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Knowledge, Attitude, and Practices towards Local Chicken Genetic Resource Conservation: Insights from Farmers in Igunga District, Tanzania

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Abstract: *There is a growing interest in understanding farmers' awareness of the loss of local chicken (LC) genetic resources. Many studies on farmers' behaviour change have concentrated more on LC productivity rather than conservation. The extent to which farmers are aware of the loss of LC c is unclear. A cross-sectional study was conducted in Igunga District in Tabora Region to assess the farmers' knowledge, attitude and practices (KAP) level towards LC genetic resource conservation. Data were collected using a survey (n=384), focus group discussions (n=10) and key informants' interviews (n=8). Content and descriptive statistical analyses were done using Atlasi.ti Version 7.5.7 and IBM SPSS version 25 computer software respectively. The index scale was computed to gauge the overall farmers' knowledge, attitude and practice respectively. The findings show that; the majority of the farmers had an overall moderate knowledge (50.8%), neutral attitude (71.1%) and fair practice (54.4%). The findings indicated a significant association between knowledge and practice ($p < 0.05$) while a lack of association was found between attitude and practice ($p > 0.05$). Free-range production system, indiscriminate crossbreeding, inadequate supplementary feeding and feed quality, lack of performance records and limited veterinary inputs and services were reported as obstacles to attaining LC genetic resources conservation. The study recommends that the government collaborate with the development partners in fostering farmers' KAP towards LC genetic resource conservation. It is for this reason that both knowledge and attitude as building blocks of practice should be increased through training and awareness campaigns focused on LC genetic resource conservation. To this end, it is vital to involve the community to attain sustainable LC genetic resource conservation in the study areas.*

Keywords: *Local chicken, genetic resources, genetic resources conservation, farmers' knowledge, farmers' attitude, farmers' practices, KAP model*

1. Background Information

Local Chickens (LC) like any other animal genetic resource are part of the biodiversity which refers to those animal species that are used or may be used, for food production (FAO, 2007). In this study, the term LC genetic resource is used interchangeably with local chicken ecotype to refer to those chickens characterized by their ability to adapt to varying agro-ecological conditions or harsh environments (Yakubu *et al.,* 2012). In sub-Saharan Africa, 85% of the rural households keep chickens as complementary to their main livelihood activities (Guèye, 2000). In Tanzania for example, among the existing 4.7 million agricultural households, 3.7 million households keep chickens (FAO, 2019). The current population of chickens is estimated at 72 million, of which 40 million are LC mainly kept in rural areas under a free-range system and the remaining 32 million are exotic ones, which include 24 million broilers and 8 million layers (Ringo and Mwenda, 2018). Despite accounting for over 60% of the total chicken population in the country and supplying nearly all chicken meat and eggs consumed in rural areas and about 20% in urban areas (Ringo and Mwenda, 2018), there has been a limited effort toward LC genetic resource conservation.

According to Delgado *et al.* (2019), the *in-situ* or 'on-farm conservation' method imply the maintenance of animal populations in their own social and ecological context at a sufficient number to ensure enough levels of biodiversity to guarantee their survival. Viewing farmers as custodians for LC production, *in-situ* conservation is essential for maintaining the LC for their livelihoods. Farmers in this study refer to the rural small-scale farmers rearing LC in their backyards.

As a strategy to address acute animal protein shortage among the poor resource farmers in rural areas, LC genetic improvement programs through cross-breeding with exotic chickens have been suggested and used (Sisay, 2017; Malago *et al.,* 2009). In Igunga District, for example, a four-year (2015 – 2019) chicken improvement program was introduced. The aim was to enhance the productivity of LC within Igunga and Mbutu wards. Farmers were randomly selected from households to participate in the program. From the program, farmers were organized into chicken rearing groups and were trained in good chicken husbandry practices. In addition, all farmers within the established chicken rearing group were given an exotic cock for crossbreeding purposes. This study defines crossbred chicken as a reproductive outcome following breeding (mating) LC hen and exotic cocks. According to the program reports (HPI, 2019), about 2,790 crossbred chicks were reported to be produced during the four years of program implementation. A review study by Sisay (2017) in Ethiopia pointed out that crossbred chicken performs better than LC. Nonetheless, Magothe, (2012) indicated that the unintended outcomes of the crossbred chickens are characterized by their poor survival rate under harsh environmental conditions and less resilient to disease outbreaks. From this end, such negative outcomes lead to the disappearance and displacement of the resources (Hanotte *et al.,* 2010). Based on the scholar's arguments, this study strives to explore farmers' knowledge, attitude and practices in wake of LC genetic resource conservation.

The analytical framework, which was adopted for this study draws from the knowledge, attitude, and practice (KAP) model. The model has been broadly used in various studies, especially in the medical field (Wang *et al.,* 2015; Marwa *et al.,* 2018; Mazigo *et al.,* 2010; Alhomoud *et al.,* 2016). Generally, in a KAP survey; information is gathered from a representative population on what is known (knowledge), believed (attitude), and done (practice) in relation to a particular topic (Vandamme, 2009), such as LC genetic resource conservation. More specifically, knowledge is defined as a community familiarity or understanding, acquired through experience or education by discovering, and/or learning on any given topic (Meena *et al.,* 2012); attitude refers to people's feelings towards a given subject, as well as any preconceived ideas which they may have towards it (Almasi *et al.,* 2019); and practice refer to how people demonstrate their knowledge and attitude through their actions (Muleme *et al.,* 2017). Borrowing from the KAP definitions, this study strives to inform us about what farmers know, how they feel and also how they do in relation to LC genetic resource conservation.

In Tanzania, there is a paucity of information related to LC genetic resource conservation. Only a few LC genetic resource studies have focused on farmers' knowledge, attitude and practices (Pius and Mbaga, 2017; Nuru, 2018; Rukia, 2000; Lindahl *et al.,* 2019). However, those studies concentrated on farmers' KAP in relation to improving LC productivity rather than conservation. For example, Mbaga and Pius (2017), assessed farmer's attitude and their influence on chicken management practices in varying agro-ecological zones in the southern highlands. While, Rukia (2020) assessed chicken vaccine failures in changing farmers' chicken management knowledge, attitude and practices in Chamwino District and Dar es Salaam region. Likewise, Lindahl *et al.* (2019) assessed knowledge about vaccines and the attitudes towards vaccinating LC against Newcastle Disease (ND) in Tanzania and Kenya. Understanding farmers' knowledge, attitude and practices is a key entry point toward LC genetic resource conservation, also for decision and policy makers to learn how and where to implement/enforce *in-situ* LC genetic resource conservation measures. Filling in this gap, this study addresses farmers' insights regarding LC genetic resource conservation in Igunga District. Specifically, it aims to assess farmers' knowledge, attitude and practices towards LC genetic resource conservation. The extent to which these factors associate with each other in relation to LC genetic resource conservation is also analyzed.

