

**CHARACTERIZATION OF POULTRY PRODUCTION AND  
MARKETING SYSTEMS IN KERSSA *WOREDA*, JIMMA  
ZONE, SOUTH WEST ETHIOPIA**

**M.Sc. THESIS**

**By**

**ROBEL EPHREM ZEWIDE**

**November, 2012**

**JIMMA UNIVERSITY**

**CHARACTERIZATION OF POULTRY PRODUCTION AND  
MARKETING SYSTEMS IN KERSSA *WOREDA*, JIMMA  
ZONE, SOUTH WEST ETHIOPIA**

**M.Sc Thesis**

**Submitted to the Department of Animal Sciences, School of Graduate  
Studies, Collage of Agriculture and Veterinary Medicine, Jimma University**

**In Partial Fulfillment of the Requirements for the Degree of**

**Master of Science in Animal Production**

**By**

**ROBEL EPHREM ZEWIDE**

**November, 2012**

**JIMMA UNIVERSITY**

# APPROVAL SHEET

## Jimma University College of Agriculture and Veterinary Medicine Graduate Studies

As thesis research advisor, we hereby certify that we have read and evaluated this thesis prepared, under our guidance by Robel Ephrem, entitled “**Characterization of Poultry Production and Marketing Systems in Kerssa Woreda, Jimma Zone, South West Ethiopia**” and recommend that it be submitted as fulfilling the thesis requirement.

Solomon Demeke (Professor)

Major advisor

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Shiferaw Mulugeta (Asst.Prof.)

Co-advisor

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

As a member of the Board of Examiners of the M.Sc. Thesis Open Defense Examination, We certify that we have read, evaluated the Thesis prepared by Robel Ephrem and examined the candidate. We recommended that the Thesis be accepted as fulfilling the Thesis requirement for the Degree of Master of Science in Animal Production.

\_\_\_\_\_  
Chairman person

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Internal Examiner

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
External Examiner

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## **DEDICATION**

In memory of my beloved Grand Mother **Eilfinesh Seyum**, and my Grand Father **Feleke Tekele**, who passed away during my research work!

## **STATEMENT OF THE AUTHOR**

I declare that this thesis is my work and that all sources of material used for this thesis have been appropriately acknowledged. This thesis has been submitted in partial fulfilment of the requirements for M.Sc. degree to Jimma University, College of Agriculture and Veterinary Medicine to be deposited in the University Library and to be made available to borrowers under the rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the awards of any academic degree, diploma, or certificate.

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**Name:** Robel Ephrem

**Date of Submission:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Place:** Jimma University

## **BIOGRAPHICAL SKETCH**

The author, Robel Ephrem, was born on March 2, 1987 G.C in Addis Ababa, the capital of Ethiopia. He attended his elementary and secondary and preparatory education at Adis Hiwot elementary and Yenegew Sew secondary and preparatory schools between 1995 and 2007 G.C, respectively. In the academic year of 2007/2008, Robel joined Jimma University, College of Agriculture and Veterinary Medicine (JUCAVM) and graduated with B.Sc degree in Animal Sciences, on June, 2010. Robel joined the School of Graduate Studies of Jimma University in 2010/2011 academic year to pursue his M.Sc degree in Animal production.

## ACKNOWLEDGMENTS

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability to proceed successfully. “I can do everything through him who give me strength (Philippians 4: 13)”

I would like to express my gratitude to my Major Advisor, Professor Solomon Demeke, whose expertise, understanding, and patience, added considerably to my graduate experience. I appreciate his vast knowledge and skill in many areas (e.g., vision, aging, ethics, interaction with participants), and his assistance in the write up of this thesis. I would also like to thank my Co-Advisor Mr. Shiferaw Mulugeta for his kind and friendly approach starting from the proposal development phase of this research undertaking. He provided encouragement, and friendly advice and constructive comments, which made this thesis, work a reality.

It gives me great pleasure in expressing my gratitude to my beloved sisters (Nigest, Nunu, Fasika, Zufan and Hana) for their love, encouragement, and financial support starting from elementary school. I would also like to thank my brother, Dagne and my parents for their positive contribution to my academic success. Finally I would like to thank the staff members of Kerssa *Woreda* and Jimma Zone agricultural office, the *Woreda* Development Agents and all the others, who supported me in conducting and finalizing this research project.

## **LIST OF ABBREVIATIONS**

ANOVA	Analysis of Variance
CACC	Central Agricultural Census Commission
CSA	Central Statistic Authority
EARO	Ethiopian Agricultural Research Organization
ETB	Ethiopian Birr
JUCAVM	Jimma University, Collage of Agriculture and Veterinary Medicine
ND	Newcastle Disease
ORC	Opinion Research Corporation
PRA	Participatory Rural Appraisal
RIR	Rhode Island Red
SD	Standard Deviation
SE	Standard Error
SNNPRS	Southern Nation Nationalities Peoples Regional State
SPSS	Statistical Package for Social Sciences
USA	United State of America



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# CHARACTERIZATION OF POULTRY PRODUCTION AND MARKETING SYSTEMS IN KERSSA WOREDA, JIMMA ZONE, SOUTH WEST ETHIOPIA

