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Analysis of the indigenous chicken value chain in Uganda

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ABSTRACT

The estimated chicken population of Uganda is 37 million with over 80% being indigenous chickens. However, the potential of indigenous chickens as a source of income and food remains poorly exploited. Additionally, while the sector has several actors, it is not clear where value is lost or gained, and how the value share and risks are distributed along the various nodes of the value chain. This knowledge gap masks exploitation points of the poor smallholder households at the production end. It is therefore critical to generate information on the structure and functioning of the indigenous chicken value chain in Uganda. Based on production potential and contribution to poverty reduction of indigenous chickens, site selection generated two agro-ecological zones. Data collection was through a structured survey administered to households in 25 villages while analysis applied the procedure of Bjorndal (2010) for value chain analysis. The results showed that most farmers (63.3%) practiced the free-range system of which 35.4% provided supplements to the chickens. Very few households (1.2%) fed their chickens entirely on commercial diet. About 68.3% of farmers acquired initial knowledge on indigenous chicken rearing from their parents, 20.4% by own initiative, 5.4% from fellow farmers and 5.4% through formal training. Most of the poultry farmers accessed extension services through Non-Government Organizations (NGOs) and fellow farmers. Income generation was the major reason why farmers reared indigenous chickens. Parasites and diseases (58.4%) and feed shortage (18.1%) were the main challenges faced by the farmers. Indigenous chickens were marketed either directly by farmers or through a number of middlemen/intermediaries. The average selling price of an egg, mature cock and hen was significantly ($P<0.05$) higher in western mid altitude farmlands than southern and eastern Lake Kyoga basin. The margin were 5450 ± 670 and 4935 ± 1220 Ug.Shs. in Southern and Eastern Lake Kyoga basin and Western mid-altitude farmlands, respectively. The intermediaries and retailers received higher profit margins of 18.18% and 18.00% compared to producers (11.37%) and wholesalers (10.25%). Improvement of indigenous chicken value chain requires increased access to services and efforts accruing from all key players, modification of the marketing system and intensification of farmer group participation in trainings. Free-range system remains predominant with women and children as the main labor providers among smallholder

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indigenous chicken farmers. Strategies to improve household nutrition and incomes from more productive indigenous chickens should account for the risks and distribution patterns of value share within such systems.

Key words: Actors, indigenous chickens, production, smallholder farmers, value chain

RÉSUMÉ

La population de poulets en Ouganda est estimée à 37 millions, dont plus de 80 % sont des poulets locaux. Toutefois, le potentiel des poulets locaux en tant que source de revenu et de nourriture demeure mal exploité. De plus, bien que le secteur compte plusieurs acteurs, on ignore toujours où la valeur est perdue ou gagnée, comment la part de valeur et les risques sont répartis le long des divers nœuds de la chaîne de valeur. Ce déficit de connaissances masque les points d'exploitation des petits ménages pauvres au niveau de la production. Il est donc essentiel de générer des informations sur la structure et le fonctionnement de la chaîne de valeur du poulet indigène en Ouganda. En fonction du potentiel de production et de la contribution à la réduction de la pauvreté des poulets locaux, la sélection du site a généré deux zones agro-écologiques. La collecte des données s'est faite au moyen d'une enquête structurée menée auprès des ménages de 25 villages, tandis que l'analyse a utilisé la procédure de Bjorndal (2010) pour l'analyse de la chaîne de valeur. Les résultats ont montré que la plupart des agriculteurs (63,3 %) pratiquaient le système en plein air, dont 35,4 % fournissaient des suppléments aux poulets. Très peu de ménages (1,2 %) ont nourri leurs poulets entièrement à l'alimentation commerciale. Environ 68,3 % des aviculteurs ont acquis des connaissances initiales sur l'élevage de poulets locaux auprès de leurs parents, 20,4 % de leur propre initiative, 5,4 % de leurs collègues et 5,4 % grâce à une formation formelle. La plupart des aviculteurs ont eu accès à des services de vulgarisation par l'intermédiaire d'organisations non gouvernementales (ONG) et d'autres agriculteurs. La production de revenus était la principale raison pour laquelle les agriculteurs élevaient des poulets locaux. Les parasites et les maladies (58,4 %) et la pénurie d'aliments pour animaux (18,1 %) étaient les principaux défis auxquels les agriculteurs étaient confrontés. Les poulets locaux étaient commercialisés soit directement par les aviculteurs, soit par plusieurs intermédiaires. Le prix de vente moyen d'un œuf, d'un coq mature et d'une poule était considérablement plus élevé ($P<0,05$) dans les régions agricoles de moyenne altitude de l'ouest que dans le sud et l'est du bassin du lac Kyoga. La marge était de 5450 ± 670 et 4935 ± 1220 UGX dans le sud et l'est du bassin du lac Kyoga et dans les régions agricoles de moyenne altitude de l'ouest, respectivement. Les intermédiaires et détaillants ont eu de marges bénéficiaires élevées de 18,18 % et de 18,00 % par rapport aux producteurs (11,37 %) et aux grossistes (10,25 %). L'amélioration de la chaîne de valeur du poulet local exige un accès accru aux services et des efforts de tous les intervenants clés, la modification du système de commercialisation et l'intensification de la participation des groupes d'agriculteurs aux formations. Le système en plein air demeure prédominant, les femmes et les enfants étant les principaux fournisseurs de main-d'œuvre parmi les petits producteurs de poulet autochtones. Les stratégies visant à améliorer la nutrition des ménages et les revenus des poulets locaux plus productifs devraient tenir compte des risques et des schémas de distribution de la part de valeur dans ces systèmes.

Mots clés : Acteurs, poulets locaux, production, petits producteurs, chaîne de valeur

INTRODUCTION

Indigenous chicken (*Gallus domesticus*) production constitutes 87.7% of the poultry flock in Uganda (UBOS, 2015). These chickens are sometimes referred to as local, native, traditional and village family chickens (FAO, 2009). Nearly all rural and peri-urban households in Uganda keep a small flock of indigenous chickens, with an average number of 20-30 birds, which contributes to their social, economic and cultural requirements (Nakkazi *et al.,* 2014). Although high yielding exotic chickens were introduced in Uganda over 50 years ago, indigenous chickens have remained important in the diets of many Ugandans (Kyarisiima *et al.,* 2011). Indigenous chicken meat is lean, with an organic origin and fetches a premium price in the markets (Kyarisiima *et al.,* 2011). In the urban market, the price of indigenous chickens almost triples that of exotic chickens (Emuron *et al.,* 2010).