This study is in line with the Sustainable Development Goals (SDGs) 1 and 2 whose specific objectives among others aim at ending poverty and hunger, achieving food security, improving nutrition, and promoting sustainable agriculture by 2030. The first step contributing to the goal is to underscore farmers' knowledge, attitude and practices in relation to LC genetic resource conservation. Also, the study is in line with the Tanzania National Compact Strategies and Action Plan to Implement Global Plan of Action (TNCSAP) for Animal Genetic Resources (URT, 2019), which calls for guiding the management, conservation and sustainable utilization of the national animal genetic resources (AnGR). Therefore, conservation of LC genetic resources involving farmers is critical for reversing the unprecedented loss of diversity and ensuring the security of LC genetic resources for economic, ecological, and social benefits in the study area and the nation at large.

1.1 Theoretical Framework

This study borrows insights and contributions from the knowledge, attitude and practice (KAP) model by Ramsey and Rickson (1976) and the social cognitive theory (SCT) by Bandura (1986). The KAP model was used in establishing the farmers' behaviour change towards LC genetic resource conservation. It examines the relationship between the KAP domains. The model asserts that an individual's practice is driven by attitude while attitude is driven by the knowledge possessed by the individual. Kaiser *et al.* (1999) supported this statement, which stated that changes in a person's attitude and practices occur due to the knowledge factors he/she possesses. This implies that awareness of farmers on the causes of loss or erosion of LC genetic resources may change their behaviour towards its conservation. As such, lack of conservation awareness creates uncertainty, which leaves farmers at the risk of external influences such as the chicken improvement program promoting local – exotic chicken crossbreeding. The relevance of the use of the KAP model is centred on the fact that in most cases the chicken-improvement innovations such breeding interventions are interested in LC productivity rather than its conservation; an aspect that would limit farmers' effort toward its conservation.

While the KAP model assumes the linear relationship between the knowledge, attitude, and practice domain (Warwick, 1983); it is criticized by scholars (Lateh and Muniandy, 2012; Kollmus and Agyeman, 2002) that a person's practice does not necessarily change due to the attitudes and knowledge possessed because practice (behavior) is a difficult aspect to change. For this reason, the model was complemented with the SCT to capture the factors beyond the farmers' control. This is because farmers' behaviour change may be influenced by some other attributes including donor intervention pressure which is beyond farmers' control. The SCT is explained in terms of a three-way, dynamic, reciprocal model in which personal factors like cognitive abilities or attitudes, environmental influences, and behaviour continually interact. A basic premise of SCT is that people learn not only through their own experiences but also by observing the actions of others and the results of those actions. It is assumed that, for conservation of LC genetic resources to occur there should be some incentives and or support by either the chicken improvement such as those funded by the development partners or government to motivate farmers to do so. In this study, the model and the theory complement each other deriving from the possibility that, the LC genetic resource conservation challenges can be within and beyond the reach of farmers. The subsequent sub-sections further elaborate on the theories used.

1.2 Conceptual Framework

As shown in Figure 1, it is assumed that knowledge is the foundation of behaviour change. Hence, farmers' knowledge is directly influenced by both the external environment and the socio-demographic variables. Besides knowledge, attitude and practice as independent variables (IVs) which affects directly the dependent variable (DV) by contributing to the conservation of LC genetic resources. Nevertheless, the environment and the LC genetic resource attributes have an indirect effect on the DV. Furthermore, this study hypothesizes that knowledge as a critical variable is not the only factor that may influence attitude. It also depends on the farmers' socio-demographic status (age, sex, level of education and rearing experience) which varies among farmers. For example, the greater the variation in rearing experience; the greater the chance that farmers will differ in their conservation objectives. The same applies to other presumed socio-demographic variables and all other IVs.

Previous studies emphasize that knowledge forms the basis for determining attitudes and practices (Flamm, 2006; Isa, 2017). Specifically, Isa (2017) connotes that knowledge can be enhanced by acquiring new information through talks, classes, media, lectures and other activities of a scholarly nature. Schrader and Lawless (2004) also concluded that the knowledge of an individual may influence his or her attitude toward that particular subject and how they feel about it could influence their behaviour. In agreement with and beyond previous studies, this study hypothesizes that existing farmer's LC genetic resource conservation knowledge may be influenced by the improvement program through training on good chicken husbandry practice and chicken breeding which in turn can change (positively or negatively) their attitude and practices towards LC genetic resource conservation. Equally, this study further assumes that the change in farmer's attitude toward LC genetic resource conservation depends on unique LC genetic attributes (ability to adapt to changing climatic conditions, tolerance to diseases and scavenging behaviour) which are favourable to the local conditions. As such, any positive interaction of the aforementioned attributes and the environment is likely to influence LC genetic resource conservation and vice versa. In addition to the attributes, this study further assumes that there must be incentives such as LC demand, low input use and consumer preference that may initiate farmers to make conservation decisions on LC genetic resources. For instance, scavenging behavior implies low feed cost. While the resilient nature to disease outbreaks implies less usage of veterinary drugs as a result LC may be preferred and highly demanded by consumers mainly due to organic nature considerations.

Therefore, this study assumes that both genetic attributes and the motivating factors (incentives) may have a direct influence on farmers' attitudes which in turn can change their practices towards LC genetic resource conservation. Therefore, the DV (conserved LC) is directly influenced by farmers' practices measured through positive actions such as controlled breeding and chicken losses, supplementary feeding, chicken housing (confinement) and record keeping. It is worth noting that the IVs depicted in the conceptual framework are interrelated to one another in the sense that the availability of one variable positively influences the other and ultimately contributes to behaviour change in LC genetic resource conservation. The vice versa is also true for such variables. Thus, the bidirectional arrow indicates an interrelationship between farmers' attitudes and socio-demographic characteristics while the unidirectional arrows depict the direct influence of one variable on the other variable(s) (Figure 1).

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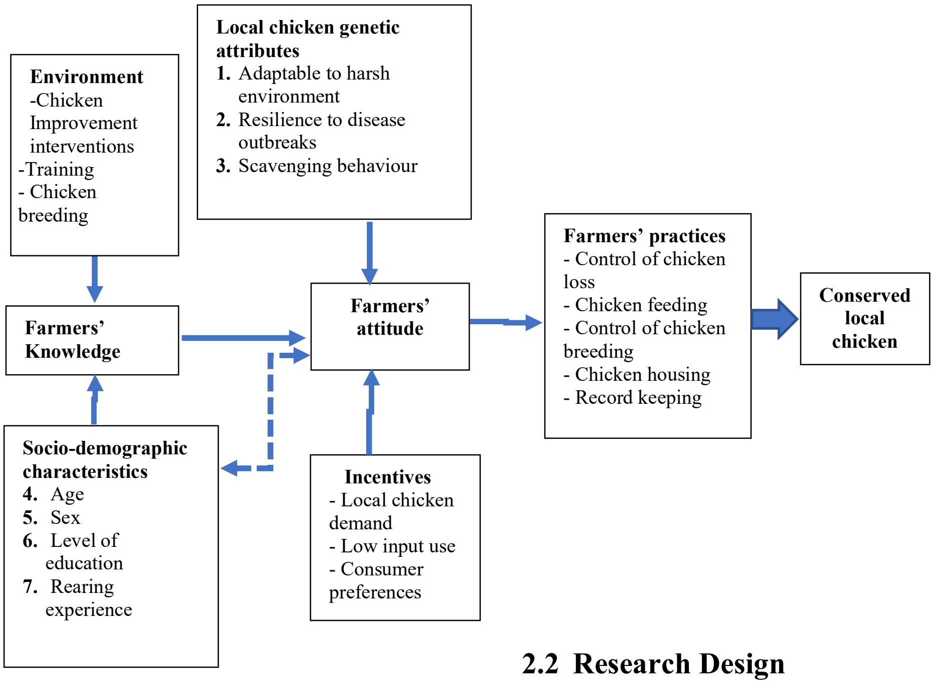

