Farmers' Preferences for Tropically Adapted Improved Chicken Breeds in Selected Agro-Ecological Zones in Tanzania

Wolfgang, G.[1], J. Makindara[2] and S. Mbaga[3]

[1]Department of Agricultural Economics and Agribusiness, College of Economics and Business Studies, Sokoine University of Agriculture.
[2]Department of Business Management, College of Economics and Business Studies, Sokoine University of Agriculture.
[3]Department of Animal, Aquaculture and Range Sciences, College of Agriculture, Sokoine University of Agriculture.

*Corresponding author e-mail: *makj@sua.ac.tz;* Mob: 0754 472376

Abstract

This study was carried out in twelve villages that were implementing the African Chicken Genetic Gain (ACGG) project in Mbeya and Mwanza regions. Multistage random sampling method was employed from Agro-Ecological Zone (AEZ) level to a village level in which respondents were systematically selected from a distribution list of chicks. Data were collected using structured questionnaires and 132 respondents were interviewed. The objective of this study was to identify smallholder farmers' preference traits of improved chicken breeds compared to local ones. The results showed that, the majority of smallholder farmers i.e. 104 (78.8%) in the study areas preferred improved chicken breeds due to the traits of fast growth rate, large body size at maturity, higher egg production, easily adaptive to the local environment, bigger sized eggs and being sold easily. Moreover, the chi- square test shows that, improved chicken traits of egg production, large egg size and being sold at good prices were statistically significant at ($p<0.05$) between regions. However, 28 smallholder farmers i.e. 21.2%, preferred local chicken due to the traits of ability to survive, scavenging ability, good meat taste, mothering ability, good hatching ability and egg taste. In this case, the chi-square test shows that, local chicken trait of ability to survive had significant difference ($p<0.05$) between regions. It is therefore concluded that improved chicken breeds were preferred by the majority of farmers due to their traits such as fast growth rate and high egg production. It is thus recommended that chicken breeders should introduce chicken which have traits preferred by smallholder farmers.

Keywords: Poultry traits, favourability, African Chicken Genetic Gain, Agro-ecological zones, Tanzania.

Introduction

Chickens are the most popular poultry species worldwide irrespective of culture and region. Chicken meat is a good source of protein, improving farm family nutrition and contributing to overall health of households' members while eggs provide a constant source of nutritious food throughout the year. These are especially beneficial to special groups of young children, pregnant women, the elderly, and sick ones (Hilmi *et al.,* 2012; Belova *et al.,* 2012; Queenan *et al.,* 2016).

In Africa, the majority of rural households keep chickens for various purposes. Most African rural households use chickens as a source of high-quality animal protein, emergency cash income, women empowerment, and food security (Padhi, 2016; Habte *et al.,* 2017; Kamau *et al.,* 2018). It is estimated that local chicken (LC) breeds make up of more than 80% of the total chicken population in the continent (Mamo *et al.,* 2013).

In Tanzania, about 86% of livestock-keepers own chickens (Michale, *et al.,* 2018). The chickens' population in the country was estimated to be 72 million, of which 40 million were LC and the remaining 32 million were exotic, which included 24 million broilers and 8 million layers (Ringo and Mwenda, 2018). About 96% of LC was in Tanzania Mainland

while only 4% were in Zanzibar (URT, 2017). According to the report, Tabora, Shinyanga, and Singida regions had the highest number of LC which cumulatively accounted for 19%. However, LC are associated with low productivity due to their small body size reaching an adult weight of 1.5 to 1.9kg at an age of 24 weeks or more (Komwihangilo, 2015). In addition, LC produces less than 60 eggs per year in three to four clutches and wastes a lot of time brooding chicks (ibid). Therefore, based on these productivity constraints associated with LC production in African countries, several initiatives were commissioned but some had little success due to among others, issues such as lack of a holistic approach in solving the constraints and dissemination of inappropriate technologies given the production circumstances (Magothe *et al.,* 2012). For example, in some areas, exotic chicken (EC) breeds were introduced but some are often not suited to local conditions and they demand high investments in terms of feeds, veterinary services and energy, while LC breeds were overlooked (Dessie, 2015). Thus, investing in these EC breeds is usually associated with high costs of production to smallholder farmers (SHFs) whose income is low and most of them have inadequate capital to invest in such expensive ventures.