Indigenous chickens are generally owned and managed by women and children (Action Aid International, 2012) who are often marginalized by men and yet play an important role on household income (Ashley and Nanyeenya, 2002). Over 90% of the day to day activities in poultry are carried out by women and children with very little male participation. Therefore, any cost-effective strategy that increases production and productivity of indigenous chickens should recognize the role of gender in poverty alleviation and food security especially when indigenous chickens are the main means of livelihoods.

Indigenous chickens are a major source of income and protein to many households (Nakkazi *et al.,* 2014). They are easy to rear, are not costly, the meat and eggs have high demand, they are adapted to the environment, a lot of indigenous knowledge exists but its potential is not yet fully exploited. Although the actors could be known, it is not clear where value is lost and gained, neither is it clear which of the actor gains most, and the challenges they face. The service providers to the chain are also scantly known to prompt interactions and deeper realization of what they are capable of executing. It is therefore critical that efforts are dedicated to improving structural development in the indigenous chicken value chain that can improve the profitability of its products in Uganda. Thus the main objective of the study was to analyse structural development in the indigenous chicken value chain. The specific objectives were to; determine the roles of the main actors in the indigenous chicken value chain, determine and map Uganda's indigenous chicken distribution and marketing channels, determine the profit levels of the key actors in the marketing of indigenous chickens, determine the challenges faced by each of the actors in the indigenous chicken value chain and explore the strengths, weaknesses, opportunities and threats of the indigenous chicken value chain.

METHODOLOGY

Study area. The study involved households that keep indigenous chickens in 25 villages of southern and eastern Lake Kyoga basin and western mid-altitude farmlands agro-ecological zones of Uganda (Figure 1). The study sites were purposively selected to complement previous studies by Natukunda *et al.* (2011) and Nakkazi *et al.* (2014). The chicken population was estimated at over 84,791 in both study locations. The households were characterised by high incidences of malnutrition, maternal mortality and morbidity rates, domestic violence, polygamy, all of which contibute directly to the rampant poverty renown in these areas (UBOS, 2015).

Study design and sample size. The survey was conducted following the value chain analysis criteria by Bjordal (2010). The poultry farmers selected were those that kept indigenous chickens following records from the Production Department of the respective districts and this acted as a basis for the identification of the sub

counties. The lists were used to build sampling frames from which the farmers were randomly selected. The sample size was calculated to provide the statistical significance based on 95% precision using Israel (2013) formula below:

$$n = \frac{Z^2P\ (1\text{-}P)}{E^2}$$

Where n is the estimated sample size
Z is the standard normal deviation depending on the degree of confidence (95%) with Z= 1.96
P is the estimated proportion of attribute that is percent in the population (adopted 80%)
E is the maximum allowance error (5%)

The traders in this study fell into two categories; those who sell live birds and those who processed birds before selling. These were selected using the snowball sampling approach. The list of consumers who had eaten chicken at least once in the last six months was compiled and this constituted the sampling frame. Respondents were randomly selected from the two districts with a precondition of having eaten chicken. The consumers were interviewed in markets, restaurants, shops and households. The sample included 240 farmers, 10 stockists, 10 restaurants, 50 traders (wholesalers, processors), 10 transporters and 100 consumers.

Data collection. Semi-structured questionnaires were designed to collect qualitative and quantitative data among the farmers, traders, transporters and consumers involved in the indigenous chicken subsector. Different questionnaires were designed for each of the respondent categories. Each of the respondents by category were required to identify the actors in the indigenous chicken subsector and responded to different questions in the questionnaire. Stakeholders flow maps were used to have a visual representation of the whole indigenous chicken value chain in the selected agro-ecological zones. Two Focus

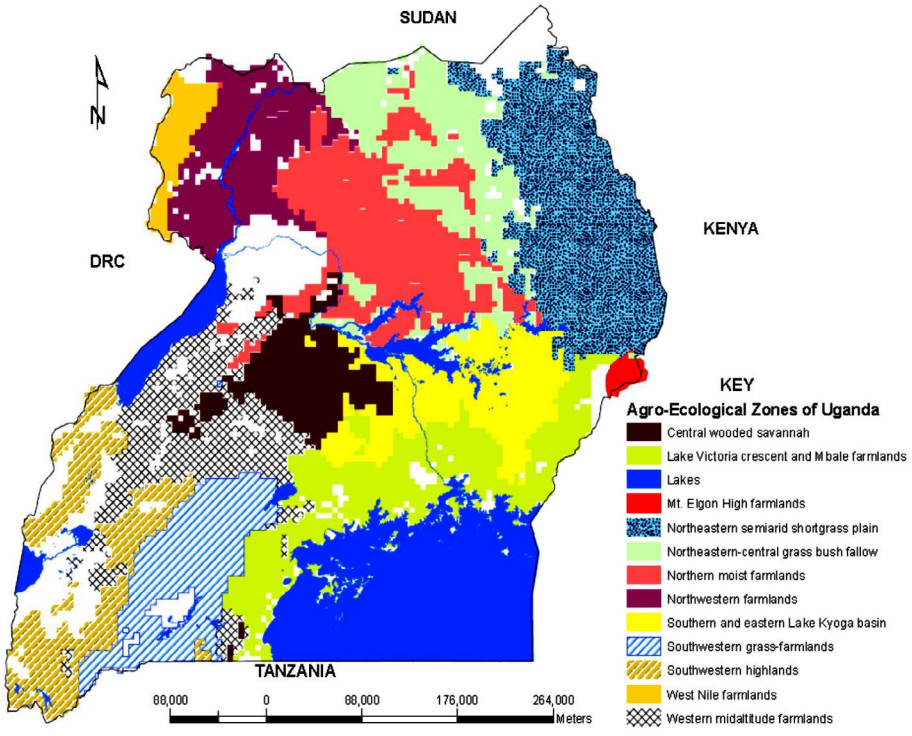

Figure 1. Map showing the study area

Group Discussions, guided by a checklist, were also conducted for data triangulation and for giving further qualitative narrative and in-depth description of what had been collected through the interviews.