Figure 1: Conceptual framework for the study

2.0 METHODOLOGY

2.1 The Study Area

The study was conducted in Igunga District in Tabora Region Tanzania (Figure 2). The region was purposively selected because it constitutes the highest number (2.9 million) of LC compared to all regions in the country (NBS, 2018). Within the Region, Igunga District was the lead in carrying out a chicken improvement program which introduced the passing of the gift principle (POG) (IDC, 2019). This principle was adopted from the livestock development partner namely Heifer Project International (HPI, 2015). It is based on the rule that each livestock-assisted farmer or family is obliged to help another farmer in obtaining the same benefits as received from the donor (De Vries, 2012). With this regard, selected farmers who benefited from training and exotic cock became donors of the same to other farmers within the community. Specifically, two wards namely Igunga and Mbutu were selected out of thirty-five wards because they operationalized the POG principle. Additionally, the selection of both wards aimed at obtaining a sufficient number of respondents who were exercising the POG principle. Since the crossbreeding of local with exotic chicken is not controlled due to the sedentary farming practices, the LC especially in Igunga and Mbutu wards are more vulnerable to genetic erosion or loss than other areas in the region.

2.2 Research Design

A cross-sectional research design was employed whereby data were collected at one specific point in time. This design has a wider scope to enable the incorporation of many variables at one specific time (Kothari, 2014). Moreover, this research design enables one to collect both qualitative and quantitative data at one point in time (Bailey, 1998). Data collection for this study was carried out from May to July 2016.

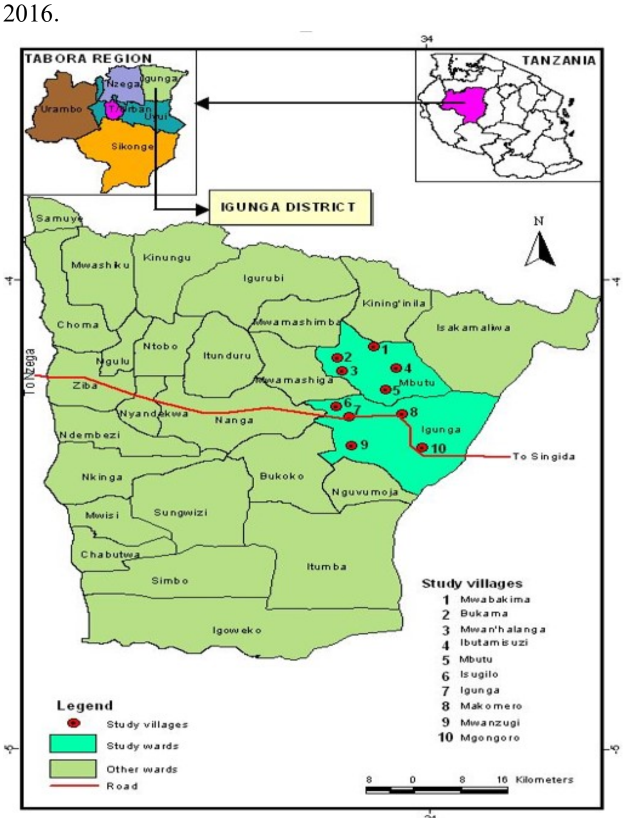

Figure 2: Map of Igunga district, Tabora region Tanzania showing study villages

2.2.1 Sampling Procedure and Sample Size

The region, district, ward and villages were purposively selected based on the operationalization of the chicken POG principle. In each selected ward (Mbutu and Igunga) five villages were selected including Mwabakima, Bukama, Mwan'halanga Ibutamisuzi and Mbutu for Mbutu ward and Isugilo, Igunga, Makomero, Mwanzugi and Mgongoro for Igunga ward (Figure 2). The selection of the villages was based on acquiring an adequate representation of farmers with varying demographic characteristics which had an influence on KAP levels regarding LC genetic resource conservation. Through the village executive office, households keeping LC were purposively recruited to participate in the four-year (2015 – 2019) LC improvement program. From the household list, farmers participating in the program were randomly selected and then organized into chicken rearing groups (CRG). In total, 10 CRG (one per village) with each comprised of 20 – 25 participants were established. From the CRG registers, a proportionate stratified sampling technique was applied to determine a sub-sample for each village. The study sample consisted of 384 farmers which were reached based on the sample size formula by Cochran (1977) of sampling from a finite population.

A total of ten focus group discussions (FGDs) were held with farmers in ten villages (one FGD per village). Each FGD is comprised of 7 – 10 farmers. The selected number of FGDs was based on capturing KAP insights among farmers regarding LC genetic resource conservation which varied in both rural and peri-urban areas. To capture various opinions from farmers on their knowledge, attitude and practices towards LC genetic resource conservation; farmers for FGD were purposively selected based on: i) sex because gender roles in chicken rearing and ownership varied between men and women; ii) Age because the perception of keeping local or exotic chicken varied among the youth and older farmers; iii) Education and rearing experience because these influenced farmer's awareness towards LC genetic resource conservation. Focus group discussion with farmers explored knowledge, attitude and practice domains concerning LC genetic resource conservation. Focus group discussion with farmers explored knowledge, attitude and practice dimensions concerning LC genetic resource conservation. A trained research assistant facilitated all the FGDs and the researcher probed and asked to follow-up questions while recording and taking notes.

The study involved eight key informants categorized into three groups as follows; three representatives from the local government (wards and the district), one representative from the central government (Ministry of Livestock and Fisheries Development) and the government livestock research institution respectively. The key informants were purposively selected based on their expertise in LC production and AnGR conservation. The study combined the assorted categories of key informants to gather their knowledge, attitude and practising insights towards LC genetic resource conservation. A checklist was developed to gather information from key informants.

2.3 Data Collection

The study collected both quantitative and qualitative data using the questionnaire survey and key informant interview (KII)/focus group discussion (FGD) guides respectively. The participation of farmers in the study was voluntary; an audio recorder was used where consent from study participants was sought before interviewing and tape-recording exercise. During data collection, both qualitative and quantitative data were collected in two phases. The first phase involved a survey with farmers to gather information on socio-demographic characteristics and the KAP variables. Then, the FGD and KII were conducted in the second phase to solicit detailed information on areas that were not covered during the survey with farmers.