Hence, in recognizing these institutional challenges experienced in past interventions, the International Livestock Research Institute (ILRI), with support from Bill and Melinda Gates Foundation (BMGF) established new collaborative farmer oriented research project called African Chicken Genetic Gain (ACGG) in order to provide better chickens to African farmers (Andrew *et al.,* 2021). This was based on the argument that improved chickens are higher yielding and may be suitable for the local conditions (Komwihangilo, 2015; Andrew *et al.,* 2021). The ACGG project approach was to distribute to SHFs high-producing but agro-ecologically appropriate improved chicken (IC) breeds namely Kuroiler and Sasso which suit the local environment so that SHF can raise them and monitor all the rearing processes, obtain the expected yields of eggs and attained the required body weight at sale. However, it was expected that at the end of the project, information on farmers' preferences of the chicken breeds and the associated economic performance should be obtained and analysed in order to assess the impact of the project. This study therefore, assessed chicken breed preferences by SHF on the tropically adapted improved chicken under low-input production systems in the selected project regions.

Theoretical Framework

This study is guided by the Consumer Choice Theory (CCT). The CCT is a branch of microeconomics and is concerned with how people decide to spend their income according to what items they individually prefer and based on their income or money they wish to spend in those items (Greenlaw and Shapiro, 2011). In this case, people do make their own choices according to how much they are willing to spend. The CCT is grounded on four key issues which are i) income of the consumer, ii) prices of goods, iii) consumer's tastes and preferences and iv) rational maximization (Greenlaw and Shapiro, 2011).

Therefore, considering smallholder chicken farmers as consumers, they are exposed to two commodities or products which are local chicken and improved ones. Moreover, ideally these farmers' choices are supposed to be influenced by their income, price of chicks, their preferences and their rationality which is expected to be maximized. However, under ACGG project arrangement, smallholder farmers involved in the project were given chicks from the beginning to keep them. Therefore, from the CCT perspective, the issues of budget and the prices were not applicable to them. Hence, they were left with two concerns of preferences and rationality in order to make their choices.

Smallholder Chicken Farmers' Preferences

According to the CCT, preferences refer to choosing or liking of one person or thing rather than another or others (Merriam-Webster, 2020). Therefore, in economic terms, preference also assumes different meanings, including that of comparative evaluation, prioritization or favouring and choice ranking (Hansson and Grüne-Yanoff, 2018). In addition, preferences are also influenced by availability and accessibility

of the information sources (Msoffe and Ngulube, 2017). That is, when consumers making choices and select the most preferred items, they must be well informed so that they can choose which good over the other and by what quantities (Cowell, 2004). Moreover, from the CCT perspective, the consumers' preferences should also be complete, consistent, non-satiative and should be substitutable (Greenlaw and Shapiro, 2011). Therefore, smallholder chicken farmers have to show their preferences between local chicken and improved ones and what influences their choice decisions. These decisions then should be complete and consistent.

Smallholder Chicken Farmers' Rationality

According to CCT and based on the fact that SHF under ACGG project were not influenced by budget or prices from the beginning, the other factor besides preferences that influence their choice is rationality. This rationality can also be explained by the rational choice theory (RCT) which argues that individuals have preferences and their choice is guided by them (Levin and Milgrom, 2004). Therefore, since these SHF as consumers, are rational, and they prefer to maximize the utility of those preferences based on their perceived or expected values (Greenlaw and Shapiro, 2011). Hence, the concept of utility is embodied in their rational decisions and it the one that was used in the analysis based on random utility concept (Greenlaw and Shapiro, 2011). Thus, the rationale behind this is that, a bundle of goods may contain attributes that give rise to farmers' utility and whenever if that bundle is the one that yields to maximizing utility or satisfaction to the consumer, then it will be the one that will be mostly preferred by smallholder chicken farmers.