Data analysis. The interview data were hand recorded on the open-ended questionnaires that were used during the process. Data from the two focus groups were hand recorded on sheets of paper and later indexed for similarities and differences in content. The collected quantitative and qualitative data were analysed using SPSS (ver. 21) (SPSS, 2012). The roles of the main actors were described in qualitative terms based on themes related to what market players offer at each node. Value chain mapping was used to articulate visual representation of the value chain in both zones. Quantitative data were analysed using descriptive statistics comprising of means, frequencies and percentages. Profit levels for each node were determined using Margin Analysis. The profit margin used in the production process were computed and the total revenue (TR) determined from sale of eggs and or chickens having an average weight of 1.5 kilograms. The profit margin (pi) was then obtained by subtracting the total revenue (TR) from the total costs (TC). The Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of indigenous chicken value chain system was also done with a view to improving the operations and efficiency of the value chain.

RESULTS

Demographic characteristics. The results are presented in Table 1. There were no significant differences in demographic characteristics between zones. The respondents in both locations were mainly males and about half were heads of households while about a third were spouses. Majority (>80%) were married and about half were aged between 31 and 50 years and had attained at least primary education. Comparisons were made between the two agro-ecological zones since they differed largely by the amount of rainfall, which drives the agricultural potential and farming systems within each category. The environment continuously evolves with the probabilities of specific weather conditions. Consequently, farmers have to frequently adapt their production techniques and production to the new conditions. Adaptations included farmers 'decisions' about their portfolio of crops and animal production (products and techniques). There were non-significant differences between zone 1 and 2 regarding all the five parameters studied. In most of the studied households, most respondents were men, over half of all respondents were heads of households, with a few being spouses and children. In both zones, over 85% of heads of household were married while a few were single, divorced or widowed. Nearly two-thirds of all household heads were aged between 31-50 years and almost one fifth were younger than 30 years. In terms of education level, in both agro-ecological zones, most heads of households had attained primary education followed by those with secondary education. Only 5% had tertiary education while a very high proportion (23%) did not attain any level of education.

Chicken flock size and structure. Results of flock size and structure in the households are given in Table 2. There was a non significant variation ($P < 0.05$) in flock size in both southern and eastern Lake Kyoga basin compared to the mid-altitude farmlands. The average flock sizes in both zones were 29.93±4.6 and 27.43±5.8 birds per household, respectively. In both zones, chicks were second highest in number and the least were breeding cocks.

Reasons for rearing indigenous chicken and feeding practices. Table 3 gives the reasons why poultry farmers reared indigenous chickens and the feeding practices used. Majority of households (91.2%) reported income as the main reason for rearing indigenous chickens.

Table 1. Demographic characteristics of households in the study area

Parameter (%)	Zone 1 (n =120)	Zone 2 (n=120)	Average	P-value
Sex				2.500
Male	68.3	77.5	72.9	
Female	31.7	22.5	27.1	
Respondents' position				0.345
Household head	55.6	48.2	51.9	
Spouse	34.2	38.4	36.3	
Child	10.0	12.0	11.0	
Others	0.2	1.4	0.8	
Marital status				0.269
Married	86.7	85.8	86.2	
Single	2.5	1.7	2.1	
Divorced	1.7	0.8	1.2	
Widowed	9.2	11.7	10.4	
Age category				0.423
<30 years	15.0	20.0	17.5	
31—50 years	55.8	62.5	59.1	
> 50 years	29.2	17.5	23.3	
Education level				1.422
None	16.7	29.2	22.9	
Primary	51.7	46.7	49.2	
Secondary	25.8	20.0	22.9	
Tertiary	5.8	4.2	5.0	

Key: Zone 1— Southern and Eastern Lake Kyoga Basin; Zone 2—Western Mid altitude farmlands

Table 2. Least square means ± S.E of indigenous chicken flock sizes per household

Parameter	Zone 1 (n =120)	Zone 2 (n =120)	Average	P-value
Total flock size	29.93 ± 4.6	27.43 ± 5.8	28.68 ± 5.2	0.5000
Cocks	3.07 ± 0.3	2.45 ± 0.2	2.76 ± 0.2	0.6000
Hens	6.68 ± 0.6	4.25 ± 0.4	5.46 ± 0.5	0.2000
Pullets	5.54 ± 0.8	5.36 ± 1.8	5.45 ± 0.3	0.2000
Cockerels	3.92 ± 0.5	6.25 ± 2.7	5.08 ± 0.6	0.6000
Chicks	10.72 ± 2.4	9.12 ± 0.7	9.92 ± 0.5	0.3000

Key: Zone 1—Southern and Eastern Lake Kyoga Basin; Zone 2—Western Mid altitude farmlands

Feeding practices. There was significant variation (P< 0.05) in feeding practices used in southern and eastern Lake Kyoga basin and western mid altitude farmlands. About 76.6% of households in Western mid-altitude farmlands feed their chickens compared to 50.0% in southern and eastern Lake Kyoga basin. Feeding system was significantly different with nearly equal numbers of households in zone 1 practicing scavenging with or without supplementation while majority in zone 2 practiced scavenging system. Feed was mainly scattered on the ground while frequency of supplementation varied more in zone 1 than in zone 2 where majority supplemented the chicken diet only once a day. Water was provided by majority of the households in both zones. Regarding feeding equipment used, majority of the households (73.0%) do not use any but provide feeds and supplements to their chickens on bare ground, 24.0% in local containers and only 7.0% used commercial feeders. Supplements are mainly given to chickens once a day. About 93.3% of households provide drinking water to their chickens.