A structured questionnaire comprised of closed-ended questions was used to collect information from respondents. Also, it consisted of both dichotomous and Likert-type scales as proposed by Likert (1932). The questionnaires were pre-tested in Bukama village in the Mbutu ward whereby 20 respondents were interviewed to assess the clarity of questions and items. The observed gaps were addressed for improving the questionnaire. The pre-test results were analyzed by using Cronbach's alpha coefficient (α), in which the scores of knowledge statements were 0.78, the attitude scale was 0.71, and the practice statements were 0.80. According to Lance (2006), the accepted value for Cronbach's alpha in social science research is 0.70. Therefore, this indicates that the questionnaire for this study was reliable.

2.4 Data Analysis

Quantitative data were summarized, coded and analyzed using Statistical Package for Social Sciences (IBM SPSS), version 25. Summated scale approach to the Likert scale was carried out to analyze the respondents' attitudes where scores on the positive and negative statements were obtained and compared. On the other hand, an index scale was developed to gauge the farmers' overall level of knowledge, attitude, and practice. Descriptive statistics such as frequencies, percentages, and means were calculated for the demographic characteristics and the knowledge, attitude, and practice levels related to LC genetic resource conservation. The association between knowledge, attitude, and practice was tested using Pearson's Chi-square. Statistical significance was tested at a 95% significance level ($p< 0.05$). Content analysis assisted by Atlasi.ti (version7.5.7) was used in the analysis of qualitative data. The data were transcribed, categorized, coded, and thereafter grouped into themes and summarized into meaningful information. Findings from quantitative data were supported with quotations from the comments made during KIIs and FGDs.

2.5 KAP Measurements

The knowledge, attitude, and practices contained a total of 24 questions. Specifically, knowledge of LC genetic resource conservation (6 statements), attitude towards LC genetic resource conservation (12 statements), and LC genetic resource conservation practices (6 questions). The level of knowledge, attitude, and practice were determined by assigning individual scores to items in each respective section as described in the subsequent sections.

2.5.1 Knowledge

The items in the knowledge on LC genetic resource conservation section were designed as true/false statements. The correct answer for each question was awarded 1 point, whereas wrong answers were marked as 0. In this case, an index ranged from 0 to 6 as the measure of knowledge towards LC genetic resource conservation; the scale had a mean of 4.75 representing moderate knowledge. The scores on the index were further categorized into low and high knowledge. Scores below the index mean were categorized as low knowledge whereas scores above the index mean were categorized as high knowledge.

2.5.2 Attitude

For the section on attitude towards LC genetic resource conservation, statements were designed using a five-point rated Likert scale (5 = strongly agree, 4 = agree, 3 = not sure, 2 = disagree, and 1 = strongly disagree). Half of the statements connoted positive responses and the other half connoted negative responses. Statements connoting negative responses were reversed so that all of the individual item scores lie on the same scale about direction. In reverse scoring, 5, 4, 3, 2, and 1 became 1, 2, 3, 4, and 5 respectively. Thereafter, the scores on the Likert scale were transformed as agree (3), uncertain (2), and disagree (1) for strongly agree and agree, neutral, and disagree and strongly disagree respectively. Being a 12-statement section, the scores ranging from 12 to a maximum of 36 were constructed as the measure of attitude towards LC genetic resource conservation; the scale had a mean of 23.7 representing moderate attitude. The scores on the index were further categorized into a negative and positive attitude. Scores below the index mean were categorized as negative attitudes whereas scores above the index mean were categorized as positive attitudes.

2.5.2 Practice

In LC genetic resource conservation practice section, the questions were on a yes or no basis. The correct answer for each question was awarded 1 point, whereas wrong answers were marked as 0. Items were then given individual scores from 0 to 1 implying that for 6 questions, the minimum score is 0 and a maximum score is 6 as the measure of practice towards LC genetic resource conservation; the scale had a mean of 4.32 representing moderate practice. The scores on the index were further categorized as poor implying farmers' actions were contrary to what was supposed to be done to conserve LC genetic resources while good practice implied farmers' actions essential for the conservation of LC genetic resources. Likewise, scores below the index mean were categorized as poor practice whereas scores above the index mean were categorized as good practice.

3.0 Findings and Discussion

3.1 Socio-demographic characteristics of the respondents

Farmers' demographic characteristics involved in the study are summarized in Table 1. The average age of the respondents was 40 years whereas the majority (71.4%) of the respondents' age ranged between 31 and 50 years (Table 1). According to Mwasha (2016), the age of a person usually is a factor that can explain the level of production and efficiency; it influences an individual's experience, wealth and decision-making. Based on the finding, the decisions may be determined by the KAP levels under the age category which may influence (positively or negatively) LC genetic resource conservation in the study area.

In terms of sex distribution, the majority (63.8%) of respondents involved in the chicken-program interventions were women. Furthermore, most (36.5%) of the respondents who owned chicken were women as compared to men (29.9%) (Table 1). This difference could be related to the perception that men regard chicken enterprises as for women. The finding compares well with those reported in a study by Chingonikaya and Salehe (2018) who indicated that 37% of the women-owned LC in both rural and peri-urban areas. Among all respondents, married couples were 88.5% (Table 1). The high percentage of married couples over the entire group is of great advantage to LC genetic resource conservation at the household level in the sense that, their family set-up most likely makes it possible to plan, decide and act together; hence a greater possibility of success in any given ventures pertaining a collective responsibility towards LC genetic resource conservation intervention. About education, 56.5 % of the respondents had completed primary education and 22.4% had no formal education, while the rest had secondary and college education (Table 1). This implies that the literacy level of the respondents was moderate and the least education attainment was basic (primary) education which is adequate to keep farm records such as that related to performance (production and reproduction) of the LC potential for conservation. A study by Oyeyinka *et al.* (2014) revealed that level of education has positive significance on knowledge and practices in chicken rearing since it is very possible for an educated person to read and properly apply the acquired knowledge and skills into practices as compared to a non-educated person.

Table 1: Demographic and socio-economic characteristics of respondents

Variable	Category	Frequency (n)	Per cent (%)
Age	18 - 30	35	9.1
	31 - 50	274	71.4
	50 <	75	19.5
Sex	Male	139	36.2
	Female	245	63.8
Marital status	Married	340	88.5
	Separated	16	4.2
	Single	10	2.6
	Widow	17	4.4
	Widower	1	0.3
Education level	No formal education	80	20.8
	Primary education	276	71.9
	Secondary education	25	6.5
	College	3	0.8
Chicken ownership	Only female	140	36.5
	Only male	115	29.9
	Male and Female	90	23.4
	Son	5	1.3
	Family	34	8.9
Years in chicken rearing	4 - 10	56	14.6
	11 -15	74	19.3
	> 16	254	66.1
Household size	1 - 3	10	2.6
	4 – 8	212	55.2
	> 8	162	42.2

Table 1 further indicates that 55.2% of the respondents had household sizes between 4 and 8 people with a mean household size of 9 people. The average household size was generally high as compared to the average of 5.9 and 4.7 persons reported at the regional and national levels respectively (NBS, 2014). This implies that households with a large number of family members are likely to encounter food security and economic constraints. As a consequence, rearing and conservation of LC may help in addressing the issues. Focus group discussion with farmers reported that during the rainy season when food is scarce, LC is sold to buy food or use the income to pay farm labors (FGD, Mwabakima Village, June 2020). The finding concurs with those reported by Ibrahim (2021) and Campbell *et al.* (2018) which indicated that the majority of farmers keep LC mainly as a source of income and food security.