Random Utility theory

Random Utility Theory (RUT) is based on the hypothesis that every individual is a rational decision-maker, maximizing utility relative to his or her choices (Ennio, 2009). The RUT assumes that, an individual chooses the most preferred bundle that yields the highest utility and that utility an individual attain, exists in the mind of the consumer and cannot be directly observed (Navrud, 2007, Diaz *et al.,* 2014). Therefore, SHF as consumers prefer the goods through which their utility is maximized with respect to the production or consumption of the attributes (Laroche *et al.,* 2008). Hence, in this case, it is the chicken strains to keep which according to Lancaster (1966) possess attributes, and which are the ones that give rise to consumers' utility.

Materials and Methods

Description of the Study Area

This study was conducted in two Agro-Ecological Zones (AEZ) of the Lake and the Southern Highlands. In the Lake Zones, Mwanza region was selected while in the Southern Highland zone, Mbeya region was selected. In Mwanza region, which is located between (Latitude, 2° 52' South and Longitude 32° 43' East, two districts of Sengerema and Misungwi were selected while in Mbeya region which is located between Latitude 8°.90' South, and the Longitude 33°.46' East, the selected districts were Mbeya and Ileje. Three villages of Nyambola, Nyamasale and Nyansenga were selected in Sengerema district while three villages of Chamabanda, Mabuki, and Nguge were selected in Misungwi district. Three villages of Swaya, Mbalizi and Iwindi were selected in Mbeya district while three villages of Isongole, Msia and Ndola were selected in Ileje district.

The SHFs recruited in the study were provided with 42 days' old pre-vaccinated chicks of either Sasso or Kuroiler, which are the two new improved breeds introduced by the ACGG project. The chicks were vaccinated against Marek's and Newcastle Disease (NCD) at the hatchery, followed by Infectious Bronchitis (IB) at 0, 7, 10, 16 and 21 days. The NCD vaccine was repeated at 10 and 21 days using Lasota vaccine. At 6 weeks, the chicks were again vaccinated for fowl pox before being distributed to farmers.

Research Design

The study adopted a cross-sectional design. The design was adopted because; the study is observational or descriptive in nature and which allows comparing many different variables at the same time. Meaning that, the study measures

simultaneously the exposure and outcome in a given population and in a given geographical area at a certain time (Hemed, 2015).

Sample Selection, Sample Size and Sampling Procedure

The study involved twelve intervention villages with a total of 264 households (i.e. 22 households per village x 3 villages per district x 4 districts = 264 households). The regions were selected based on their chicken productivity and potential adaptation of the IC in the selected AEZ. The districts were selected randomly during the project design stage and were the ones which were also selected during this study. At the village level, respondents were systematically selected from Chick Distribution List (CDL) established by the African Chicken Genetic Gain (ACGG) project enumerators where the 2nd individual was selected for interview. During the study, a total of 132 respondents were interviewed from twelve villages (i.e. three villages from each district) which were also randomly selected. The selected villages were Mbalizi (11), Swaya (11) and Iwindi (11) of Mbeya district; Isongole (11), Msia (11) and Ndola (11) of Ileje district; Nyambola (11), Nyamasale (11) and Nyansenga (11) of Sengerema district; Chamabanda (11), Mabuki (11) and Nguge (11) of Misungwi district.

The data were collected using structured questionnaires from smallholder farmers that participated in the implementation of ACGG project. Discussion with stakeholders specifically District Agriculture, Irrigation and Cooperative Officers (DAICOs), and ACGG project enumerators was also conducted to ensure sufficient data is generated for meaningful analysis and evidence-based recommendations.

Data Analysis

The data obtained were coded and recorded into the spreadsheets for statistical analysis. The data were analysed using Statistical Package for Social Sciences version 16.0 (SPSS 16.0) and means, frequencies, and percentages and test statistic were generated. The objective was to compare smallholder farmers' preferences for the improved chicken breeds against local chicken, where the comparison was carried out using descriptive statistics. The significance difference between means was tested using t-test for independent samples while the proportion difference between regions was tested using Pearson Chi-square test.