## ABSTRACT

*This study was conducted to characterize poultry production and marketing systems in Kerssa Woreda of Jimma Zone, South West Ethiopia. Six Kebeles of the Woreda were selected using multistage random sampling from which, 30 Households (HHs) were randomly selected. A questionnaire survey was conducted on these selected 180 HHs pertaining population characteristics, management, marketing, and productivity of the indigenous chickens integrated with participatory rural appraisal. Moreover, 30 HHs who had adopted hay-box brooder and exotic chickens were purposively selected to study the performance of hay box and exotic chickens. The data collected were subjected to descriptive and analysis of variance. The results obtained showed that the mean flock size of the respondents was 8.37chickens/HH. The majority (> 80-85%) of the respondents indicated that the indigenous chicken production system of Kerssa Woreda is characterized by scavenging with supplementary feeding, natural incubation and brooding, lack of separate poultry house, periodic disease outbreak and open marketing system of eggs and live chickens. About 70 % of the respondents reported that predation is the major constraint of chicken production in the area. The mean annual egg production/hen of the Woreda was estimated to be  $56.67 \pm 1.04$ . The mean annual egg production of the indigenous chickens of Gello kebele (67 eggs/hen) was significantly ( $p < 0.05$ ) higher than the others. The lowest (48.86 egg/hen) was recorded in Kitimbile Kebele. The mean hatchability and chick mortality to an age of 8 weeks of the Woreda was 67.08 % and 50.15% respectively with no significant difference ( $P > 0.05$ ) between the Kebeles. The farmers who adopted exotic chickens were successful in raising layer type day old chicks with the use of hay-box brooder as measured by chick survival (60-89%), rate of sexual maturity (5.53 months) and egg production (159.66 egg/hen/year). The exotic chickens adopted performed fairly good under the Kerssa local conditions. The current market price of eggs (Birr 1.5/egg) and adult live chickens (Birr 71.16/head) is also rewarding. Therefore the provision poultry input and opportunity of credit scheme seems to be the future direction for efficient poultry production in the Kerssa Woreda.*

**Key words:** *Indigenous chickens, exotic chicks, flock structure, management, marketing and Productivity*

# 1. INTRODUCTION

Poultry farming is widely practiced in Africa and almost every farmstead keeps household poultry mainly for food production and provision of family income. Religions and cultural considerations are also amongst the reasons for keeping chickens by resource poor farmers in Africa (Dwinger *et al.*, 2003). Ethiopia is not exception to this situation and household poultry is kept as source of food, family income and for other social and cultural roles. (Tadelle and Peter, 2003).

Traditional household poultry of indigenous chickens is an integral part of small scale farming system in Ethiopia. The traditional poultry production system as currently practiced in Ethiopia is characterized by small flock, minimal inputs, poor marketing system and periodic devastation by disease condition and predation (Tadelle and Ogle, 1996a; Alemu and Tadelle, 1997). The indigenous chickens predominately prevailing in the traditional production system are considered to be low in productivity due to low egg production potential, production of small sized eggs, slow growth rate, late sexual maturity, small clutch size, pronounced broodiness and high chick mortality (Teketel, 1986; Aberra, 2000).

The Ethiopian indigenous chickens are known to possess desirable characters such as thermo tolerant, disease resistance, acclimatization to their environment, good egg and meat flavour, hard egg shells, high fertility and hatchability as well as high dressing percentage (Aberra, 2000). However, in spite of the above important and desirable characters, the indigenous chickens have been neglected and reared as a side-line agricultural activity. There has been no significant development efforts geared towards the indigenous chickens and all the past experience tends to indicate that the government poultry extension services dealt with technologies with little or no reference to indigenous chicken management, marketing and development interventions (Mekonnen, 2007).

The results of a study conducted by Alemu *et al.* (2006) suggested that marketing problem is one of the major constraints for the adoption of village poultry technology indicating that very little attempt has been made to promote indigenous chickens market. This is



particularly true in southwest Ethiopia including *Kerssa Woreda* of Jimma zone, where special market emphases are placed on cash crops such as coffee and Khat (*Catha edulis*).

The chicken population of Jimma zone is estimated to be 1,489,519 of which 96,028 is found in *Kerssa Woreda*. The indigenous chicken population of *Kerssa Woreda* is the sixth higher population among the seventeen *Woredas* of Jimma zone (Jimma Agricultural office 2010, Personal communication). However, the contribution of the indigenous chicken resource of the *Woreda* to human nutrition and family income seems to be disproportionately small which may probably attributed to the low productivity of the flock. The low productivity of the local scavenging chickens is not only because of their low egg production potential, but also due to high chick mortality, longer reproductive cycle and low management standard of the traditional household production system. Unfortunately however, the productivity of indigenous chicken and the production system at which the indigenous chicken are exposed is little known in *Kerssa Woreda*. This condition calls for the characterization of the production performance of village chicken.

As the result of the above stated challenges associated with indigenous chickens, the *Kerssa Woreda* Agricultural Bureau in collaboration with plan Ethiopia and Jimma University College of Agriculture and Veterinary Medicine (JUCAVM) started the distribution of hay box brooder and exotic chickens within the farming population with little information on their compatibility to the farming system, socio-economic circumstances, ownership pattern and production environment.. Plan Ethiopia supported the construction and distributions of more than 200 hay box brooders of 30 chick capacity and large numbers of intermediate bee hives within the farming population of *Kerssa Woreda* through the government extension channels. Jimma University College of Agriculture and Veterinary Medicine students get to practice community development skills by assisting in brooder box construction, delivery and community training sessions and JUCAVM has been able to extend the hay box technology and exotic chicks to hundreds of farmers in Jimma zone including that of *Kerssa Woreda*.

Hence, there is a strong need to investigate the performance of the hay box brooding technology and the distributed exotic chickens. This being the case, it is essential to conduct field survey on the current status of both the indigenous and exotic chickens in the

*Woreda*. Therefore, this study was undertaken to characterize poultry production and marketing system of *Kerssa Woreda* of Jimma Zone with the following specific objectives.

1. To study poultry production, management system and production performances of indigenous chickens in *Kerssa Woreda* of Jimma Zone.
2. To investigate in to the poultry marketing channels of *Kerssa Woreda* of Jimma Zone.
3. To study the performance of hay box brooding technology and exotic chicken distributed within *Kerssa Woreda* of Jimma Zone.