Table 3. Reasons for indigenous chicken rearing and feeding practices

Parameter (%HH)	Zone 1 (n =120)	Zone 2 (n =120)	Average	P- value
Why rear indigenous chickens				0.2000
Income generation	92.5	89.9	91.2	
Food security	5.0	9.2	7.1	
Social and cultural benefits	2.5	0.9	1.7	
Feeding system used				0.0001
Total scavenging	50.0	76.6	63.3	
Entirely on commercial diet	1.7	0.7	1.2	
Scavenge and supplement	48.3	22.5	35.4	
Feeders used for supplements				0.5000
Commercial feeders	5.8	8.3	7.0	
Improvised containers	30.0	18.0	24.0	
Scattered on the ground	64.2	81.7	73.0	
Frequency of supplementation				0.5000
Once a day	40.7	72.5		
Twice a day	37.3	21.3		
All the time	22.0	6.2		
Do you provide water				0.1000
Yes	95.8	90.8	93.3	
No	4.2	9.2	6.7	

Key: Zone 1— Southern and Eastern Lake Kyoga Basin; Zone 2— Western Mid altitude farmlands

Table 4. Access to and source of extension services in indigenous chicken production

Parameter (%HH)	Zone 1 (n =120)	Zone 2 (n =120)	Average	P- value
Extension services				0.005
Yes	57.2	44.8	51.0	
No	42.8	55.2	49.0	
Frequency of extension services				0.234
Very often	40.2	33.9	37.1	
Rarely	59.8	66.1	62.9	
Sources of extension services				0.001
NGOs	55.8	59.8	59.3	
Fellow Farmers	35.1	30.1	27.6	
CBOs	4.1	5.3	4.7	
Extension workers	5.0	5.0	3.5	

Key: Zone 1— Southern and Eastern Lake Kyoga Basin; Zone 2— Western Mid altitude farmlands; HH— Household

Extension service delivery. Extension services are critical to the development of any value chain as they create an enabling environment for learning and sharing technological and innovative advances (Mugisha *et al.,* 2014). Analysis of the availability of extension services to the farmers was conducted. Results on the status of extension service delivery on indigenous chicken production is summarized in Table 4. There was a significant difference ($P< 0.05$) in number of households that received extension services in the two agro ecological zones (57.2% for zone 1 compared to 44.8% for zone 2). The respondents from Southern and Eastern Lake Kyoga Basin very often (40.2%) received extension services compared to Western Mid-altitude farmlands. The main source of extension service were Non-Government Organizations (NGOs) and fellow farmers.

Profit margin analysis of free range indigenous chicken production. Table 5 shows the profit margin analysis of indigenous chicken

production under free range, intensive and semi-intensive system for a flock size of 30 birds. Results showed significant variations in the selling price of an egg, a mature cock and a hen in both zones that resulted into varying revenue levels. The average selling price of an egg, a mature cock and hen were significantly higher ($P<0.05$) in western mid altitude than southern and eastern Lake Kyoga basin. However, the costs of production and revenue across the three management systems in both zones was not significantly different although numerically higher in southern and eastern Lake Kyoga basin.

Stakeholders identification and roles. Table 6 shows the different stakeholders that constitute the indigenous value chain of the two agro ecological zones as well as the various roles that each stakeholder is expected to perform in the sector. The stakeholders were categorized into research institutions/organizations, input suppliers and hatcheries, farmers, extension agents, wholesalers, retailers and supermarkets of indigenous chickens, financial institutions and consumers. The research institutions/ organizations were mainly from the Ministry of Agriculture, Animal Industry and Fisheries, Universities and National Agriculture Research Organization (NARO) whereas extension agents were the Ugandan Government extension workers and those from Non- Government Organizations. The financial institutions were mainly banks, Micro-Finance Institutions (MFIs), Savings and Credit Cooperatives (SACCOs) and Village Savings and Loans Associations (VSLA).

Table 5. Profit margin analysis of indigenous chicken production under free range, intensive and semi –intensive system

Parameter (UgShs)	Zone 1 (n =120)	Zone 2 (n =120)	Overall	P-value
	Mean ± S.E			
Free range system				
Selling price of an egg	304 ±6.7	360± 6.2	333	0.0001
Selling price of tray of eggs	9796 ±815.9	9800± 712.5	9759	0.0001
Selling price of mature cock	20093±481.6	22585±340.0	21339	0.0001
Selling price of mature hen	14677±1334.0	14755±257.2	14716	0.0090
Cost of production/bird	7550±2623.0	7565±764.0	11300	0.4000
Average income/bird	13000±3452.0	12500±3452.0	12750	0.3000
Profit margin	5450± 670.0	4935±1220.0	7917	0.3000
Intensive system				
Selling price of an egg	534±6.4	541± 3.2	537.5	0.5662
Selling price of tray of eggs	9890±754	10773± 216	10331.5	0.0010
Selling price of mature cock	20122±549.1	22724±670.0	21423	0.0050
Selling price of mature hen	14807±194.0	15755±207	15281	0.0041
Cost of production/bird	8127±110	8230±521.0	8178.5	0.0023
Average income/bird	15400±407	14670±459	15535	0.4566
Profit margin	7273±297	6440±1220.0	6856.5	0.3904
Semi-intensive system				
Selling price of an egg	510±4.3	523±2.8	510	0.0002
Selling price of tray of eggs	10300±431	10334±105.5	10317	0.003
Selling price of mature cock	22105±712	23004±130.5	22554.5	0.043
Selling price of mature hen	16734±406	16894±207	16814	0.3342
Cost of production/bird	7968±251	8001±190.	7984.5	0.3011
Average income/bird	14540±610	14970±758	14755	0.2054
Profit margin	6572±359	6969±568	6770.5	0.3000

Key: Zone 1— Southern and Eastern Lake Kyoga Basin Zone 2—Western Mid altitude farmlands
UgShs= Uganda Shillings (1US$=3,600 UgShs as of 2017)

