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**Poultry Farmers' Information needs and Extension advices in Kilosa, Tanzania: Evidence from Mobile-based Extension, Advisory and Learning System (MEALS)**

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**Abstract**

**Background:** Poultry farmers need different information in order to improve their farming and contribute to the national economy. Information on poultry management is usually obtained from family members, friends, and neighbors with previous experience, extension officers, researchers, Television, radio, web and mobile based agriculture information systems. Promoting utilisation of vetted sources of information is envisaged to support poultry farmers in making informed decisions about management practices. This in turn will result into increased poultry productivity.

**Objective:** Many researches have been done to evaluate various information sources but few have been done to evaluate the mobile based extension, advisory and learning system here referred to “UshauriKilimo”. This study particularly assessed poultry farmers’ information needs and extension advices given through the agro-advisory system among farmers in Kilosa district of Tanzania. The objective was to determine poultry farmers’ information needs submitted through “UshauriKilimo” and resulting advisory responses.

**Method:** ICT based agro-advisory system 'UshauriKilimo' was deployed and used by poultry farmers for more than two years. The data from it were used to assess poultry farmers information needs. Only questions and advisory responses addressing poultry farming were analysed. These data were imported into the Qualitative Data Analysis Software, MAXQDA Plus 12 (Release 12.2.0) where they were coded, counted and analysed. Frequencies of variables were performed during content analysis.

**Results:** More than 340 farmers used “UshauriKilimo” for the period of two years. There were more than 1500 questions and answers which contained 320 questions related to poultry farming. Most of the poultry farmers who used “UshauriKilimo” sought information on health management aspects (diseases transmission, diagnosis, treatment and control); egg production; chicken feeds and feeding; chicken breeds and housing aspects. Information on markets was the least used.

**Keywords:** UshauriKilimo, Mobile Phone, ICT, Poultry, Farmers, Advisory, Extension, Learning, System

## 1.0 Introduction

Poultry production in Tanzania constitutes the main part of the livestock sub-sector, of which livestock is part of agriculture sector (Nonga et al. 2010). The current chicken population in Tanzania is estimated to be of 69 million birds, of which 37 million are backyard and the remaining 32 million are commercial, including 24 million broilers and 8 million layers (Msami, 2008; Polder *et al.*, 2016). Considering the economic importance of poultry sector in the country, there is a huge potential for it to grow further. In most of the developing countries extension service serves as a major source of information to the farmers. However, farmers do not get information specific for their agricultural activities due to various reasons one of them being failure to meet the extension agents (Doss 1999; Wakhungu 2010). The situation hinders poultry productivity and reduces their contributions to the agriculture sector and to the achievement of broader economic and social development goals.

Furthermore, there are few extension agents compared to farmers that lead to very limited access to extension advice. The farmer-extension officer ratio<sup>1</sup> presently ranges from 10,000-20,000:1. Consequently, extension services are often directed towards farmers who are more likely to adopt modern innovations, for example farmers with sufficient resources in well-established areas (Oakley & Garforth, 1985). It is unfortunate that, most farmers in rural areas are not well established to access agricultural information from other sources apart from the extension service. Worse still, farmers in rural areas are least likely to see an extension worker due to poor transportation infrastructure in the remote rural areas (Rukonge et al. 2008), and are therefore bypassed by extension service providers. Similarly, farmers in rural settings are also constrained from getting information from extension officers due to their level of education, which limit active participation in training that uses a lot of written material (Meinzen-dick et al. 2010). Meeting farmers' information needs depends on the existence of both the relevant information content and sources (Msoffe and Ngulube 2015). Thus, information needs of poultry farmers can be met using extension agents through face-to-face interaction and other additional sources such as advisory services from friends, neighbours and information and communication technologies (ICTs) based online interaction platforms (Lwoga et al. 2010)

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<sup>1</sup> [https://doi19z5hov92o.cloudfront.net/sites/default/files/resource/2009/03/3515-tanzania\\_research.pdf](https://doi19z5hov92o.cloudfront.net/sites/default/files/resource/2009/03/3515-tanzania_research.pdf)