With regards to chicken rearing experience, a great number (66.1%) of the respondents had been involved in poultry production for more than 16 years with a mean experience of 7 years. This suggests that the majority of the poultry farmers in the study area are experienced in poultry production and expected to have a high knowledge level of poultry management practices. Also, it suggests that an experience in chicken rearing is an important conservation aspect because more years in LC rearing corresponds to experiential knowledge on what type of LC is relevant to conservation. Further to the socio-demographic findings, results from KII and FGD regarding LC genetic resource conservation came out with three key themes. These were knowledge, attitude, and practices. These themes are discussed along with those found in questionnaire surveys whereby quotes from the KII and FGDs are made.

3.2 Farmer's knowledge of LC genetic resource conservation

Table 2 shows that the majority (96.9%) of the respondents are aware that farmers are the custodians for LC genetic resource conservation. Additionally, findings from the FGDs indicated that;

> *...farmers have specific preferences on the types of local chickens that they would prefer to keep in return for the value they gain towards livelihood improvement (FGD, Isugilo village, June 2020).*

The findings imply that LC rearing is an integral part of the farmers' livelihood. The findings compare well with those reported by Asmara (2014) in Indonesia who concluded that farmers are the de facto conservation agents of farm animal genetic resources. Likewise, Halimani *et al.* (2010) in South Africa reported that farmers are the custodians of Farm Animal Genetic Resources (AnGRs). Furthermore, the argument on the contribution of LC genetic resources to livelihoods further implies that farmers make choices on the types of LC to keep based on beneficial alternatives, as such some of the resources may be abandoned and therefore lost even before they are known. According to Faustin *et al.*(2010), the number of endangered LC chicken breeds in developing countries is higher than in developed countries. However, the absolute number of endangered breeds is questionable because reliable population data that allows risk classifications is lacking for many LC genetic resources in most developing countries including Tanzania (FAO, 2007).

Linking farmers' chicken management knowledge and conservation, Table 2 indicates that 91.4% of the respondents affirmed the statement that capacitating farmers on good chicken husbandry can create awareness of LC genetic resource conservation. Additionally, most (90.9%) of the respondents also supported that knowledge of good chicken husbandry can minimize chicken losses. However, during FGDs, participants expressed their concerns on LC genetic resource conservation:

> *...there is too much dependence on traditional knowledge which alone is not sufficient to enhance productivity and hence conservation of LC genetic resources (FGD, Mwabakima Village, June 2020).*

The findings imply that regular farmers' training on chicken management is important for creating awareness of critical aspects that influence LC genetic resource conservation. This argument is affirmed by Lagu and Kayanja (2010) who indicated that the existence of traditional knowledge alone such as those on chicken diseases management is a LC conservation obstacle. For example, a study by Okeno *et al.* (2012) in Kenya indicated that knowledge of seasonal disease outbreaks may be required to determine schedules for vaccination programmes. This practice may contribute to the conservation of LC genetic resources within their production environments (*in–situ* conservation).

Table 2: Knowledge variables on LC genetic resource conservation

SN	Statements	TRUE	FALSE
1	Capacity building on chicken husbandry can create awareness of LC conservation.	351 (91.4) [a]	33 (8.6)
2	Farmers are custodians of LC genetic resource conservation	372 (96.9)	12 (3.1)
3	Indiscriminate crossbreeding results in the erosion of LC genetic resources	324 (84.4)	60 (15.6)
4	Farmer's knowledge of good chicken husbandry practices can minimize LC genetic losses	349 (90.9)	35 (9.1)
5	Lack of information on LC genetic resources is a conservation obstacle	283 (73.7)	117 (26.3)
6	The growing commercial poultry sector is likely to increase the risk of LC genetic loss	298 (77.6)	86 (22.4)

[a] *The figures out and in the brackets are the number and percentage of responses respectively*

Specific to LC genetic erosion, Table 2 further indicates that the majority (84.4%) of the respondents agreed that indiscriminate crossbreeding is one of the main causes of LC genetic erosion. However, the majority (77.6%) of the respondent affirmed that the growing commercial poultry sector is a threat to conservation because farmers may attempt to replace and/or crossbreed the LC with exotic ones. This may happen due to the perceived low productivity of LC (Kohler-Rollefson, 2001; Yakubu *et al.,* 2012). The findings compare well with those reported by Yakubu (2011) in Nigeria who also found that over the years, farmers have perceived that local animal genetic resources are unproductive and inherently inferior to exotic ones. Furthermore, Table 2 indicates that 73.7% of the respondents agreed that the lack of genetic (breed) information on LC was a conservation obstacle. This was further expressed by the participants during FGDs that:

> *… exotic chickens have rich formal information on reproduction and production performance…but, such information in local chickens is based on individual farmers' perceptions, experiences and or hearsays…whereby every farmer understands (appreciates) differently (FGD, Igunga village, June 2020).*

Therefore, lack of access to formal information regarding LC performance may explain the reason why farmers generalize that LC has a lower performance as compared to exotic chicken. Nonetheless, key informants' interviews underscored the fact that there are existing LC genetic resources that have better genetic features and are potential for conservation. For instance, one of the key informants stated that:

> *…"despite the lack of documentation, almost every farmer knows at least one local chicken ecotype with better performance trait…for example, kuchi ecotypes are well known for their superiority in weight performance…and is one of the most preferred ecotype in the community" (Key Informant, Igunga District Livestock and Fisheries Officer, June 2020).*

Another key informant from Tanzania Livestock Research Institute (TALIRI) added that:

> *…"it is not easy for the farmers to recognize that the LC genetic resource is threatened because some of the genetic resources may appear to be abundant locally but threatened at a national level" (Key informant, TALIRI, July 2020).*

The argument that LC may appear abundant locally but threatened at a national level suggests that there is a limited characterization of LC genetic resources in the study area and the nation at large. Commenting further on LC characterization, another key informant specified that:

> *…"various scholars have characterized local chicken…but this has been limited to academic consumption…there is no effort whatsoever that such wealth of knowledge is disseminated to farmers with regards to promoting the conservation of LC genetic resources"*
> *(Key Informant, National AnGR coordinator, Ministry of Livestock and Fisheries Officer, June 2020).*

The finding implies that a lack of knowledge on LC genetic characteristics may explain the reason why most farmers crossbreed their LC with exotic ones. The findings concur with those reported by Lwelamira *et al.* (2008) in Tanzania who indicated that there is scanty information available for most of the performance traits for Tanzania LC genetic resources. Also, it agrees with those reported by Zander *et al.* (2009) in Kenya and Ethiopia who indicated that farmers' knowledge about LC breeds is important in the selection of species and/or breeds for conservation programmes.