Table 6. Stakeholder identification and roles

Stakeholder	Roles
Research Institutions/Organizations e.g. MAAIF, NARO, Universities, NAGRC & DB	Advice, genetic improvement, development and generation of technologies to enhance production and productivity, provision of the institutional framework to conduct research
Input suppliers and Hatcheries	Advice, supply of feeds, day old chicks and production equipment
Farmers	Producers of mature chickens and chicken products
Extension Agents e.g. Government Extension Workers, NGOs etc	Provision of advisory services to farmers, support technology development and linkages with markets, support private sector and farmer institutional development, ensure that the research and extension needs of farmers are identified and answered
Wholesalers	Buying and selling in bulk, Packaging, Branding and Value addition
Retailers, Supermarkets	Buying and selling (in smaller quantities), Packaging, Branding and Value addition
Transporters	Transportation of chickens to markets
Financial Institutions e.g. Banks, Micro-Finance Institutions (MFIs), Savings and Credit Cooperatives (SACCOs), Village Savings and Loans Associations (VSLA)	Provision of credit to farmers and advisory services
Consumers e.g. Individuals, Hotels	Buyers of chicken products, Utilisers of chicken products, Influence production and market, feedback provision to farmers and retailers

MAAIF= Ministry of Agriculture, Animal Industry and Fisheries; NARO= National Agricultural Research Organization; NAGRC = National Animal Genetic Resources; DB= Data bank

Stakeholder resource flow map. The flow maps present the resources and nature of support services that are available and accessible to different stakeholders in the indigenous chicken sector of the two agro-ecological zones (Figure 2). These resources were further grouped based on their availability at local, regional and national level. There are few indigenous chicken commercial farmers and these have easy access to the resources and have maximum support service from the strategic partners and the government production department. However, small-scale and resource poor farmers find it difficult to access the resources and markets, although some Non- Government Organizations and input distributors do provide support and technical services to them. Research institutions and reputable organizations such as National Agricultural Research Organization (NARO), Agriculture affiliated Universities and National Animal Genetic Resources and Data bank (NAGRC & DB) are public institutions

that provide research and training to the poultry sector but their services are not easily accessible to the poultry keepers. There are several manufacturers and suppliers of inputs/ equipment used in management of indigenous chickens which included manufacturers/ suppliers of feeders, drinkers, poultry medicine and other poultry equipment.

Indigenous chicken value chain mapping. Figure 3 shows the value chain mapping of the indigenous chicken sector of the two agro ecological zones. The major focus was on information and product flow from producers to final consumers. Results showed that there were basically six categories of actors in the indigenous chicken value chain, i.e., pre-producers, producers, transporters, whole processors, retailers and consumers. The pre-producers were mainly veterinary and extension officers and input suppliers; producers were mainly farmers and middlemen; transporters used mainly motorcycles or bicycles, pick up and taxis; wholesalers were regional indigenous chicken markets traders; retailers were urban markets traders, urban shops and supermarkets and consumers were high profile hotels, local hotels and restaurants and household consumers. The value chain mapping indicated that flow of information and products is mainly through pre-producers, transporters and retailers to consumers. The main agents in information and product flow are the middlemen and retailers, and are thus the predominant actors in flow of products and information in indigenous chicken value chain.

Marketing and transportation of indigenous chickens. The marketing of indigenous chickens in Uganda is mainly through agents/ middlemen and shops to household consumers, institutions, high profile and local hotels and restaurants. The common means of transport of indigenous chickens from the producers and village markets to the regional or urban markets is motorcycles, pick-ups or taxis that either originate from within the regions or are on transit. Chickens are sometimes carried in local cages that have an average carrying capacity of about 80 chickens per cage. Sometimes traders use taxis to ferry