ICTs refers to a range of technologies that facilitate production, storage and exchange of information by electronic means (Chapman et al. 2003). ICTs tools such as computers, cell phones, and internet services can play an important role in sharing poultry farming information. ICTs tools are no longer a luxury, for those who can afford them; they are the gateway to the latest information to improved poultry farming methods and access to the best poultry markets. Poultry productivity depends largely on access to information—about modern poultry farming techniques and technologies, where to sell profitably poultry produce, and how to add value to poultry produces. In a nutshell, access to information is vital for farmers to succeed in poultry production. The study by Temba *et al.* (2016) reported that majority of poultry farmers use ICTs (televisions, mobile phones and radio) to access extension information; few farmers use internet, magazines, books, fliers and audio-visual materials. The major challenges facing farmers in accessing agricultural information are high costs, unreliable electricity, poor TV and radio signals and illiteracy (Temba *et al.* 2016; Msoffe and Ngulube 2016). Despite these challenges the use of ICTs to address some of the difficulties facing conventional extension service to poultry farmers is inevitable. Establishing rural telecentres integrating ICTs such as internet connection, television, video, printing and photocopying services for providing agricultural information (Kiplang'at & Ocholla, 2005) will be of high value to the disadvantaged rural farmers. The use of mobile phones in Tanzania have extensively penetrated in the remote areas allowing the flow of information to the farmers via mobile phones possible.

Given the above scenarios, an intervention which complemented the existing conventional agricultural extension service by blending it with a web based farmers' advisory information system and mobile based farmers' advisory information system was developed. According to Sanga et al. (2016), the system is named as 'UshauriKilimo', which is a Swahili word meaning agricultural advisory. 'Ushaurikilimo.org' is an Agro-Advisory Service that allows any agriculture actor (e.g. farmer, extension officer, policy maker, trader, etc.) to ask advises from an agriculture extension officer using either web or mobile phone. The system has both web and mobile sub-systems. Thus, 'UshauriKilimo' is an integrated system which has modules for mobile based farmers' advisory information system (M-FAIS) and web based farmers' advisory information system (W-FAIS). M-FAIS and W-FAIS allow farmers to get advice in various agricultural issues such as agronomic practices, post-harvest operations, livestock husbandry, forestry, veterinary services, community development and market. A farmer requests an

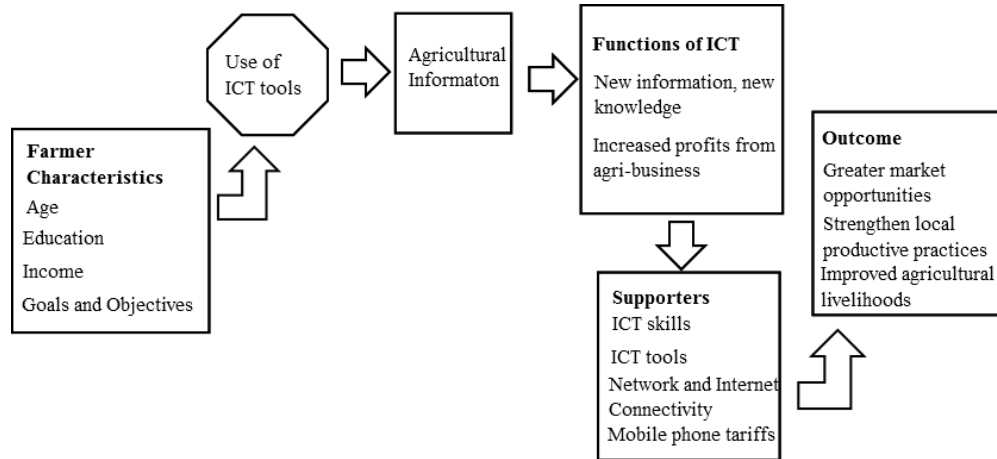
agricultural advisory or sends a question to a phone number where the advisory or the answer is provided by agriculture experts via his or her mobile phone. In summary, UshauriKilimo is a Mobile-based Extension, Advisory and Learning System (MEALS) linking poultry farmers and other actors in communication and dissemination of information.

