price thereby obtaining high incomes. There is



need to organize marketing of indigenous chickens such as the establishment of indigenous chickens marketing actions as this will help farmers shape indigenous chicken production into a more commercialized enterprise.

In an effort to improve commercialization and profitability of indigenous chicken there is need to encourage each stakeholder involved in input market to consumers to explore opportunities in indigenous chicken production. This will enable each player to be more efficient and viable in the supply or commercialization of indigenous chickens (Greenbiz, 2016). Players need to be encouraged to have a deeper understanding of the value chain map to enable development of possible business opportunities in indigenous chicken production. Furthermore, government must draft a policy which value organically produced products by offering a premium incentive. Naturally produced indigenous chickens will help to reduce reliance on commercial feeds which might be expensive thereby reducing profitability.

#### *Areas for further research*

There is need for future research to focus on seasonal changes in indigenous chicken production. This is because demand for indigenous chicken tends to vary with seasons, holidays and most festive seasons. The study showed more males involved in household decisions on commercialization of chickens, however there is need to establish ownership of indigenous chickens as this influences decision making in commercializing indigenous chickens. This is because although household head may influence decision to commercialize, impact remain limited if the household head is not the owner of the chickens.

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