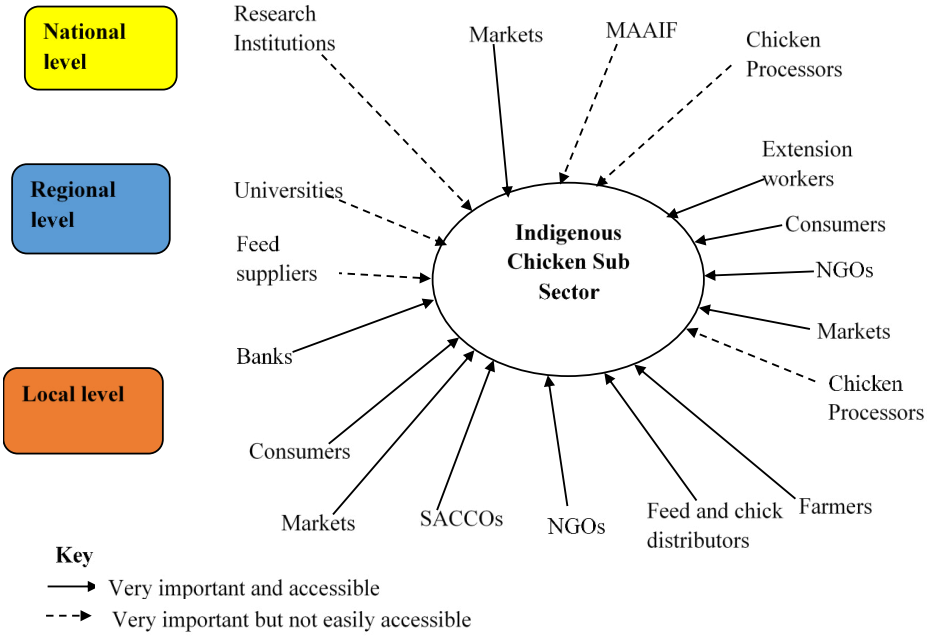

Figure 2. Stakeholder resource flow map

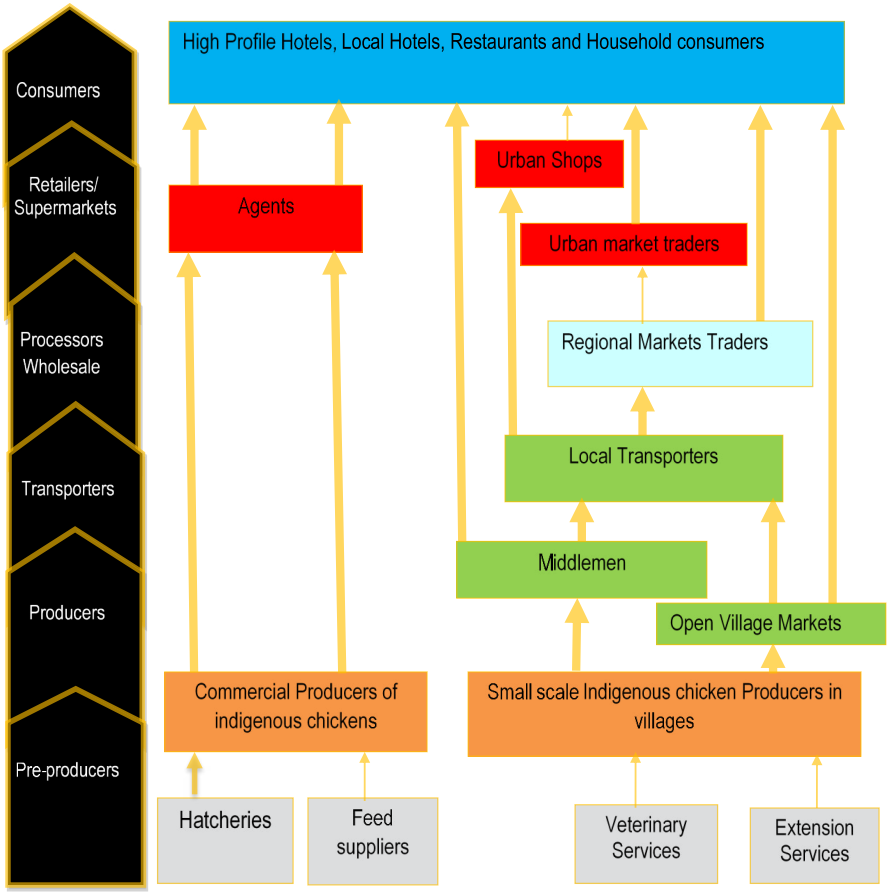

Figure 3: Indigenous Chicken Value chain mapping

chickens to urban centers. The consumer market of indigenous chickens was segmented into:

High profile hotels: These normally prefer mostly exotic breeds as their supply is more reliable and less costly, however, some of their customers prefer indigenous chickens. Local hotels and restaurants (including bars and road side roasters) buy exotic and indigenous chickens depending on their customers, however they complained more about the unreliable supply and high price charged for local chicken.

Households and institutions buy exotic and indigenous breeds of chickens depending on their location and availability. In the more rural areas, they prefer the indigenous chicken whereas in urban centres they buy both types of chicken. Exotic breeds are normally well-dressed and packaged and sold in urban supermarkets. This is only occasionally done for indigenous chickens in urban stall markets; they are not sold in supermarkets.

Profit share analysis of the key actors in the marketing of indigenous chickens. Indigenous chicken farmers in both zones reported to spend Uganda Shillings 11300 in raising one chicken which is later sold at 12750 to middlemen making a profit of Uganda Shillings 1450 (11.37%) of the revenue (Figure 4). The frontline assemblers incur a total cost of Uganda Shillings 13500 and sell at Uganda Shillings 16500 to wholesalers with a profit margin of 3000 (18.18%) (Figure

4) of the revenue in town and urban cities. The wholesalers spend Uganda shilling 17500 on coordination, transportation and transportation of live chickens and receive an income of Uganda shilling 19500 per bird with profit margin of 2000 (10.25%) of the revenue. The retailers incur a cost of production of Uganda shillings 20500 and sell at Uganda shillings 25000 per bird to final consumers (Restaurants/ Hotels) making a profit margin of 4500 (18.00% of the revenue). The producers and wholesalers of indigenous chickens receive a smaller profit margin than the middlemen and retailers. The chart below represents the costs, prices and profit margin for each of the major value chain actors, and it shows that the middlemen earn the highest and the wholesalers the least per bird of 1.5 kgs. However, if one considers the volumes handled, it can be appreciated that wholesalers are the highest beneficiaries in the value chain.

Indigenous chicken production constraints. The indigenous chicken sub-sector is faced with a number of constraints at different levels of actors. The constraints were authenticated through Focus Group Discussions and engagement of experts. In this section, the constraints at different levels of actors were identified and are summarized in Table 7.

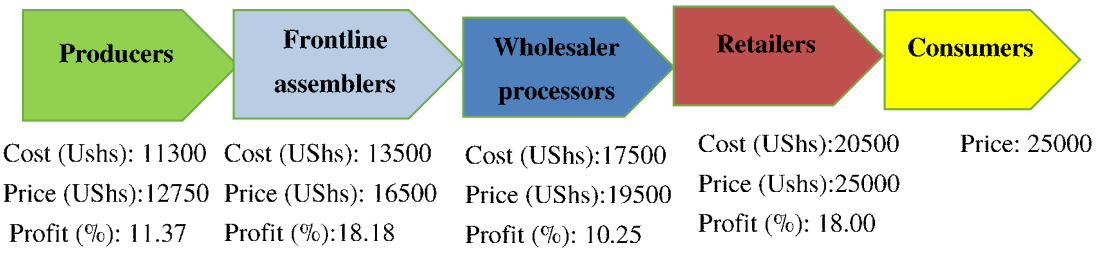

Figure 4. Profit share analysis of Key actors in the Indigenous chicken marketing

Table 7. Constraints faced by the key actors of the indigenous chicken subsector

Category	Constraints
Pre-producers	Limited capital to effectively and efficiently sustain production and service delivery High labour costs Limited knowledge and skills development in business management Limited support from government towards provision of extension services-limited facilitation to trainings
Producers category	Limited capital to expand on production capacity Unpredictable price fluctuations Parasites and diseases-high incidences of mainly Newcastle disease High mortality rates especially for chicks associated with predation, poor housing and poor feeding Lack of technical knowledge /information on good farming practices High feed costs Lack of output markets –they sell to traders/middlemen who set the prices for their produce without consideration of the production costs. Theft of birds at the village level Limited basic poultry breeding principles/knowledge Limited access to better and fast maturing breeds locally adaptable

Transporters	Transit mortalities due to poor transportation facilities Poor infrastructure-impassable roads in rural areas Feeding and transport costs reduce profit margins Poor market facilities –in tertiary and secondary markets for trade Inadequate knowledge for identification of diseases Non-existence and enforcement of quarantine for contagious diseases Limited operating capital
Wholesalers	Lack of reliable organized specialized commercial indigenous chicken producers Limited operating capital
Retailers	High mortalities due to high incidences of diseases Increasing costs of maintenance of birds until sale – purchase of feeds, payments of market charges trade license, and stall rentals Competition from other traders from the same market niche
Consumers	High incidence of diseases and parasites and hence lower quality of birds sold Price fluctuations Limited flow of indigenous chicken meat in fast food Poor processing of birds Lack of reliable supply systems especially where there are no established channels and relations

The farmers further ranked seven major challenges faced during production of indigenous chickens as follows: parasites and diseases (58.4%), feed shortage (18.1%), poor marketing (7.7%), poor housing (6.5%), inappropriate chicken ecotypes (6.1%) and limited knowledge on improved indigenous chicken production (3.2%) (Figure 5).