Previous studies have attempted to evaluate poultry farmers' information needs (Aina 1991; Ozowa 1995; Kalusopa 2005; Chisenga et al. 2007; Meitei and Devi 2009; Byamugisha et al. 2010) and access to appropriate information (Matthewman et al. 1998; Adomi et al. 2003; Lwoga et al. 2011) in developing countries. It is evident, however, that very little is known about access of information using ICT based systems (Shenoy and Sawant 2003). To ensure the ICT based systems for agricultural information dissemination is fully utilized, it is important to evaluate the information flow within 'UshauriKilimo'. Knowledge about the information needs and advisories submitted through 'UshauriKilimo' could assist in understanding poultry farmer's information needs and devising better strategies for meeting them. This could be useful in adjusting the advisory approaches with a purpose of improving the effectiveness of 'UshauriKilimo' and meeting farmers' needs. The purpose of this study was therefore to assess poultry farmers' information needs and extension advices communicated through 'UshauriKilimo'.

### **1.1 Conceptual Framework**

The study used a combination of two modified frameworks: Ospina and Heeks (2012) and Alvarez and Nuthall (2006). Ospina and Heeks framework shows the role of ICTs in transforming agricultural production through enhancing access to agricultural information. The framework guided the study in assessing the roles played by ICTs, the factors influencing the usage of ICTs and the benefits attained through the usage of ICTs. In combination with this framework is the Alvarez and Nuthall (2006) framework that look into various characteristics that determine the use of ICTs. Since the farmer is an essential component in the information system of a farm, the decision to use ICTs often depends on the personal characteristics of the farmer, such as his or her personality, experience, age, education, goals and objectives. Alvarez and Nuthall (2006) used the model on dairy farmers to determine whether the adoption and use of computers by the farmers was determined by some characteristics or variables (Figure 1). The model is useful for this study because computers are part of ICT tools that will be assessed.

Although they focused on dairy farmers, this study used the framework to study the use of ‘UshauriKilimo’ by poultry farmers in Tanzania.



**Figure 1:** Ospina and Heeks (Ospina and Heeks 2012) and Alvarez and Nuthall (Alvarez and Nuthall 2006) combined framework

ICTs facilitate the accessibility of agricultural information services thus it is a channel necessary for gaining new agricultural knowledge and increasing profits from agricultural business. For ICTs to be effective it is important to have adequate infrastructure, affordable tariffs and skills necessary for using them. When ICTs are used effectively, they may improve the livelihoods of the agriculturists, strengthen local productive practices with modern ones and exposure to greater market opportunities nationally and internationally.

### 1.2 Significance of the study

ICTs developments have taken place in Africa with the significant growth over the past decade (Asenso-Okyere and Mekonnen 2012). Almost every activity is dependent on ICTs in one way or another to the extent that it is believed to bring about social and economic development (Asenso-Okyere and Mekonnen 2012). This study is significant due to the growing need of using ICTs in our everyday activities. ICTs are important to the communication process especially to farmers who need information that can hardly be accessed from the extension services. Providing timely agricultural information to a large group such as the poultry farmers in Tanzania is a step forward towards agricultural development and livelihood improvement at

large. Use of ICTs has a potential to open and speed up communication channels for market opportunities, good farming methods as well as agricultural training needs.

## **2.0 Methodology**

### **2.1 Study area**

This study was carried out in Kilosa District and based on online agro-advisory system open to all Tanzanian poultry farmers. Kilosa district is one of the six districts of Morogoro region, located on the eastern side of the country, about 200 km west of Dar es Salaam. Morogoro region is divided into six districts namely Kilosa, Kilombero, Morogoro rural, Morogoro urban, Mvomero and Ulanga. Morogoro was selected as a study area because it is one the regions with considerable mobile phones network. These developments could partly be attributed to the region's proximity to Dar es Salaam city, which has the highest ICT developments in the country. Kilosadistrict was chosen because it is well known for its numerous and diversified agricultural activities. It is more remote compared to Morogoro urban district, consequently the level of ICT access and usage in Kilosa is expected to be low as compared to Morogoro urban. The district being near to an urban district, made it qualify for the study. Kilosa has a total population of 438, 175 where by 219, 797 are females (URT 2013).

### **2.2 Research design**

In this study, the 'UshauriKilimo' was developed in collaboration with farmers and other actors such as agricultural and livestock products processors, traders, and policy makers. It was then piloted in Kilosa District for more than two years (Sanga et al. 2016). Farmers and extension agents used it to supplement the conventional agricultural extension service. During operationalization of UshauriKilimo massive data were stored in its database/knowledge base. Thereafter, the search tool for UshauriKilimo was developed to help farmers to search knowledge base using different keywords. In this study, we have used the search tool to collect data related to livestock by querying the knowledge base with keywords 'kuku'. This is Swahili word for 'poultry'. The results from query were some information which needed manual data cleaning. The cleaned data were subjected to another tool for qualitative data analysis from massive data obtained after searching process. MAXQDA<sup>2</sup> is a qualitative data analysis tool which was used for content analysis.