## **2. LITERATURE REVIEWS**

### **2.1. Poultry Production in Ethiopia**

In Ethiopia the poultry sub-sector represents an important part of the national economy in general and that of rural economy in particular. Ethiopia is one of the few African countries with large chicken population. Nevertheless there is no exact figure representing the national poultry population. In the early 1980s, the Ethiopian poultry population was reported to be 56 million (Sub-Sector Review, 1984), whereas; in the agricultural year of 2003, the national poultry population was estimated at 42.9 million of which 2.18% consists of imported exotic breeds of chickens kept in urban and peri-urban areas. The remaining 97.82% consists of indigenous chickens kept under traditional village production system. Recent estimates put the poultry population of the country at around 34.2 million with native chicken representing 94.4%, hybrid chicken 3.92% and exotic breeds of chickens mainly kept in urban and peri-urban areas 0.64% (CSA, 2007). According to CSA (2009), the current Ethiopian chicken population was reported to be 38.1 million.

The four major Regional States in terms of land area and human population (Oromiya, Amhara, SNNP, and Tigray) collectively account for about 96% of the total national poultry population. Chicken rearing is not common in the lowlands of Ethiopia i.e. Somali, Gambella, Afar and Benishangul-Gumze Regional States, which collectively own 3.24% of the total national chicken population. Oromiya region has about 34.4% of the total national chicken population and contributes 36% of the total annual national egg and poultry meat production. The region's rural areas constitute about 97.1% of the total regional chicken population while the urban areas constitute 2.9%. The Regional State is divided into 12 Administrative Zones of which Jimma Zones account for about 12% of the total regional chicken population (Solomon, 2007).

The Ethiopian indigenous chickens are none descriptive breeds closely related to the Jungle fowl (Sub-Sector Review, 1984) and vary in colour, comb type, body conformation and weight and may or may not possess shank feather. Broodiness (maternal instinct) is pronounced. They are characterized by slow growth, late sexual maturity and low

production performance. The mean annual egg production of indigenous chickens is estimated at 60 small eggs with thick shell and deep yellow yolk colour (Alemu and Tadelle, 1997). Egg laying period and number of eggs laid per period are to some extent higher in urban than in rural areas (CACC, 2003). The carcass weight of local chicken at 6 months of age was 559 g which was significantly lower than that of the 875 g reported for Leghorn under the Ethiopian condition but higher in dressing percentage than exotic chickens (Teketel, 1986). According to the Sub-Sector Review (1984), the total national annual poultry meat and eggs production were estimated at 72 300 and 78 000 metric tonnes, respectively, resulting in per capita consumption of 57 eggs and 2.85 kg of poultry meat. In the year 2005, the total annual poultry meat and egg production were estimated at 6720 and 26059 metric tons respectively. The price of a live bird (e.g. a cockerel) rose by a similar amount, from 7-12 birr 1998 to 25-30 birr in 2006 (Doviet, 2005). The decline in national poultry population and per capita poultry meat and egg consumption and rise in price could partially be attributed to the growing population and rising incomes in the urban areas. Therefore, providing the necessary support to the development of poultry production in rural areas is essential in order to increase the household income and food security (Wethli, 1995 and Solomon, 2007).

There is no recorded information on the first batch of exotic breeds of chickens introduced to Ethiopia. It is widely believed that missionaries imported the first exotic breeds of chickens. Four breeds of exotic chickens (Rhode Island Red, Australorp, New Hampshire and White Leghorns) were imported from Kenya, Denmark and the United States to Jimma and Alemaya in 1953 and 1956, respectively. Trials and experimental works in the area of poultry housing, feeding, brooding, management and disease and parasite control were initiated soon after importation at Jimma, Alemaya and Debre Zeit (Wiggins, 1958). Those three experimental stations (Jimma, Alemaya and Debre Zeit) were historically significant and played key roles in the establishment phase of the current modern poultry sector and the national poultry extension system of the country (Solomon, 2007).

At present it is estimated that the exotic chickens make up about 4.6% of the national poultry population (CSA, 2007) indicating that the share of exotic chickens in the total annual egg and poultry meat production has increased. Unfortunately however, the contribution of exotic poultry to the Ethiopian economy is significantly lower than that of

the neighbouring African countries. All the available evidence indicates that all the imported breeds of chickens performed well under the intensive management system (Alemu and Tadelle, 1997). The current Ethiopian modern poultry sub sector comprises of the small scale intensive and large scale commercial production systems.

The small scale modern poultry farms are run either as supplementary to the family income or as a full time business in urban and peri-urban areas. Under this system of production, a small number of exotic breeds of chickens (50-1,000) are produced along commercial lines using relatively modern management methods. This activity is being undertaken as a source of income in and around major cities and towns such as Debre Zeit located at about 45 km southeast of Addis Ababa. Most of these farms obtain their feeds and foundation stocks from the large scale commercial poultry farms and occasionally from nearby government owned breeding and multiplication centres. They are also involved in the production and supply of table eggs to various supermarkets, kiosks and small roadside restaurants through middlemen. There are several private large scale commercial poultry farms in and in the vicinity of Addis Ababa, the majority of which are located in Debre Ziet. Some of the commercial farms have their own broilers parent stock, feed processing plants, hatchery, slaughter houses, cold storage and transportation facilities. The large scale commercial poultry farms are run as full time businesses and highly dependent on the market for inputs. The owners are wealthy by the Ethiopian standards. Table and fertile eggs, day old chicks and broilers meat are the major products of these farms. There is also a third sector, keeping dual purpose chickens of exotic breeds at the government owned poultry breeding and multiplication centres (Solomon, 2007).

The centres distribute fertile eggs, baby chicks and pullets and cockerels. Some of them have hatchery units, brooder and layers houses, and veterinary clinic and feed processing units. The marketing channel of the breeding and rearing centres consists of the distribution of fertile eggs, baby chicks, pullets/cockerels and culled layers to the rural farming communities at a very subsidized price. For example exotic pullets of 3-months of age are sold at Birr 65 from the private commercial poultry farms, whereas, exotic pullets of the same age are distributed at Birr 18 from the government owned poultry breeding and rearing centres, indicating more than 100% subsidies. In Ethiopia, women are capable of selling chicken and eggs as these are under their control. Poultry keeping in most of the

developing countries including Ethiopia are the responsibility of women. The recipient of the poultry extension package of Ethiopia are not exceptional to this conditions, since priority is given to women during distribution of fertile eggs, chicks, pullets/cockerels and culled layers from the breeding and rearing centres (Solomon 2007).