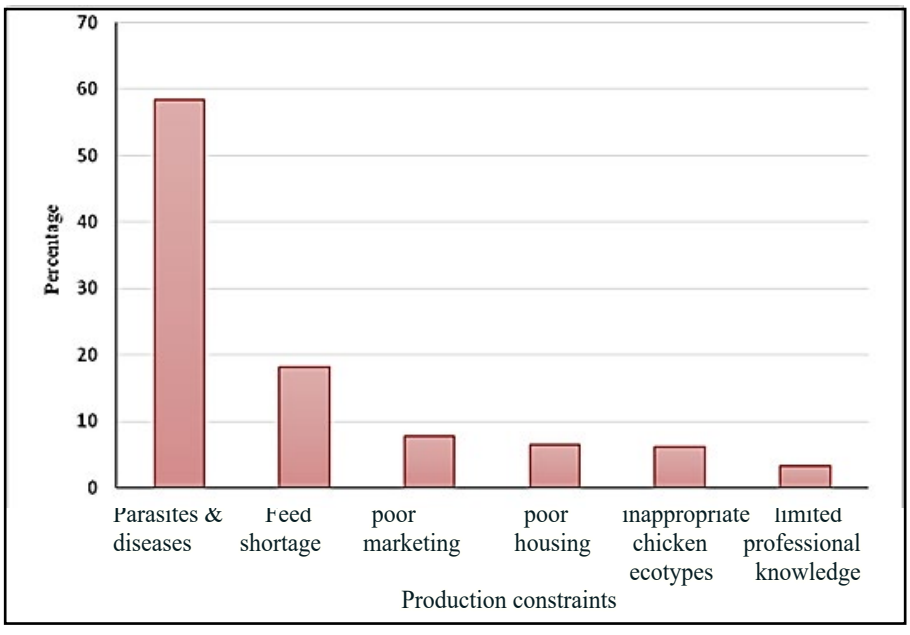

Figure 5. Major production constraints in indigenous chicken rearing

SWOT analysis of indigenous chicken sub-sector. This is presented in Table 8. The sector actors identified strengths such as the use of locally available feeds, the increasing number of indigenous chicken population, the fact that indigenous chickens grow naturally, and enterprises based on these chickens are not labour intensive. The expanding extension programmes and the inclusive government policies were highlighted as major opportunities for the sector. However, inappropriate breeding programmes, poor market infrastructure and absence of producer grouping are major weaknesses, while frequent disease outbreaks, unstable markets, high feed prices and rampant thefts of chickens are serious threats to the sub-sector.

DISCUSSION

Demographic characteristics. The trend in demographic characteristics indicates that male and people aged between 31- 50 years were the majority of the respondents. This could, to some extent, be attributed to the fact that women and children are not heads of households and hence play a minimal role in making decisions. This finding is in agreement with Moreki *et al.* (2010) and Ayieko *et al.* (2014) but contrary to findings by Natukunda *et al.* (2011) who reported that women are key decision makers in poultry business. Apriori expectation would suggest that since indigenous chicken enterprises are home based, it ought to attract more female than male participation. This could be further attributed to the cultural constructs and biases that favour men to control the factors of production majorly land (Mugisha *et al.,* 2014). It is also the responsibility of men to provide for the financial needs of the households, hence the increased responsibility to identify and invest in income generating ventures, such as poultry. The majority of farmers are of productive age with adequate energy to undertake the labour requirements of the enterprise. Also, the majority of farmers interviewed had attained primary level education. This is important because education enhances one's ability to receive, decode and understand information. The few who have attained secondary and tertiary education can be given tailored training as trainers of their peers to enhance their skills as a strategy towards developing the value chain.

Table 8. Strengths, weaknesses, opportunities and threats of the indigenous chicken sub-sector

Strengths	Weakness
Increased number of chickens produced Chickens are naturally grown Chickens use locally available feed materials Not labour intensive Short reproductive cycle	Limited access to professional knowledge in better chicken management practices In appropriate breeding programs Poor market infrastructure Lack chicken farmer organisation groups
Opportunities	**Threats**
Increasing number of NGOs programs providing free technical training to smallholder farmers Supportive government's plan and policies, and legal environment Diversity of indigenous chicken Availability of hatcheries at farm level	High mortality and morbidity rate: Frequent disease outbreak (Fowl Cholera, Fowl Pox, Newcastle disease) Unstable markets High feed prices Theft of chickens

The average family size in both agro ecological zones was 9 people per household. This is higher than the average for Uganda (UBOS, 2015) and Kenya (Ayieko *et al.,* 2014) but comparable to findings by Nakkazi *et al.* (2014) who observed average family size of 11 and 10 people in Gulu and Kiryandongo districts, respectively. The higher family size in both zones might also be attributed to the high level of polygamy in the areas. Besides, the western mid altitude farmlands is inhabited by war refugees especially from Northern Uganda following the 20 years insurgency.