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<sup>2</sup> "MAX" named after Max Weber, the famous German sociologist; "QDA" stands for Qualitative Data Analysis.

### **2.3 Population and sample selection**

The study population comprised of poultry farmers in Kilosa district that were involved with ‘UshauriKilimo’. A sample of 20 farmers from each village of 17 participating villages was selected. Thus, in total we had more than 340 farmers using the ‘UshauriKilimo’. It is worth noting that “UshauriKilimo” was open to all farmers in Tanzania who are doing agriculture and have access of mobile phone. This included those involved in keeping poultry and/or interested with poultry farming. Earlier report from data analytics by Fue et al. (2017) on ‘UshauriKilimo’ indicate that out of more than 1000 questions submitted to the system via farmers’ mobile phones, 47% questions were from livestock and 53% were from crops.

### **2.4 Data collection and analysis**

#### **2.4.1. At Kilosa District**

Farmers who have used “UshauriKilimo” since 2014 till now (<http://ushaurikilimo.org/>).

#### **2.4.2. The agro-advisory system**

This study was done on the poultry farmers using “UshauriKilimo” to seek for information related to poultry keeping. Information relating to poultry were searched at “UshauriKilimo” (<http://ushaurikilimo.org/farmerview.php>) where farmers used to ask questions and/or seek advisories on various areas of their concern. A farmer was allowed to request an agricultural advisory or sends a question to a phone number where the advisory or the answer was provided by an agriculture experts via his or her mobile phone (Sanga et al. 2016).

The system operate under the principle that if the question is simple the extension officer who is at village can answer using either their mobile phones or web or e-mail. But if the question asked by a farmer is complex then the system can forward it to the ward extension officer. In case the question is still complex for the ward extension officer then the question can be forwarded to the district extension officer who is supposed to be subject matter specialist (sms). Otherwise, if the question is difficult to be answered by extension officers in village, ward and district then it can be forwarded to experts for answers or for further research. The experts are from Agricultural Research Institutes, Livestock Institutes and Universities.

The online search on “UshauriKilimo” returned a total of 320 phrases or sentences. The sentences or phrases in this context meant a row containing blocks consisting of questions, answers, phone number (s) of farmers, date and time for question asked by a farmer. Out of the



320 sentences, 54 were not related to poultry. The returned results were copied, pasted into word document and critically sorted to remain with questions and advisories related to poultry. The data were imported into the Qualitative Data Analysis Software, MAXQDA Plus 12 (Release 12.2.0) where they were coded, counted and analysed. Analysis of the frequencies of variables was performed.

### 3.0 Results

#### 3.1 Poultry farmers' information needs submitted to "UshauriKilimo"

The information needs submitted by poultry farmers to "UshauriKilimo" are presented in Table 1, Table 2, Table 3, Table 4, and Table 5.

**Table 1:** Information needs by poultry farmers on diseases transmission, diagnosis, treatment and control

Information needs	Frequency
Transmission of diseases in chickens	1
Vaccination of chickens against different diseases	14
Vaccination against Fowl Typhoid	1
Vaccination against Fowl pox	1
Vaccination against Newcastle disease	8
Treatment of diseases and drugs to use	59
Diagnosis of diseases	22

A total of 106 questions were asked by poultry farmers seeking information on diseases transmission, diagnosis, treatment and control (Table 1).

**Table 2:** Information needs by poultry farmers on egg production

Information needs	Frequency
Improving quality of eggs	1
Poor hatchability	1
Chicken eating eggs	2
Poor quality	3
Storage of eggs	5
Incubation of eggs	11
Profit	1
Low production	10

A total of 34 questions asked by poultry farmers were on egg production (Table 2).

**Table 3:** Information needs by poultry farmers on feeds for chicken

<b>Information needs</b>	<b>Frequency</b>
Availability of feeds for chicken	1
Type feeds for chicken	7
Price of chicken feeds	1
Amount of feed per chicken	4
Feed formulation and preparation	18

A total of 31 questions from poultry farmers were on chicken feeds (Table 3).