Findings and Discussion

Socio-economic Characteristics of the Respondents

The age of the respondents ranged from 21 to 80 years (Table 1), implying that both younger and older farmers are involved in chicken production. Moreover, the mean age of the respondents was 42.3 years signifying that most of the SHFs involved were of the average age group. These findings were similar to those of Oluwafemi (2015) who argued that the majority of respondents involved in chicken production in Ovia North East area of Edo State in Nigeria were people of average age. The results as presented in Table 1 show that, in both regions most of the respondents 84 (63.6%) were young (i.e. below 36 years old) while the rest i.e. 48 (36.4%) were old (i.e. above 36 years old). The results show further that 63 (47.7%) of old respondents preferred IC while about 21 (15.9%) preferred LC. In addition, about 41 (31.1%) of the young respondents preferred IC breeds while the remaining 7 (5.3%) preferred LC (Table 1). The results also show that most of the respondents i.e. 109 (82.6%) were female while the rest i.e. 23 (17.4%) were male (Table 1). The higher proportion of female respondents may be explained by the fact that female was purposefully targeted by the ACGG project for poverty alleviation through high producing chicken breeds as a pathway to women empowerment (Goromela *et al.,* 2018). These results are similar to those obtained by Abadi, (2017) that women are taking the vital role in managing and production of rural chickens in North Western zone Tigray, in Ethiopia. The findings also show that 87 (65.9%) of the female respondents preferred IC while the rest i.e. 22 (16.7%) preferred LC and 17 (12.9%) of male respondents preferred IC while 6 (4.5%) preferred LC (Table 1).

In the case of education level of the respondents, the findings show that 116 (87.9%)

had formal education at the level of primary and secondary schools while about 16 (12.1%) had non-formal education (Table 1). The higher proportional in literacy level found by this study represent a prospect for further intellectual growth and contribution to socio-cultural development of Tanzanian society (URT, 2017). Moreover, the findings show further that 93 (70.4%) of the educated respondents preferred IC and the remaining 23 (17.4%) preferred LC while 11 (8.3%) of non-educated ones preferred IC and 5 (3.8%) preferred LC (Table 1). This is appealing because most of the SHFs were able to read technology packages on improved chicken production since they had the minimum education level that enabled them to read and write. Furthermore, the majority i.e. 131 (99.2%) of the respondents were engaged in farming as the main activity and only 1 (1.0%) was not a farmer. The results were expected since the majority of individuals in rural Africa are essentially SHFs thus the results concur with those of Bukwelles (2015).

Table 1: Socio-economic characteristics of respondents

Variables	Description	Breed preference		
		Improved chicken	Local chicken	Overall (N=132)
Age of respondents	Below 36 years	41(31.1%)	7(5.3%)	48(36.4%)
	Above 35 years	63(47.7%)	21(15.9%)	84(63.6%)
Sex of respondents	Male	17(12.9%)	6(4.5%)	23(17.4%)
	Female	87(65.9%)	22(16.7%)	109(82.6%)
Education of respondents	Non formal	11(8.3%)	5(3.8%)	16(12.1%)
	Formal	93(70.4%)	23(17.4%)	116(87.8%)
Occupation of respondents	Off farming	1(0.8%)	0(0.0%)	1(0.8%)
	Farming	103(78.0%)	28(21.2%)	131(99.2%)

Smallholder Farmers' Preferences

The findings show that the majority of the respondents i.e. 104 (78.8%) preferred IC while fewer i.e. 28 (21.2%) of them still preferred the LC breeds (Table 2). The percentage of farmers' preference shows no statistically significant difference ($p<0.05$) in the study regions. These findings are similar to those of Sharma *et al.* (2015) who claim that, the majority of farmers in Uganda preferred raising IC as compared to LC because of better weight gain, texture and taste of meat and larger egg size. In general, during the study it was also found that the majority of the respondents i.e. 96 (72.7%) adopted IC production while fewer 36 (27.3%) remained producing LC (Table 2). The adoption percentage showed a statistically significant different ($p<0.05$) between respondents that adopted IC and those that remained with LC in the study areas.