## **2.2. Comparative Advantages of Raring Chickens**

Chicken production comprises of considerable potential to improve the livelihoods of rapidly increasing populations of developing countries. For many poor people in developing countries, chickens are the only type of livestock they can afford to keep (Tadelle, 2011). Village chicken production is an important agricultural activity of rural communities in most developing countries and household chicken production plays a major role in poverty alleviation and achieving food security at household level. It provides off-farm employment, income generating opportunity and source of gifts and religious sacrifices (Wethli, 1995). Rural household poultry is affordable source of animal protein and sources of family income. Household poultry require limited space, feed and capital investment compared to other domestic animals kept in rural Ethiopia. The indigenous chickens also represent part of the livestock production system.

Village chicken products are often the only source of animal protein for resource-poor households. Eggs are source of high-quality protein for sick and malnourished children under the age of five. Chickens are considered to be fast in human food production due to their short reproduction cycle compared to most other livestock. Chickens are also affordable and more often slaughtered at the household level during holidays and religious ceremonies (Delgado *et al.*, 1998) and about 32% of the animal protein needs of the household is supplied from poultry (Tadelle *et al.*, 2003), indicating that rural household poultry production plays a significant role in the provision of family food at the global level. In summary, Poultry and poultry products are superior in nutritive value, affordable in price, source of family income that benefits children and women. Poultry is small in body size, rapid in human food production due to short life cycle and require small space, feed and capital. Poultry cause minimum environmental degradation and appealing in rural and draught stricken and moisture scarce areas. As compared to other livestock, poultry is

suitable for large scale commercial production due to the application of artificial incubation and artificial brooding.

### **2.3. Socio Economic Role and Purpose of Poultry Keeping**

Nearly all rural families keep a small flock of poultry and rearing of poultry has practiced for many generations for different social and cultural reasons (Gueye, 2003). However, the most common purpose of keeping chickens is production of human food (eggs and meat) and provision off family income. According to the study conducted in the Central Highlands of Ethiopia by Tadelle *et al.* (2003), about 50, 27 and 23% of the egg produced are used for hatching, sale and home consumption, respectively. In another study conducted by Aberra and Tegene (2007) in southern parts of Ethiopia, about 71.4% of chickens raised by the rural community were used for egg production while the rest 28.6% were used for meat production purposes. Poultry keeping has a symbolic importance within the social, cultural and religious contexts. For most of these social and cultural functions or sacrifices, a specific sex and plumage colour of poultry are prescribed (Gueye, 2003). In Ethiopia, Tadelle and Ogle (2003) reported that white and red cock are sacrificed for good harvest wishes while red and black spotted cocks are sacrificed on the occasion of the Ethiopian New Year. Poultry are given as gifts for relatives to be used as breeding seed or to be slaughtered for religious ceremonies. Cocks are used as alarm clock and staring capital to youth and for the invitation of special guests'. Farmers in rural area invite special guests to partake of the popular dish "*doro wat*", which contains both chicken meat and eggs (Sonaiya, 1990a; Sonaiya, 2000; Tadelle and Ogle, 2001).

The importance of rural poultry in national economies of developing countries and its role in improving the nutritional and income status of many smallholder farmers and landless communities has been recognized by various scholars and rural development agencies (Roberts and Gunaratne, 1992; Dolberg, 2003). In addition to their contribution of high quality animal protein and family income rural poultry represent a significant part of the rural economy. This segment of production in Africa as a whole represents an asset value of US\$5.75 billion (Sonaiya, 1990a).

It is indicated that the share of exotic chickens in the total annual egg and poultry meat production has increased to 4.6% in 2007 (CSA, 2007). Reliable economic data concerning the value of commercial poultry products sold in any one year is not available. The general indications are that the intensive poultry industry plays a key role in supplying poultry meat and eggs to urban markets at a competitive price. The industry also provides employment for a range of workers from poultry attendants to truck drivers to professional managers.

### **2.3.1. Poultry ownership**

According to Guèye (1998), more than 70% of chicken owners in rural areas of sub-Saharan Africa are women. Village poultry are generally owned and managed by women and children and are often essential elements of female-headed households (Guèye, 2000; Bagnol, 2001). Likewise, some studies showed that women have a more active interest in poultry ownership than men do. According to the survey made in Welaita (Hoyle, 1992), senior men and senior women have the highest flock ownership accounting to 30% and 47%, respectively when compared to the other gender groups such as boys and girls. Ownership affects decision-making and intra household labor dynamics. The management of rural chicken in Africa is a family affair with construction of chicken house being done by men. Whereas looking after chicken, controlling and utilizing the earnings from the sale of eggs and chicken belongs to women (Gueye, 2003). Similarly, Tadelle and Ogle (2001) indicated that in Ethiopia management of chickens is fully in the domain of women whereas decision making regarding control and access to resources varies considerably. Kitalyi (1998) showed that in Gambia, there was gender plurality in decision-making in village chickens production. The same source indicated that in the United Republic of Tanzania men dominated in both selling and buying chickens in village markets.

Men make major decisions regarding production strategies, purchase and sale of many of the livestock activities. However, poultry keeping in most of the developing countries, including Ethiopia is the responsibility of women. In a study conducted by Tadelle and Ogle (1996a), to characterize poultry production systems in the highlands of Ethiopia, it was learnt that women look after the birds, and the earnings from the sale of eggs and



chicken are often their only source of cash income. It is therefore, important to actively involve women in the process of poultry improvement, which has actually been neglected in the past. Female-headed households are more involved in poultry keeping as means of earning income since they have fewer other opportunities than the male-headed ones. A non-parametric test showed that a significantly higher proportion of female-headed households have poultry but no other animal (Aklilu, 2007).