**Table 4:** Information needs by poultry farmers on chicken breeds

<b>Information needs</b>	<b>Frequency</b>
Information needs on cross breeds	6
Availability of different types of chicken breeds	3
Information on chicken breeding	3
Information needs on layers	16
Age to stop laying for layers	1
Age to start laying for layers	1
Information needs on broiler	5
Information needs on local chickens	57
Availability of local chickens	2
Management system of local chicken	1
Types of local chickens	2
Age to start laying for local chickens	2

A total of 99 questions were asked by poultry farmers were on chicken breeds (Table 4).

**Table 5:** Farmers information needs on housing

<b>Information needs</b>	<b>Frequency</b>
Building house	1
Startup capital	2
Characteristics of chicken house	6
Size of chicken house	8
Chick brooders	5
Site visit	3

House photo	2
Feeding Equipment availability	4

A total of 31 questions were asked by poultry farmers on housing for chicken (Table 5).

### 3.2 Advisory responses to poultry farmers submitted through “UshauriKilimo”

Majority of farmers who requested advisory on diseases, sought to know the drugs for treatment of different diseases. Majority could report at least one clinical sign and requested the drug for treatment. The main clinical signs reported by the poultry farmers were swollen eyes, death, diarrhoea, facial swelling, purulent nasal discharge, drowsy, snoring and weak legs. The main diseases diagnosed by the livestock field officers based on reported clinical signs were Newcastle, Infectious coryza, Helminthosis and Coccidiosis. The main drugs prescribed by the livestock experts for treating the reported cases at “UshauriKilimo” included Oxytetracycline (OTC), Multivitamins, Fluban, Limoxin, Piperazine, Doxycol, Amprolium, ESB3 and Tetracolvit. The summary of clinical signs, diseases and drugs used by the poultry famers are shown in Table 6.

**Table 6:** Clinical signs, diseases and drugs used by the poultry farmers as reported via “UshauriKilimo”

Clinical sign	N	Diseases reported	N	Drugs used for treatment*	N
Loss of feathers	1	Gumboro	1	Oxytetracycline (20, 50%)	14
Vomiting	1	Avitaminosis	1	Tylosin (Tylosin tartarate)	1
Swollen eyes	10	Fowlpox	1	Hipralona (Enrofloxacin 100 mg)	1
Weak legs	5	Helminthosis	5	Doxycol (Doxycycline hyclate 5000 mg/g, Colistin sulphate 5000 mg/g)	5
Fatty organs	1	Coccidiosis	3	Trimazin (Sulfadiazine 250 mg/g, Trimethoprim 50 mg/g)	2
Snoring	6	Fowl Typhoid	2	Amprolium (Amprolium hydrochloride)	5
Torticollis	2	Infectious coryza	5	DCP (Dicalcium phosphate)	4
Death	10	Newcastle disease	7	ESB3 (Sulfachloropyrazine 30%, Sodium monohydrate)	5
Drowsy	6			Tetracolvit (Colistin sulphate 7 g, OTC 10g)	5
Upright wings	1			Fluban (Enrofloxacin 100 mg/ml)	9
Drop in egg production	1			Limoxin (Oxytetracycline hydrochloride)	8
Lesions in	1			Multivitamins	12

head/wounds					
Diarrhoea	8			Neoxyvital (OTC hydrochloride, Neomycin sulphate, Vitamins, Trace elements)	1
Purulent ocular discharge	3			Askarisks	1
Loss of appetite	1			Piperazine (Piperazine Citrate)	7
Coughing/sneezing	1				
Purulent nasal discharge	6				
Facial swelling	6				