Preference Traits of Chicken Breeds

The study assumed that SHFs preferences are also influenced by chicken characteristics such as growth rate, body size, body weight, body shape, egg production, egg size, meat taste, egg taste, market price, ability to resist disease and adaptability. The results as presented in Table 3 shows that SHFs preferred IC breeds due to their fast growth rate, large body weight, large egg production, ability to adapt, bigger egg size and sold easily at good prices. These findings are similar to those of Getiso (2017) who argues that in Ethiopia, the improved chicken breeds (Sasso) were selected for having large body size and producing high amount of meat. However, the percentage of high egg production, highly adaptive and easiness to sell at competitive prices for IC show statistically significant different ($p<0.05$) in the two regions. Moreover, despite the fact that IC breeds have significantly superior performance when compared to LC but specifically their performances differ across AEZs.

Table 2: Smallholder farmers' preference in relation to their location

Variable	Mwanza region (n=66)	Mbeya region (n=66)	Overall (N=132)	χ^2 Value
Chicken breeds preferences				
Improved chicken breeds	56(42.4%)	48(36.4%)	104(78.8%)	0.89
Local chicken breeds	10(7.6%)	18(13.6%)	28(21.2%)	
Chicken breed adoption				
SHFs remained with local chicken	11(8.3%)	25(18.9%)	36(27.3%)	0.06*
SHFs Adopted improved chicken	55(41.7%)	41(31.1%)	96(72.7%)	

**Significant at 5%*

On the other hand, SHFs preferred LC due to ability to survive, ability to scavenge, brooding and hatching ability (Table 3). The percentage of ability to survive for LC showed a statistically significant difference ($p<0.05$) between the two regions. This is due to fact that chicken breeds may differ in performance across AEZs. The results is in line with those of Mulugeta *et al.* (2019) who claim that the chicken breeds for Sasso and Kuroiler respectively. Moreover, in terms of mortality rate, for Kuroiler it was between 10–25% as compared to Sasso which ranges between 30–60%. It was also found further that more chicken died in the Lake zone followed by the Southern Highland zone, while the lowest mortality was recorded in the Central zone (Goromela *et al.,* 2018).

Table 3: Preference traits of chicken breeds

Chicken attributes	Mwanza region (n=66)	Mbeya region (n=66)	Overall (N=132)	x^2 Value
Improved chicken breeds				
Fast growth rate	40(30%)	36(27%)	76(58%)	0.481
Large body weight	43(33%)	33(25%)	76(58%)	0.078
High egg production	41(31%)	25(19%)	66(50%)	0.005*
Highly adaptive	47(36%)	19(14%)	66(50%)	0.000*
Big sized eggs	34(26%)	23(17%)	57(43%)	0.053
Sold at higher price	33(25%)	15(11%)	48 (36%)	0.001*
Local chicken breeds				
Ability to survive	6(5%)	15(11%)	21(16%)	0.032**
Scavenging ability	8(6%)	12(9%)	20(15)	0.332
Good meat taste	6(5%)	13(10%)	19(14)	0.083
Good mothers	8(6%)	6(5%)	14(11)	0.572
Good hatching ability	8(6%)	5(4%)	13(10%)	0.381
Good egg taste	5(4%)	6(5%)	11(8%)	0.753

**, ** are significant at 5%.*

were well adapted in highland and midland agro-ecology and they were producing better than the ones kept in lowland agro-ecology in Ethiopia. In addition, during ACGG project implementation, egg production per hen per year ranged from 160–171 eggs and 156–168 eggs

Conclusion and Recommendations

Conclusion

This study was conducted in Mwanza (The Lake AEZ) and Mbeya (The Southern Highlands AEZ) regions where the African Chicken Genetic Gain (ACGG) project was

being implemented in order to improve chicken productivity in Tanzania. The main objective of the study was to identify SHFs' preference traits of improved chicken breeds compared to the local ones, and specifically what are those preferred characteristics. The study found that the majority of SHFs (77%) preferred improved chicken strains as compared to local ones. The findings also show that the majority of farmers (81.4%) who preferred improved chicken strain were female. The study shows farmers' characteristics which influence chicken traits preferences were growth rate, large body weight, large egg production, ability to adapt to the local environment, bigger egg size and competitive prices. In addition, the findings show that high egg production, adaptive ability and competitive prices were statistically significant at 5% level of significance. It can therefore be concluded that majority of farmers and especially women do prefer improved chicken trait as compared to local ones. It can also be concluded further that characteristics which influence their choices are high egg production, adaptive capacity and the prices at sales.