The financial resources of the poor households are scarce to be able to purchase a hen to start their own flocks. However there is a social system to start poultry keeping based on sharing in which female headed households are relatively more involved. Poultry sharing is usually arranged between households that have close family or marriage relationships in the village. Often this is an inter-household relation between women like sisters or nieces (Aklilu, 2007). Compared to the poor women, the better-off households are more often involved in poultry keeping and had more improved chicken breeds and separate poultry houses. Improved breeds (RIR) are sold to farmers from poultry multiplication stations through the agricultural extension system. Farmers also consider that distance to neighbouring house and involvement in backyard gardening affect a household's decision on the flock size to be kept. Households in a dense neighbourhood were expected to have less space and keep fewer poultry to prevent conflicts among neighbours. More over households accessible to village or regional towns tend to keep larger flock sizes than those on remote areas (Aklilu, 2007). Findings confirmed that women owned most chicken flocks and that income generated from chicken production belongs to them (Pederson *et al.*, 2001). Seeberg (2002) also reported that 92% of the interviewed women kept the income from selling of eggs and chicken in their own hands and they sent more of their children, especially girls, to school. Experiences from Bangladesh showed that improved chicken productions increased farmer's livelihood and women empowerment (Danida, 1998). Evaluation reports from a number of integrated development projects in developing countries also indicate that scavenging village chickens play a significant role in poverty alleviation and enhancing gender equity among the disadvantaged communities (Saleque, 1996).

## **2.4. Challenges of Poultry Production**

### **2.4.1. Long Reproductive Cycle**

The Ethiopian traditional poultry production system comprises of the indigenous chickens characterized by lack of planned breeding. It is by natural incubation and brooding that chicks are hatched and raised all over rural Ethiopia. A broody hen hatching, rearing and protecting few number of chicks (6-8) ceases egg laying during the entire incubation and brooding periods of 81 days. Yet the successes of the hatching and brooding process depends on the maternal instinct of the broody hen and prevalence of predators in the area, such as birds of prey, pets and some wild animals, all of which are listed as the major causes of premature death of chicks in Ethiopia (Solomon, 2007). Mean survival rate to an age 3-months of baby chicks reared under natural brooding condition in Ethiopia is about 40% (Sub Sector Review 1984; Hoyle 1992; Ethiopian Statistical Authority 1985-1996), indicating that the broody hen ceases egg laying for 2.7 months for the purpose of rearing 2.8 chicks to an age of 3 months. Artificial chick brooding should be adopted to initiate improvement in poultry production in Ethiopia. Unfortunately however, electricity is not available in rural Ethiopia. Hay-box chick brooding technology (developed at JUCAVM) in which no artificial heat is employed seems to be a brooder of choice by small scale poultry producers in Ethiopia (Solomon, 2007). The hay-box brooders used to raise batches of 10 to 70 baby chicks consisted of 4- outer framing boards, mesh-wire floors, central nests, door and 4-small ventilation holes drilled at the top of each frame board (total of 16 holes per box). Hay was stuffed very loosely between the sides of the boxes and the central nests and the tops of the boxes are covered with sacks filled with hay. Chick runs of appropriate dimensions are constructed and fitted to each box

### **2.4.2. Disease and predation**

The Ethiopian indigenous flocks are said to be disease resistant and adapted to their environment. However, survival rates of chicks kept under traditional production system is considered to be very low. Disease and predators are known to be the major causes of mortality in the country (Negussie, 1999). According to Negussie and Ogle (1999), losses attributed to Newcastle disease is estimated at about 57.3% of the overall annual chicken

mortality, whereas fowl pox, coccidiocis, and predation accounts for about 31.6%, 9.4% and 1.7% of the total annual flock mortality respectively. A survey conducted in Southern Ethiopia identified Fowl cholera followed by New Castle Disease, Coccidiosis, Fowl influenza (Infectious Bronchitis), Fowl pox ,Fowl typhoid and Salmonella to be the major poultry diseases respectively (Aberra and Tegene, 2007).

The general indications are that the health status of the backyard poultry production system is very poor and risky, since scavenging birds live together with people and other species of livestock. Poultry movement and droppings are very difficult to control and chickens freely roam in the compounds used by households and children. There is no practices (even means) of isolating sick birds from the household flocks and dead birds could sometimes be offered or left for either domestic or wild predators (Solomon, 2007). Chickens and eggs are sold on open markets along with other food items. The current live bird marketing system displays significant and potential hazard to people (including buyers) that comes to such places indicating that the implementation of bio-security and hygienic practices in such a system is generally difficult. The experience from Newcastle disease in endemic countries and the attitude of communities in handling sick birds (most prefer to sell sick ones) shows that marketing systems played considerable role in dissemination of disease in wide geographic areas in relatively short period of time (Feseha, 1995). The first record of Newcastle disease was in 1970 on poultry farm near Asmara, Eritrea, from where it spread all over Ethiopia within a short period of time. In summary, it is very difficult to apply health and bio-security measures on full day scavenging birds in small flock sizes (Solomon, 2007).

The health measures at the government owned poultry breeding and multiplication centres were extremely poor. The basic hygienic practices are often disregarded and husbandry know-how are generally lacking. Foot-bath application, if at all it is practiced, was only when people enter the poultry houses but not when they leave poultry houses. Almost all the breeding and multiplication centres were devastated by the outbreak of Infectious Bursal Disease i.e. Gumboro disease (Yilma, 2007). The health status in many of the small scale intensive poultry farms is extremely poor (Abebe, 2006).