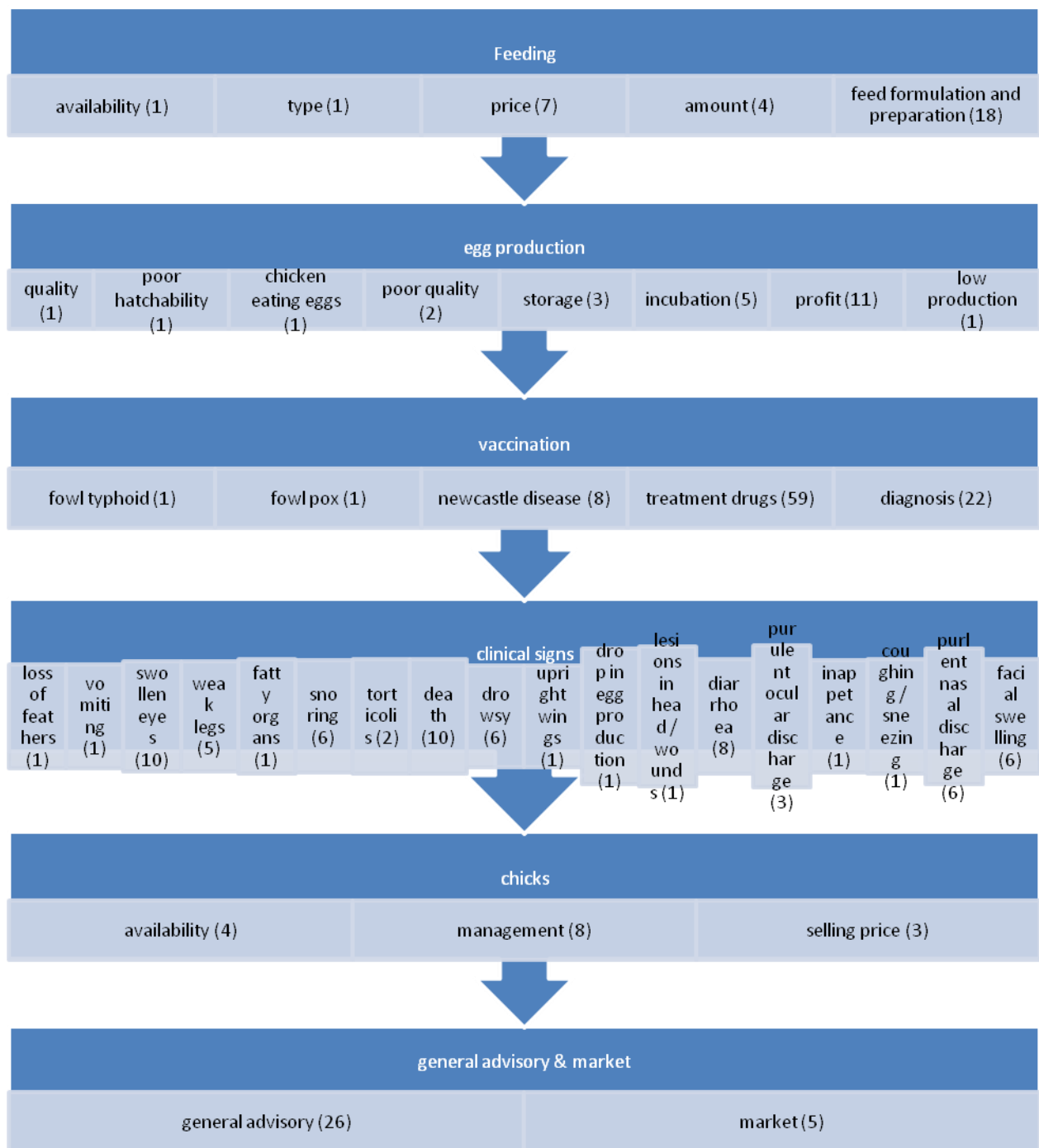
\*In the brackets on the column for the drugs used for treatment is the antibiotic ingredients of the respective drug

In summary, the information needs of poultry farmers' who used "UshauriKilimo" is as depicted in Figure 2.

Figure 2 shows that the ranking of questions asked in terms of frequency is as follows:

- i. treatment drugs (59)
- ii. general advisory (26)
- iii. diagnosis (22)
- iv. feed formulation and preparation (18)

These questions can be termed as frequently asked questions (FAQ) by poultry farmers using 'UshauriKilimo'. This is a deeper data analysis from earlier study which was done to analyse general questions asked by agro-pastoral and pastoral communities (Fue et al. 2017).