Recommendations

Therefore, based on the study findings, it can be recommended that when planning to introduce agricultural technologies which aim to improve productivity, the focus should be on SHFs and especially women. In addition, factors behind preferences of these technologies such as those influencing preference of improved chicken versus local ones should be taken into account in order to increase high acceptability of these technologies.

Acknowledgements

The authors acknowledge African Chicken Genetic Gain (ACGG) project for the financial support The authors also acknowledge the ACGG Project National and Regional Coordinators, District Agricultural, Irrigation and Cooperative Officers (DAICOs) and ACGG Field Data Enumerators who supported the logistical issues and data collections. Finally, but not least, the authors acknowledge the SHFs respondents for their participation during the study.

References

Abadi, T. (2017). Perception of farmers on exotic chicken breeds and its management condition in North western zone Tigray, Ethiopia. World Scientific News 86(3): 168–179.

Andrew R., Makindara J., Mbaga S.H., and Alphonce R. (2021). Effects of Inputs and Production on Viability of Introduced Chicken Strains at Farm Level: A case of small chicken keepers in selected areas of Tanzania. Horvath, D. Eds. Agricultural Issues and Policies: Opportunities and Challenges of Smallholders and Smallholding. Nova Science Publishers, Inc. New York.

Belova, A.V., Smutka, L. and Rosochatecka, (2012). World chicken meat market – its development and current status. Acta univ. agric. et silvic. Mendel. Brun., 2012, LX, No. 4, pp. 15–30

Bukwelles, M.S. (2015). Socio-economic importance of local chicken production in peri-urban areas of Kinondoni District, Tanzania. [https://www.semanticscholar.org] site visited on 12/09/2019.

Dessie, T., Esatu, W., Waaij, L.V., Zegeye, F., Gizaw, S., Okeyo, A.M. and Arendonk, J. van. (2013). Village chicken production in the central and western highlands of Ethiopia: Characteristics and strategies for improvement. ILRI Project Report. Nairobi, Kenya: ILRI.

Diaz, C., Drucker, A. G., Carabaño, J., & Zander, K.K. (2014). Determination of non-market values to inform conservation strategies for the threatened Alistana-Sana bresa cattle breed. Animal, 1373–1381.

Ennio, C. (2009). Random Utility Theory in Transportation Systems Analysis. Springer Optimization and Its Applications, Vol. 29.

Getiso, A., Bekele, B., Zeleke, B., Gebriel, D., Tadesse, A. and Abreham, E. (2017). Production performance of Sasso (distributed by Ethio private poultry farms) and Bovans brown chickens breed under village production system inthree agro-ecologies of Southern Nations, Nationalities,and Peoples' Regional State (SNNPR), Ethiopia. *International Journal*

of Livestock, 8(9): 145-157.

Getiso, A., Jimma, A., Asrat, M., H/Giorgis, K., Zeleke, B. and Birhanu, T. (2017). Management Practices and Productive Performances of Sasso Chickens Breed under Village Production System in SNNPR, Ethiopia. *Journal of Biology, Agriculture and Healthcare,* 7(7): 1-16.

Goromela, E. Urassa, N. and Mulema, A. (2018). TALIRI and ACGG join forces to scale up improved Kuroiler and Sasso chicken in Tanzania. [https://africacgg.net] site visited on 12/09/2019.

Greenlaw, S.A. and Shapiro, D. (2011). Principles of Economics, Economics and the Economy. Timothy Tailor Publishers, Houston, Texas.

Habte, T., Amare, A., Bettridge, J., Collins, M., Christley, R. and Wigley, P. (2017). Guide to chicken health and management in Ethiopia. ILRI Manual 25. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Hansson, S.O., and Grune-Yanoff, T. (2018). Preferences. The Stanford Encyclopaedia of Philosophy, 2018 Eds.