In Ethiopia prevalence of predators in the area, such as birds of prey, pets and some wild animals, all of which are listed as the major causes of premature death of chicks (Solomon 2007). According to Mekonnen( 2007) in southern part of Ethiopia where snakes, rats, dogs, cats and foxes were the main predators that caused losses especially in young birds. Similarly, according to Aberra's ( 2000) report from the Southern part of Ethiopia wild birds (eagle, hawk, etc.) are the most common predators during the dry season while wild cat (locally known as "*Shelemetmat*") is the most dangerous predator during the rainy season

#### **2.4.3. Nutritional constraint**

There is no purposeful feeding of chickens under the village conditions in Ethiopia and scavenging is almost the only source of diet. Scavenging feed resource base for local birds are inadequate and variable depending on season (Hoyle, 1992 and Alemu and Tadelle, 1997). The amount of feed available for scavenging in relation to the carrying capacity of the land areas and flock dynamics across the different seasons and agro-ecologies is still not adequately quantified. However, studies conducted in three villages of the central highlands of Ethiopia revealed that the materials present in the crop, as visually observed, are, seeds, plant materials, worms, insects and unidentified materials (Tadelle and Ogle, 2000).

During the short rainy season (March to May) the percentage of seeds in the crop contents was higher at all the three study sites, probably because of the increased availability of cereal grains which had just been harvested and are given to the birds in larger amounts than during the big rainy season and dry season of the year. The relative amounts of available plant materials are lower during the short rainy season. The mean percentage of plant materials in the crop contents is highest during the rainy season (June to September) as a result of the increased availability of plant materials and the relative scarcity of seeds during this season might have increased intake of plant materials. The largest proportions of worms in the crop contents were found during October to February in higher altitude which might be attributed to the relatively high and extended rainfall. A larger proportion of insects were also found during the short rainy seasons (Tadelle and Ogle, 2000).

The crop analysis result indicated that the physical proportion of seeds was higher in the short rainy season and the concentration of crude protein; calcium and Phosphorus were below the recommended requirements for egg production (Tegene, 1992; Tadelle and Ogle, 1996b; Alemu and Tadelle, 1997). Both egg production and egg size vary with season, as the quality and availability of feed varies (Mbugua, 1990). According to the finding of Tadelle and Ogle (1996b), the scavenging feed resource is deficient in protein, energy and probably calcium for layer birds, indicating the role of supplementation in bringing a considerable increase in egg production. There might be deliberate supplementary grain feeding during the ripening and harvesting period (October-March). The quantities of supplementation gradually decrease until June-August, during which scavenging is the only source of their feed (Alemu and Tadelle, 1997).

Full day scavenging chickens are vulnerable to predation and disease. The need to leave the family dwelling to scavenge for feed makes them more vulnerable to predation. The further they go, the greater the danger. Scavenging for food away from the family dwelling also results in birds coming into contact with larger number of birds from other flocks than would otherwise be so, facilitating the spread of infection. Newcastle disease is usually cited as the most widespread, particularly during the rainy. Processed poultry feed mainly consisting of cereal grains, cereal grain by-products and oilseed cakes are available from feed mills that are largely concentrated in and around the capital, Addis Ababa. Transport costs add significantly to the cost of feed in areas distant from the sources of supply. The lack of regional feed mills and dependence on supplies of some ingredients from large cities and its surroundings add to the overall cost of feed in many parts of the country (Solomon, 2007).

#### **2.4.4. Lack of organized market and poor access to market**

Even though chicken meat is relatively cheap and affordable source of animal protein (Alemu and Tadelle, 1997), lack of organized marketing system and the seasonal fluctuation of price are the main constraints of the poultry market in Ethiopia. Informal marketing of poultry and poultry products involving open markets are common throughout the country. Both live birds and eggs are sold on road sides. Almost every little shops or kiosks sell table eggs in Ethiopia. Most indigenous birds are sold live and consumers take

considerable care to ensure that they are buying healthy birds. Farmers may sell directly to clients at weekly markets or farmers may sell to traders who in turn sell the product to the consumer. Indigenous birds and eggs could be transported over longer distances to supply urban markets which results in quality deterioration. Both eggs and live birds are transported either on foot or using public transportation along with other bags, sacks of grains, bundles of fire wood etc. The price of live birds varies depending on sex, colors, size and market location and the demand for both eggs and live birds are subjected to seasonal variations. According to Hoyle (1992) and Kena *et al.* (2003), late May to early June is an opening period of the “rainy season” which coincides with outbreak of poultry disease and farmers sell all or higher proportion of their flocks in the SNNP Regional State and in Eastern Shewa Zone of the Oromia Regional State. In most parts of the country, prices fall to their lowest annual level until the end of August. Price rises for the Ethiopian New Year (September 11) and for *Meskel* feast (September 27). The feast which occurs in December and April lead to price rising above the other times. The plumage color, sex, combs types, feather covers are also very important in influencing price.

According to Gausi *et al.* (2004) the major constraints in rural chicken marketing were identified as low price, low marketable output and long distance to reliable markets. As a result, the smallholder farmers are not in a position to get the expected return from the sale of chickens. Likewise, poor marketing information system, poor access to terminal market, high price fluctuation and exchange based on plumage color, age and sex are among the main constraints of chicken market in the country (Kena *et al.*, 2002).

### 3. MATERIALS AND METHODS

#### 3.1. Description of the Study Area

This study was conducted in Kerssa *Woreda* (district) of Jimma Zone, Oromia Regional State. Kerssa *Woreda* is located at about 320 km southwest of Addis Ababa (Fig 1). The *Woreda* lies in the central part of Jimma Zone and has an area of about 975 Km<sup>2</sup>. Kerssa *Woreda* is one of the four “*Woredas*” bordering the Gilgel Gibe Hydroelectric dam. The annual temperature ranges between 11.2 and 29.6<sup>0</sup>c and the mean annual rainfall is 1150 mm. Topographically, the *Woreda* comprises of mountains, plateaus, hills plains and valleys. Farmers in the area practice mixed crop-livestock agriculture. Kerssa *Woreda* extends between 1740 and 2660 meters above sea level. Kerssa *Woreda* is classified into 33% (highland) and 67% (midland). Orthic Acrisols and pellic Vertisols are the major soil types found in Kerssa. (<http://www.oromiyaa.com> ).