Further investigation of the overall farmers' knowledge of LC genetic resource conservation shows that most of the respondents (50.8%) had moderate knowledge with regards to LC genetic resource conservation with a mean and standard deviation of 4.75 ± 1.67 (Table 3). Commenting on the sources of knowledge, FGDs participants declared that:

> *…some of the chicken husbandry knowledge requires infrastructures such as a cold chain for vaccine storage whereby due to financial constraints, few farmers can translate this knowledge into practice (FGD, Mwanzugi Village, June 2020).*

Further findings from key informant responsible for the livestock extension services said that;

> *…"moderate farmers' level of knowledge about local chicken genetic resource conservation might be due to moderate level of knowledge about chicken rearing practices" (Key Informant, Igunga Ward Livestock Extension Officer, June 2020).*

The findings imply that farmers' knowledge of chicken management is a necessary precondition for LC genetic resource conservation. However, even with good knowledge, it requires other aspects to attain it. The findings agree with those reported by Nuru (2018) in Bagamoyo, Tanzania who also reported that 63.3% of the farmers had a moderate level of knowledge about LC management and this is mainly contributed by several factors like ignorance, insufficient training, lack of assurance, medium level of education and economic status of respondents. A report by Research into Use Programme (RIU, 2011) showed that resources and technical knowledge allow farmers to undertake a range of baseline interventions to improve chicken performance.

Table 3: Level of Knowledge on LC genetic resource conservation

Knowledge Index	Frequency	Per cent	Mean index ± Std*
Poor	36	9.4	4.75 ± 1.67
Moderate	195	50.8	
Good	153	39.8	

* *Standard deviation*

3.3 Farmer's attitude towards LC genetic resource conservation

Investigation of farmers' attitudes is demonstrated by their feelings on aspects that influence LC genetic resource conservation. Drawing from Table 4 findings, such feelings are grouped into two main themes; (i) the relevance of farmer collaborations in LC conservation and (ii) LC genetic potential. These themes are presented along with the farmers' and key informant views regarding LC genetic resource conservation.

3.3.1 Farmer collaborations

Table 4 findings show that 82.5% of the farmers agreed that farmer collaboration is important for the community-based conservation of LC genetic resources. Underscoring the importance of community-based conservation, one key informant said that:

> *"…in rural areas where free-range production system is dominant… conservation of LC genetic resource should not be viewed from an individual farmer or a household perspective…but rather, as a community-based approach.*
> *(A key informant, National AnGR coordination unit, June 2020).*

Table 4: Respondents' distribution based on attitude percent (n = 384)

S/N	Item	Disagree %	Undecided %	Agree %
1	Farmer collaboration is vital for the community conservation of LC genetic resources	6.8	10.7	82.5
2	I would prefer conserving LC because it is hardy	4.7	6.5	88.8
3	LC is rich in genetic diversity hence an opportunity for conservation	5.7	9.4	84.9
4	We can consider the conservation of LC based on its physical appearance (e.g. body size)	6	14.8	79.2
5	I consider indiscriminate crossbreeding as a conservation obstacle	11.7	26.6	61.7
6	I give more attention to LC production than conservation	45.3	26.6	28.1
7	Conservation of LC does not necessarily require farmer collaborations	44.8	35.7	19.5
8	Factors other than hardiness may be considered to conserve LC.	68.2	25.8	6
9	LC genetic diversity is not sufficient enough to justify its conservation.	78.9	17.2	3.9
10	Genetic performance is not the only base for conserving LC.	86.2	11.5	2.3
11	Indiscriminate crossbreeding is not considered a conservation obstacle	83.9	8.6	2.9
12	I have less interest in LC production than in conservation	88.5	14.8	1.3

The findings suggest that LC genetic resource conservation is a shared responsibility involving all stakeholders within a community. The findings agree with those reported by Yakubu *et al.* (2012) in Nigeria who affirmed that community-based management is a system of AnGR and ecosystem management in which the farmers are responsible for the decisions on definition, priority setting, and implementation of all aspects of conservation and sustainable use of AnGR. Additionally, Gandini *et al.* (2012) also reported that there is a positive trend between collaboration among farmers and the AnGR viability as such farmers with a positive attitude and experience to collaborate tend to maintain the resource and increase their flock size.

3.3.2 Local chicken genetic potential

Results in Table 4 indicate that 84.9% of the respondents revealed that LC is rich in genetic diversity implying an opportunity for breeding selectively within the LC populations rather than relying on the use of exotic chicken. According to Khobondo *et al.* (2015), LC has the highest rate of variation of population types among chicken species. Despite the opportunity, about 88.5% of the respondents disagreed with the negative statement that they have less interest in LC production than conservation suggesting that

LC genetic resource conservation in a study area is still underestimated. Commenting on the lack of conservation interest, FGD participants stated that:

…despite the hardiness, local chickens have a slow growth rate…hence, they are crossbred with exotic cocks to increase productivity (FGD, Ibutamisuzi village, June 2020).

The finding implies that the slow growth rate attribute of the LC may have a negative impact on the erosion of LC genetic resources. Regardless of the slow growth rate, 88.8% and 79.2% of the respondents pointed out that hardiness and physical appearance as the preferred conservation criteria respectively (Table 4).

A further investigation of the criteria during FGDs, the participants explained that;

> *...local chickens possess special features such as less or no feathers on some parts of their bodies, small body size, and less weight…this makes them adapt to a wide range of stressful environmental conditions (FGD, Makomero Village, June 2020).*

This finding suggests that LC with adaptive traits are naturally selected because they can survive, produce and reproduce well under stressful conditions; a feature that farmers would like to conserve. Findings agree with those reported by Islam *et al*. (2009) in Bangladesh who indicated that the LC with naked neck gene (lack of neck feathers) has a good heat dissipation mechanism and is well adaptive to harsh tropical environments and nutrition. Besides, it is highly resistant to diseases as compared to the full-feathered LC. Moreover, the argument on the findings regarding adaptability to a wide range of environmental conditions agrees with those found by other scholars (Mwambene *et al.,* 2019; Nigussi *et al.,* 2010; Emebet *et al.,* 2014) who also reported that the widespread distribution of LC is evidence to the adaptive ability to harsh environmental conditions and disease outbreaks. For this reason, a study by Okeno *et al.* (2012) suggested that a breeding programmes targeting the improvement of LC should focus on within-breed selection rather than crossbreeding with exotic chickens. Hence, maintaining the unique LC attributes which are valued by farmers and avoiding genetic erosion and dilution and contribute to their conservation.

Further investigation of the overall farmers' attitude towards LC genetic resource conservation shows that most of the respondents (71.1%) had a neutral attitude towards LC genetic resource conservation with a mean and standard deviation of 23.7 ± 3.4 (Table, 5). The neutrality of the attitude is based on two schools of thought as narrated during FGD:

> *...first, some farmers would prefer conserving LC genetic resources based on the socio-cultural value…secondly, the preference would base on the economic value…depending on the one's objective, both aspects have an influence on the conservation of LC genetic resources (FGD, Mwabakima Village, June 2020).*

The findings indicate that farmers are likely to make a conservation decision in return for the value they will obtain from the LC genetic resource. Based on the value proposition, awareness of the contextual issues has been acknowledged as one of the essential factors influencing farmers' attitudes toward conservation activities (Del Saz-Salazar *et al.,* 2009; Sudarmadi *et al.*, 2001). The finding agrees with those reported by scholars (Oldenbroek, 1999; Rege and Gibson 2003) who mentioned that the reasons for conserving AnGR need to take into account economic, ecological, scientific, and socio-economic considerations. Functional genetic traits, such as those related to disease resistance, are considered economically important as productive traits (Cardellino and Boyazoglu, 2009). Consistent with the findings, *in-situ* conservation is more sustainable in situations where the species and/or breeds at risk fulfill a commercial role (Gibson, 2006; Rege, 2003) and/or maintain the cultural values of particular communities (FAO, 2007).