Hemed, M. (2015). Cross-sectional studies: Training Course in Sexual and Reproductive Health Research Geneva 2015. GFMER Tanzania.

Hilmi, M., Dolberg, F. and Clarke, B. (2012). Products and profits from poultry. Rural Infrastructure and Agro-Industries Division, Food and Agriculture Organization of the United Nations, Rome, Italy.

Kamau, C.N., Kabuage, L.W., Bett, E.K. and González-redondo, P. (2018). Impact of improved indigenous chicken breeds on productivity: The case of smallholder farmers in Makueni and Kakamega counties, Kenya. Cogent Food and Agriculture 4(0): 1–12. https://doi.org.

Komwihangilo, D.M. (2015). The role of chicken in the Tanzanian economy and opportunities for development: An overview. Presented at the First ACGG Tanzania Innovation Platform Meeting, Dar es Salaam, Tanzania, 13-14 July 2015. Dar es Salaam, Tanzania: Tanzania Livestock Research Institute.

Lancaster, K. J. (1966) A new approach to consumer theory. *The Journal of Political Economy* 54(2): 132-157.

Laroche Dupraz C., Awono, C. and Vermersch, D. (2008) The Lancaster's theory applied to local chicken consumption in Cameroon. Review of Agricultural and Environmental Studies, 86(1): 1-20.

Levin, J and Milgrom, P. (2004). Introduction to Choice Theory. Stanford, CA: Stanford University Press.

Magothe, T., Okeno, T., Muhuyi, W. and Kahi, A. (2012). Indigenous chicken production in Kenya: II. Prospects for research and development. *World's Poultry Science Journal,* 68: 133–144. https://doi.org. Site visited on 30.04.2017.

Mamo, W., Melaku, M., Tamir, B. and Zeit, D. (2013). Characterization of Urban Chicken Production System in Northern Gondar, Amhara Regional State, Ethiopia Wollega University, College of Agriculture and Rural Development, Department of Animal. pp 192–198.

Merriam-Webster (2020). Definition of preference. https://www.merriam-webster.com/dictionary/preference. Site visited November 2020.

Msoffe, G.E., and Ngulube, P. (2017). Information sources preference of poultry farmers in selected rural areas of Tanzania. *Journal of Librarianship and Information Science,* 89(1), 82-90.

Mulugeta, S., Goshu, G. and Esatu, W. (2019). Growth performance of DZ-white and Improved Horro chicken breeds under different agro-ecological zones of Ethiopia. *Journal of. Livestock Science,* 11: 45-53.

Navrud, S. and Bråten, K.G. (2007). Consumers' Preferences for Green and Brown Electricity: A Choice Modelling Approach: Vol.117. https://doi.org/10.3917/redp.175.0795. Site visited on 30.12.2017.

Oluwafemi, R.A. (2015). Socio-economic characteristics of village poultry farmers in Ovia North East Local Government Area of Edo State Nigeria and their production constraints. *International Journal of Life Science and Engineering,* 1(2015): 132-139.

Padhi, M. K. (2016). Importance of indigenous breeds of chicken for rural economy and their improvements for higher production performance. Scientifica 2016: 1-9. dx.doi.org.

Queenan, K., Alders, R., Maulaga, W., Lumbwe, H., Rukambile, E., Zulu, E., Bagnol, B. and Rushton, J. (2016). An appraisal of the indigenous chicken market in Tanzania and Zambia. Are the markets ready for improved outputs from village production systems? Livestock Research for Rural Development. Volume 28, Article #185. http://www.lrrd.org.

Ringo, E.J. and Mwenda, V. (2018). Poultry Subsector in Tanzania: A Quick Scan. [https://www.agroberichtenbuitenland.nl] site visited on 14/09/2019.

Sharma, J., Xie, J., Boggess, M., Galukande, E., Semambo, D. and Sharma, S. (2015). Higher weight gain by Kuroiler chickens than indigenous chickens raised under scavenging conditions by rural households in Uganda. Livestock Research for Rural Development. Volume 27, Article #178. http://www.lrrd.org.