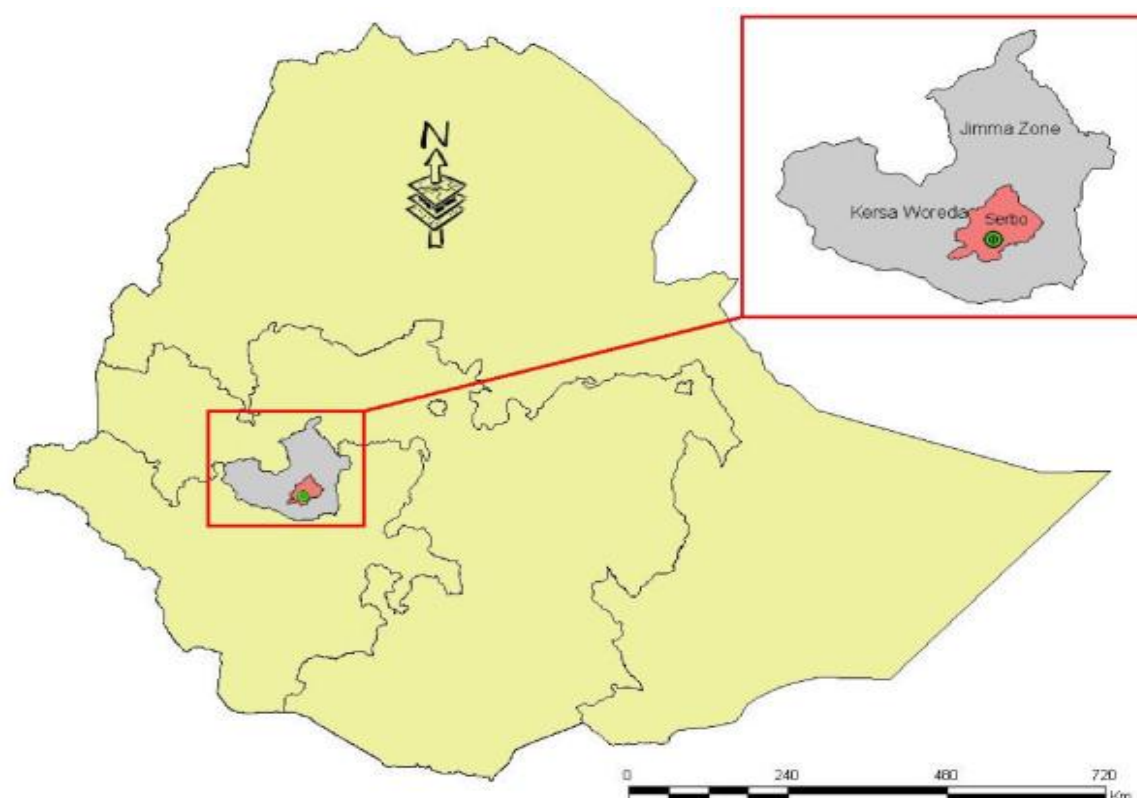


Figure 1 Map of Ethiopia with the selected Kerssa *Woreda* of Jimma zone.

### 3.1. Sampling Procedures and Data Collection

#### 3.1.1. Sampling procedures

Multi stage probability random sampling method was followed. The Kebeles were selected based on stratified sampling to represent high, medium and low poultry population in the Wereda (Table 1). A total of 30 households were randomly selected from each of the six *Kebeles* (Table 1). Thus a total of 180 households were used to carry out the survey. Another 30 households who adopted hay-box brooder with exotic chicks were purposively selected to carry out the survey on the performance of hay box brooding technology and exotic chickens. The farmers recalled information was considered for this study.

Table 1 Sampling frame of households in each *kebeles* with indigenous poultry population

Poultry Population	<i>kebeles</i>	Number of Households
High (1789-4988)	Gello	30
	Bulbul	30
Medium (507-1788)	Merewa	30
	Ankeso	30
Low (102-506)	Tikurbalto	30
	Kitimbile	30
Total	6	180

#### 3.1.2. Data collection

Structured questionnaire integrated with Participatory Rural Appraisal (PRA) was used to collect data from primary sources which mainly comprised of households, development agents and key informants followed by review of the available secondary data sources. A visit to physical facilities of live bird and egg markets and open discussion with poultry



farmers and live bird and egg sellers, buyers and intermediaries were also made. Finally data on poultry population and flock structure, management practices, marketing system and production performance were collected using the questionnaires (Annex c).

### 3.2. Data Analysis

Descriptive statistics such as mean, range, frequency and percentage were calculated and all the surveyed data were analysed using Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, Illinois, USA, 2007). Performance data were subjected to analysis of variance (ANOVA) using the general linear model procedure of SPSS.

Model for data analysis

$$Y_{ij} = \mu + i^{\text{th}} + \epsilon_{ij}$$

Where:

$Y_{ij}$  = the value of the respective variable mentioned above

$\mu$  = overall mean of the respective variable

$i^{\text{th}}$  = the effect of  $i^{\text{th}}$  Kebele ( $i = 1-6$ , Gello, Bulbul, Merewa, Ankeso, Tikurbalto and Kitimbile)

$\epsilon_{ijk}$  = random error term

## **4. RESULTS AND DISCUSSIONS**

### **4.1. Respondents Profile**

The characteristics of the respondents are presented in Table 2. The results of this study showed that about 76.7% of the respondents were male and the average age of the respondents was 43.8 years, showing that they belong to economically active age groups. About 96.1% of the respondents reported their involvement in farming activity as a means of livelihood. The largest proportions of the respondents (83.9%) were married and their mean family size was calculated to be 5.1 persons, the value of which is comparable to that of the national average (5.2) for rural Ethiopia (CSA and ORC Macro, 2006). On the contrary, the result of this study was less than that report by Asefa (2007) from Awassa Zuria (7.0). About 68% of the respondents were found to be illiterate (Table 2). Such a high level of illiteracy in the area might probably limits the effectiveness of formal training programs and requires more emphasis to be placed on practical demonstration of essential concepts in the area of improved poultry production. Among the literate respondents, 12.8, 9.4 and 8.3% had basic (reading and writing), elementary (1-8), and first cycle secondary education (9-10) respectively. About 1.7% had gone through second cycle secondary education (11-12). About 84.4% of the respondents were Muslim whereas the remaining 11.1% and 4.4% were Orthodox Christian and Protestants, respectively.