Table 5: Level of attitude on LC genetic resource conservation

Attitude index	Frequency	Per cent	Mean ± Std*
Negative	48	12.5	23.7 ± 3.4
Neutral	273	71.1	
Positive	63	16.4	

* *Standard deviation*

3.4 Respondents' practices toward LC genetic resource conservation

Chicken husbandry practices play a crucial role in the conservation of LC genetic resources. Investigations on practices towards LC genetic resource conservation identified three main themes. The themes identified were production system, feeding, and record keeping. These themes are presented along with the research respondents' views in light of the LC genetic resource conservation perspective.

3.4.1 Production system

Results in Table 6 indicate that 66.7% of the respondents avowed that they rear LC under a free-range (scavenging) production system. This implies that the chickens are not confined; therefore, farmers have no control over the chicken mating; an aspect which may result in loss of genetic vigor due to inbreeding. Owing to LC genetic improvement under the free-range production system, FGD with farmers indicated that;

> *… chicken improvement program contributed to the erosion of LC genetic resources…for example, once the exotic cock donation and the training were over; it was the end of the matter…besides, no replacement stock could avoid the repetitive breeding (inbreeding)…unfortunately, lack of controlled mating will continue causing genetic erosion/dilution (FGD, Isugilo Village, June 2020).*

This finding implies that the implementation of chicken improvement programs without assessment of the existing production system could result in genetic erosion especially when there is no controlled mating. The finding agrees with those reported by Tadelle *et al.,* (2000) in Ethiopia and by Kosgey (2004) in Kenya who suggested that chicken improvement programs are unsustainable due to unreliable supply and high costs of acquiring and maintaining exotic breeding cocks, and incompatibility of genotypes with farmers' breeding objectives and production systems.

Results in Table 6 indicate that majority (95.3%) of the respondents had experienced chicken losses without knowing the cause. However, 71.9% of the respondents affirmed that they had no control strategy over the losses. Remarking on the reason for the chicken losses in light of the current production system, FGD participants claimed that:

> *…as the name suggests, free range production system is a freestyle practice…there is no control of what happens on the ground …in this situation, the chickens are predisposed to genetic erosion or losses…most importantly, the chicks are often affected (FGD, Mgongoro Village, June 2020).*

The findings denote that unless the free range production system is transformed into another with better control, the conservation of LC genetic resources will not occur in the study area.

Commenting on production system transformation, one key informant declared that:

> *…"A change of the production system such as from free-range (scavenging) to semi-scavenging may help to maintain LC within their production environment due to possible control on disease outbreaks, breeding and predation" (Key Informant, Mbutu Ward Livestock Extension Officer, July 2020).*

The findings compare well with those reported by Alfred *et al.* (2012) in Morogoro, Tanzania who found that losses in LC were high, especially in chicks and that predation was the leading cause for the losses. In Kenya, a study by Okeno *et al.* (2011) evidenced the possibility of conserving LC genetic resources only if the LC were confined. In Bangladesh, Sarkar and Golam (2009) indicated that the free-range production system could be upgraded to a semi-scavenging system to appreciate the performance and conservation of the LC genetic resource.

3.4.2 Feeding practices

In response to chicken feeding, 88% of respondents agreed that they provide supplementary feeding to their chicken flocks (Table 4). This finding compares well with those reported by Halima (2007) in the North West Amhara Region who showed that 99.3% of chicken owners provided supplementary feeds to LC. Also, Mapiye *et al*. (2005) in the Rushinga district of Zimbabwe indicated that 95.5% of the farmers produced their supplementary feeds and only 4.5% used purchased feed. However, during FGDs, participants expressed their concern about feeding that;

> *…local chickens can be improved through supplementary feeding…however, the reproductive performance depends on the availability of feed resources which also varies with season…the situation may become worse during the dry spell (FGD, Mwan'halanga Village, June 2020).*

From the finding, one key informant further added that:

> *…"farmers feed mainly on available grains (energy sources) such as maize, sorghum, or millet…the remaining feed resources are accessed through scavenging which can be limited in some of the areas or may depend on seasons" (Key informant, TALIRI Mpwapwa, July 2020).*

The findings indicate that LC encounters nutritional stress in terms of access and quality which may result in poor production, reproduction, and conservation of the resource. Mutayoba *et al.* (2011) reported that seasons, breeds, social habits, and life cycle of insects and other invertebrates influence the quality and quantity of scavengeable feeds and underscored the significance of supplementary feeds in seasons when scavengeable feeds are hard to find. On the other hand, Panda *et al.* (2012) reported that poor-quality feeds and incorrect mixing of dietary nutrient levels such as energy and protein can, possibly, cause nutritional stress and health concerns among LC. Although Fentie *et al.* (2013) and Yakubu (2009) ascribed LC as able to survive in a harsh environment, scavengeable feed resources are challenging to find.

3.4.3 Performance recording

Results in Table 6 show that 60.9% of the respondents mentioned that they do not keep performance records because they regard it to be tedious work agreeing to a study by Cuong *et al.* (2019) who reported that for various reasons, the majority of farmers do not keep records. However, this argument posited by the finding was supported by participants during FGD who said that;

> *…local chickens are kept for subsistence purposes, and few can be sold to neighbors or consumed…for this reason, the record-keeping is not feasible (FGD, Bukama Village, June 2020).*

The findings suggest that LC genetic resource conservation effort in a study area may not have an impact due to a lack of farmer's performance records as one key informant stated;

> *…"keeping records for traits of economic significance are required for accurate performance evaluation regarding… performance trends, selection criteria, and mating …since most farmers do not keep records…lack of this practice is a potential risk to genetic erosion" (Key Informant National AnGR coordinator, July 2020).*

The finding from the key informant indicates that lack of records is a factor that has a negative impact on LC genetic resource conservation as farmers may not be able to trace genetic attributes of interest. The finding agrees with those reported by Tada *et al.* (2012) in South Africa who reported that the lack of performance records, particularly of the local animal breeds, can lead to undefined breeding seasons and random mating. A study by Mlambo *et al.* (2011) found that farmers in rural areas do not keep records because they pay little attention to chickens than other livestock and crops. For this reason, the consequences of uncontrolled mating are well documented and include, among others; the production of un-uniform animals, the presence of undesirable and genetic defects, and inbreeding depression (Andersen *et al.,* 2005; Scholtz, *et al.,* 2010).