Flock size and structure. The average flock size of 28 was composed majorly of chicks (50%). The cock to hen ration was around 1:2 which is not considered suitable for reproductive performance (seen as poor fertility). The recommendation is 1:5 under free-range or 1:10 under semi-intensive and intensive management. The hen to chick ratio is about 1:5 (40 eggs/hen/year) which indicates losses of up to 50% of eggs/hatched chicks. A nearly equal number of cockerels and hens is kept and this could indicate that they are the main source of income rather than eggs. The farmers need to be trained on fertility management. The average indigenous chicken flock size and structure of the two agro-ecological zones is in agreement with the numbers reported by Adomako (2009), Natukunda *et al.* (2011), and Nakkazi *et al.* (2014) who established that flock size ranges from 20 to 40. The southern and eastern Lake Kyoga basin had a numerically bigger flock size than the western mid altitude possibly because of the influence of the extension services that are provided very often by Non-Government Organisations in the Lake Kyoga region which results into increased survival rate of chickens. Similarily Natukunda *et al.* (2011) reported that poultry farmers in Kamuli were getting advisory services, trainings, credit and input facilities from an NGO known as Volunteer Efforts for Development Concerns (VEDCO), and public sector Extension service providing institution, known as the National Agricultural Advisory Services (NAADS). More so, agricultural extension was found to be the main source of information about improved chicken production system.

Reasons for rearing indigenous chicken and feeding practices in households. Income generation was the major reason why farmers reared indigenous chickens. Clearly, this is a household income diversification strategy. The driver for taking up this could be due to the high and attractive market demand for indigenous chicken meat in Uganda because they require minimal input and care compared to exotic chickens. They are also considered to be more "nutritious" and "healthy". The sale of chickens generates income that cover expenses such as school fees and medical bills. This is in agreement with recent studies in Kenya (Kingori, 2010) and Uganda (Natukunda *et al.,* 2011; Nakkazi *et al.,* 2014) who reported that the majority of farmers sold off live birds and eggs for money. However, the findings are contrary to Adomako (2009) who reported that food security was the most important reason why farmers kept indigenous chickens. Regarding feeding practices, the majority of the poultry farmers allowed their birds to scavenge because it was less costly compared to feeding them on commercial diets. Further more, indigenous chickens are efficient feed converters of home residues. However, this finding is not in agreement with the findings by Nakkazi *et al.* (2014) who reported that the majority of the poultry farmers practiced scavenging but also provided supplementary feeds.

Extension service delivery. Most households reported to have received extension services in indigenous chicken production. However, extension service provision was not regularly provided. It was therefore not surprising that indigenous chicken production was generally

characterised by small flocks of 5-20 birds whose survival depended largely on scavenging and owners made use of their indigenous chicken rearing knowledge acquired over a long period of time in order to optimize on profits. On the other hand, most farmers undertook chicken rearing as a hobby with no strategies that enhanced on leveraging their knowledge to boost production. This may be attributed to the limited number of government extension workers. This resulted from restructuring of the extension service structures which withdrew staff from the line Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), to local Governments and a public programme known as NAADS (National Agricultural Advsory Services). This has resulted in a mix up of who is responsible for providing agricultural advisory services.

Profit margin analysis. Results show a higher cost of production/bird under free-range followed by semi-intensive and finally intensive. Additionally, the gross margins followed the same trend. This is an important finding particularly as production and reproduction losses are associated with free-ranging system. Do these significance levels compare within or across zones? Just looking at the figures, the semi-intensive system works best as it fetches higher product prices at the lowest unit cost. There was a significantly higher selling price of eggs, cock and hen in western mid-altitude farmlands than in the southern and eastern Lake Kyoga basin. However, the cost of production per bird was lower in the latter, making it more profitable. This may be attributed to lack of well-organized marketing structure of indigenous chickens due to the small flock sizes reared by farmers. It should be noted however that these results were not subjected to an in-depth Benefit Cost Ratio (BCR) analysis as was done by Islam *et al.* (2015).

Key actors in indigenous chicken marketing. Although the actors at different levels could be known, each is faced with challenges leading to scant interactions and realization of what they are capable of executing collectively which affects the whole poultry value chain. As a result, some actors' efforts are not appropriately utilized and if this is changed, indigenous chicken production will be improved. These findings are in line with the findings of Mathuva (2005).

Constraints. The major constraints faced by farmers of indigenous chickens were diseases and parasites, food shortage, poor marketing, poor housing, inappropriate breeds and limited professional knowledge. The results of this study indicate that 98% of the interviewed farmers experienced disease condition in their flocks which resulted in reduction in numbers of indigenous birds per household. This caused farmers to keep few birds due to the fear that they would lose a lot of birds due to disease outbreaks. Similar results were reported by Guèye (1998) and Kugonza *et al.* (2008).

CONCLUSION AND RECOMMENDATIONS

The strengths and opportunities identified by the indigenous chicken stakeholders are real and should be capitalized on to transform the sector. Uganda is endowed with a range of plants and other organisms that chickens can forage and convert into ready meat (Magala *et al.,* 2012a; 2012b; Siya *et al.,* 2018). The favourable climate ensures that feed availability for scavenging/ free range chickens is significantly better than in all the countries neighbouring Uganda, hence Uganda can be a hub for rearing such chickens. Contemporary studies show that even under various scenarios of climate change, Uganda would still have a stable and productive environment (Osima *et al.,* 2018) hence sustaining this would lead to production of feed resources that would support the increasing number of indigenous chicken population. Agricultural extension and in particular, advisory services for livestock farming are largely perceived to be a private affair. The finding that

extension programmes on indigenous chicken production are expanding does bode well for the poultry sub-sector. Efforts need to be put on stopping inappropriate breeding programmes particularly indiscriminate crossbreeding, that threaten to erode the native chicken germplasm; undertaking improvements in market infrastructure particularly establishing indigenous chicken marketing points starting in production hotspots and then rolling out to the rest of the country. This should be done alongside promotion of indigenous chicken producer groups using the now domesticated innovation platform paradigm. When this is done, the threats reported namely: frequent disease outbreaks, unstable markets and rampant thefts of chickens could be tackled. The indigenous chicken subsector employs many actors whose efforts and roles have not been exploited, resulting in glaring losses in the entire value chain and production constraints as well. Therefore, it is recommended that improvement of the indigenous chicken sector requires increased access to services and efforts accruing from all key players, strengthening the marketing system and farmer group participation in trainings.

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STATEMENT OF NO-CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this paper.

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