**Figure 2:** Frequency of questions asked by poultry farmers

#### 4.0 Discussion

Livestock service delivery in Tanzania is provided by the Government and the private sector. In order to reach the majority of small-holder and subsistence livestock keepers, the government of Tanzania established a village and ward level network of livestock officers to provide basic

animal health and husbandry services. Surprisingly, despite the Government assigning public livestock field officers to almost all the rural wards 80% of the households keeping livestock in the rural ward cannot access the services from them (Shipman and Blum 2017). Certainly, only 20% of livestock keepers utilize veterinary extension services. This leads to the livestock keepers to seek information using other means including mobile phones, radios, magazines, television and internet surfing. In recent years, there is an increased use of mobile phones even by farmers living in peri-urban areas of Tanzania with good coverage of mobile phone networks. Farmers are using social media such as Facebook, Whatsapp, mobile phone text messages and other ICTs technologies to share information. Based on this, we developed a web and mobile based farmer's advisory information systems to easy access and use by farmers and agricultural extension officers. We used the developed systems to assess poultry farmers' information needs and extension advices given through the agro-advisory system among farmers.

The findings of this study showed that majority of the poultry farmers who used "UshauriKilimo" sought information on poultry feeds and feeding, egg production, poultry breeds and breeding, poultry housing, and poultry diseases diagnosis and control. Information on markets was the least used by poultry keepers. Majority of the agro-advisory system users were seeking information on local chicken probably due to high demand in the market. Due to this increased demand of local chickens (pure and cross) in the market, many people venture into poultry farming without prior knowledge on poultry farming. As result they face a lot of challenges such as poor growth, high mortalities and reduced egg production leading to economic losses and frustrations. This makes agro-advisory system an important mobile application (mobile app) for farmers to get information and practical experience needed for the improved poultry farming.

Previous studies in Tanzania have shown that disease control, poultry protection, breeds and breeding, and feeding and nutrition are the most accessed information by poultry farmers (Msami 2002; Msoffe and Ngulube 2016; Angello et al. 2016; Fue et al. 2017). A similar trend was observed in the present study which investigated the information needs of poultry farmers in using 'UshauriKilimo'. Unlike poultry keepers in the rural areas, poultry keepers in urban areas benefit more by accessing information from many different sources including veterinary shops, extension services, fellow livestock keepers, print sources, agricultural exhibitions and seminars (Angello et al. 2016). Further observation is that the present study matches with the study by

Temba et al. (2016) who investigated on information seeking behaviour of poultry farmers' who accessed ICT tools. The pattern of the information which was most asked by poultry farmers in Morogoro through mobile phones, television and radio were poultry husbandry, poultry diseases and control, poultry nutrition and housing (Temba et al. 2016). The study by Temba et al. 2016 indicated that 82.5% of poultry farmers do not get enough advisories on the most used ICT tools (i.e. Mobile phones, television and radio). In addition, there is a correlation between productivity and access to extension service via mobile phones. To reduce poverty level of poultry farmers, advisory services need to be enhanced (Msoffe et al. 2010). The development and piloting of MEALS as a mechanism to improve interactions between poultry farmers, researchers, experts and other actors is likely to have a positive outcome and impact (Figure 1). In this context farmers are certified to first record health parameters of their animals and get advisory services on real-time or by having direct communication with their respective livestock experts (Erick and Kasamani 2015). The data produced from these processes are stored as FAQ which can be shared openly to other actors online (Figure 2). This helps dissemination of livestock related information fast, efficiently and at any where and any time of the day (Fue et al. 2017). Mobile phones can be used as surveillance tools and at the same time serves as vehicle for dissemination and communication of information packages on control and preventative animal health services (Mtema et al. 2016). The use of mobile and web based advisory platforms could speed up the flow of information from livestock field officers (i.e. extension agents) to the farmers and other actors. The delayed information flow and service delivery to the poultry farmers has led to even farmers taking the role of livestock field officers such as treating sick birds. This have been observed in this study and in the previous studies (Gustafson et al. 2015). Thus, the effort done through "UshauriKilimo" need to be scaled up so that the challenges identified by Msoffe and Ngulube (2015) and Temba et al. (2016) can be addressed.

### **3.0 Conclusion and Recommendation**

Information needs of poultry farmers vary widely between individuals and groups. As information needs varies widely among farmers, it is more appropriate to respond to their needs on individual basis. Variations of information needs necessitate the need to develop user-centred information services in order to meet farmers' needs. With an innovation, such as "UshauriKilimo", it is more pragmatic approach to deal with individual farmers needs. The

reason for this is that top – down or supply driven approach are not working in conventional agriculture extension. Thus, the future is on demand driven or bottom-up approach where information providers and/or agriculture experts have to focus on the needs of individual farmers rather than responding to their needs with an approach of “one size fits all”.

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