Further investigation of the overall farmers' practice toward LC genetic resource conservation shows that most of the respondents (50.8%) had fair practices toward LC genetic resource conservation with a mean and standard deviation of 4.32 ± 0.987 (Table 6). During FGDs, farmers argued that access to livestock extension services was one of the main causes of the fair practice. This was reported in one of the FGD that:

> *...access to livestock extension services is limited...some farmers have while others don't have at all (FGD, Mwanzugi Village, June 2020).*

Table 6: Statements and Levels of practice toward LC genetic resource conservation

S/N	Practice statements	YES	NO
1	Do you consider free-range as your main production system?	256 (66.7)[a]	128 (33.3)
2	Have you experienced chicken losses with an unknown causes?	366 (95.3)	18 (4.7)
3	Do you have a control strategy over the chicken losses?	108 (28.1)	276 (71.9)
4	Do you provide supplementary feeding to your chickens?	338 (88)	46 (12)
5	Do you conduct selective breeding in your chicken flocks?	87 (22.7)	297 (77.3)
6	Do you keep performance records on your chicken flocks	150.1(93.2)	233.9 (60.9)
Practice Level	**Frequency**	**Per cent**	**Mean ± Std**
Poor	64	16.7	4.32 ± 0.98
Fair	209	54.4	
Good	111	28.9	

[a] *The figures out and in the brackets are the number and percentage of responses respectively*

The finding implies that access to technical support services from the livestock extensionists may be linked to improved LC management practices which in turn can promote the conservation of LC genetic resources. A study Muhairwa *et al.* (2007) in Morogoro, Tanzania reported that there are few livestock extension agents compared to farmers which lead to very limited access to veterinary extension advice. From the findings, the argument on limited access to inputs and services may be a reason to fair LC genetic resource conservation practices.

3.5. Association between farmers' knowledge, attitude, and practices

Findings in Table 7 indicate a significant association ($p < 0.05$) between knowledge and practice and there is a lack of association between attitude and practice. Several reasons have been viewed by farmers and key informants about the association of knowledge, attitude, and practices toward LC genetic resource conservation. For example, two FGDs had views regarding the association of knowledge, attitude, and practices towards LC genetic resource conservation. In one of the FGDs, participants stated that:

> *...even with good knowledge, the perception that local chickens do not require management attention is a common feeling among most farmers...for this reason, there is less concern on LC genetic resource conservation practices...however, the few farmers who have applied good knowledge with a focus on improving local chicken are inclined to conserving the resource (FGD, Makomero Village, June 2020).*

Participants in another FGD also mentioned that;

> *...therefore, irrespective of our knowledge and the management practices...it is believed that the exotic genes will be eliminated naturally...this is because...crossbred cocks cannot challenge local cocks during mating, as such, crossbreds are not aggressive and cannot mate if they are kept with local cocks (FGD, Makomero Village, June 2020).*

From the FGD findings, farmers' feelings about the dominance of the local gene in the production environment may be one of the reasons explaining why attitude is not necessarily associated with the practice. However, the argument regarding the few farmers who have applied good knowledge on improving LC genetic performance validates Table 7 findings on the reason why farmers' knowledge is associated with practices towards LC genetic resource conservation. The findings concur with those reported by Nuru (2018) in Bagamoyo District, Tanzania who showed that small-scale farmers' knowledge was positive and significantly correlated with the performance of LC management practices. Other scholars (Abdelqader *et al.,* 2007; Gondwe and Wollny 2007; Henning *et al.,* 2007; Okeno *et al.,* 2012) reported that although farmers may have good traditional knowledge appropriate for their production systems, they may require technical knowledge regarding basic veterinary and breeding practices to sustainably conserve the LC genetic resources within their production environment (*in – situ*).

Table 7: Association between knowledge, attitude, and practice levels

Category		Practice: Count	Poor	Moderate	Good	p-Value
Knowledge	Low	36	4 (11.1) [a]	25 (69.4)	7 (19.4)	
	Moderate	195	25 (12.8)	114 (58.5)	48 (31.4)	0.021*
	High	153	35 (22.9)	70 (45.8)	13 (8.6)	
Attitude	Negative	48	7 (14.6)	28 (58.3)	13 (27)	
	Neutral	273	46 (16.8)	150 (54.9)	77 (28.2)	0.887
	Positive	63	11 (17.5)	31 (49.2)	21 (33.3)	

[a] *The figures out and in the brackets are the number and percentage of responses respectively*

* *Significant: $p \leq 0.05$.*

4.0 Theoretical Implications

This study has come up with uncertain insights from farmers based on their moderate knowledge, neutral attitude, and poor practices on LC genetic resource conservation in Igunga District. The KAP model emphasizes solely on linear relationship of the KAP dimensions, while social cognitive theory emphasizes the inclusion of the environment as a construct necessary to influence the behaviour change towards LC genetic resource conservation. Findings indicate that uncontrolled breeding is one of the main features of the free-range production system. As such, the introduced chicken improvement program using exotic chicken exacerbates the erosion/loss of LC genetic resources. This is because such interventions may influence farmers' attitudes to change their practices towards or against LC genetic resource conservation. From this study, such influence is against LC genetic resource conservation. Therefore, the KAP model is challenged because attitude does not necessarily influence practice. On the other hand, SCT is confirmed because the rearing environment influences LC genetic resource conservation.

However, for farmers to change their behaviour (practices), this study argues that no single solution fits all in conveying the farmers' behaviour change towards LC genetic resource conservation; the issue of whether to conserve or not will depend on the context. There are contexts, which require knowledge; others require support from the external environment such as stakeholder involvement in the utilization of financial resources with regard to the purchase of veterinary inputs and/or infrastructural development such as those related to the construction of the chicken house (confinement). Moreover, others require a combination of both knowledge and a supportive environment. In this view, the application of these theories depends on the context built in within and or beyond farmers' control in regards to LC genetic resource conservation. This may suggest that no single theory among the two; the KAP model and social cognitive theory can stand alone to explain a comprehensive solution to LC genetic resource conservation. In events where one needs an intervention, it is recommended to use lenses of both theories and chose the appropriate option; that most suits the context of conserving LC genetic resources.

5.0 Conclusion and Recommendations

Farmers have indicated uncertainty of LC genetic resource conservation in a study area which is depicted by their moderate knowledge, neutral attitude, and fair practice levels. This situation can have serious implications for the erosion of LC diversity in Igunga District, and probably in many other places in Tanzania. Furthermore, it has been learned that a free-range production system, indiscriminate crossbreeding, feeding and feed quality, lack of records, and limited veterinary inputs and services are obstacles to attaining LC genetic resources conservation. On the other hand factors with positive influence entails those related to farmer collaborations, supplementary feeding, and the hardiness of LC genetic resources. Further findings have indicated that there is a lack of association between attitude and practices mainly because attitudes are not directly observable as practices. The study recommends that the government collaborate with the development partners in fostering farmers' KAP towards LC genetic resource conservation. It is for this reason that both knowledge and attitude as building blocks of practice should be increased through training and awareness campaigns focused on LC genetic resource conservation. To this end, it is vital to involve the community to attain sustainable LC genetic resource conservation in the study areas.

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