Table 2 Respondents' profile.

<b>Variables</b>	<b>Categories</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Mean</b>
Sex	Male	138	76.7	
	Female	42	23.3	
Age (years)	≤30	33	18.5	
	31-60	129	71.5	43.8
	≥61	18	10.0	
Marital status	Single	18	10.0	
	Married	151	83.9	
	Divorced	5	2.8	
	Widowed	6	3.3	
Household size/Family	1-5	69	38.3	
	6-10	110	61.1	5.1
	≥11	1	0.6	
Educational status	Can't read and write	122	67.8	
	Read and write	23	12.8	
	Elementary (1-8)	17	9.4	
	First Cycle Secondary (9-10)	15	8.3	
	Second Cycle Secondary (11-12)	3	1.7	
Religion	Muslim	152	84.4	
	Christian	20	11.1	
	Protestant	8	4.4	

## 4.2. Flock Structure and Characteristics

The flock size and structure of indigenous chickens in Kerssa *Woreda* of Jimma Zone are shown in Table 3. The most common plumage colors of the indigenous chicken found in the study area were white (*Netch*), red (*Key*), black (*Tikur*) and *gebsima*. The highest mean number of chicks per household was 2.55 followed by mean number of hens (2.16) which were lower than those reported from Dale *Woreda*, (4.9 chicks) and 3.1 hens (Mekonnen, 2007). The overall mean flock size per households of the *Woreda* was 8.37chickens/household, indicating higher chicken population/HH in the study area compared to most of the other parts of the country. The value reported in this study is higher than the mean flock size of Gomma *Woreda* (6.23) and Jamma District (5.6) as reported by Meseret (2010) and Mammo *et al.*, (2008), respectively. Moreover, the mean flock size reported from the current study is higher than that of the national (4.1) and Tigray (7.2), Amhara (4.4), Oromia (3.6) and Gambella (7.5) regional averages as reported by CACC (2003). The result reported from this study seems to be in agreement with the average flock size of Africa (5-10 birds/household) as reported by (Sonaiya, 1990).

Table 3 Flock size and structure of indigenous chickens in Kerssa *Woreda*, Ethiopia.

Chicken category	Chicken per HH	% of Chickens' per HH			% of Respondents owning Chicken		
		Mean $\pm$ SD	Range	%	0	1-4	5-10
Chicks	2.55 $\pm$ 2.79	0-13	31	45.6	32.2	21.1	1.2
Pullets	1.73 $\pm$ 1.20	0-7	21	26.1	72.9	1.2	-
Cockerels	0.77 $\pm$ 0.83	0-3	9	47.2	52.8	-	-
Hens	2.16 $\pm$ 0.74	1-10	26	-	97.8	2.2	-
Cocks	1.15 $\pm$ 0.75	0-2	13	21.7	78.4	-	-
<b>Over all, Mean</b>	<b>8.37<math>\pm</math>3.24</b>	1-22	-	-	-	-	-

Hen (>1 year), Chicks (0-8 weeks), Pullet (>2 month - 1 year female), Cockerels (2 month - 1 year male), cock (> 1 year).

As shown in table 3, about 31, 26 and 13% of the total indigenous chicken population of Kerssa *Woreda* were found to be chicks, hens and cocks respectively. The lower

proportion of cock compared to chicks and hens might indicate that the farmers of Kerssa *Woreda* are more focused on the egg production and replacement stock. This result seems to be similar to that of Wilson *et al.*, (1987) and Abdou *et al.*, (1992) who reported that higher proportion of hens in the flocks is an indication of strong desire for egg and chick production. The result of this study is also in agreement with the findings of Tadelle and Ogle (1996a) who reported that chicks' account for the largest segments (53%) of the indigenous chicken population of the central highlands of Ethiopia followed by mature hens consisting 43% of the flock.

The results of this study also showed that, the proportion of cockerels (9%) was lower than the proportion of pullets (21%) within the indigenous chicken population of the Kerssa *Woreda*, the results of which might be attributed to the use of cockerels for home consumption (as food) and market (family income). This result further justifies the strong desire for egg production and the use of pullets as replacement stock in the study area. These results are similar to that of Meseret (2010) who reported higher proportion of pullets per households as compared to the proportion of cockerels within the Gomma *Woreda* indigenous chicken population.

According to CACC (2003) about 41.7%, 18.5%, and 39.7% of the national poultry population are chicks to an age of 8 weeks, growers aged from 9 to 20 weeks and adult birds of more than 20 weeks, respectively. The majority of the national chicken population (41.7%) comprises of chicks of 0-8 weeks of age, which is characterized by high mortality of about of 40–60%. The laying flock seems to be dominated by old age and surplus breeding males. About 30.9 % of the total national standing chicken populations are hens of which about 16% are none layers. According to the results of this study, 31, 29, and 39% of The Kerssa *Woreda* indigenous chicken population are chicks to an age of 8 weeks, growers aged from 9 to 20 weeks and adult birds of more than 20 weeks, respectively. The population of adult birds of more than 20 weeks are similar for both the Kerssa *Woreda* and national average and the proportion of chicks and growers also seem to follow the same trend (Appendix II)

### **4.3. Chicken Production Systems and Management Practices**

#### **4.3.1. Management practices**

##### **4.3.1.1. Feeds and feeding practices**

The results of the survey conducted on feed resources and feeding practices of indigenous chickens of Kerssa *Woreda* are shown in Table 4. According to the results of this study, all the respondents reported to practice scavenging system with supplementary feeding of kitchen wastes, grains (maize or sorghum) and some feed mill by-products. Similarly, Tadelle and Ogle (2001) reported that the feed resource base for rural poultry production is scavenging and consists of household waste, anything edible found in the immediate environment and small amounts of grain supplements. The result of this study is also in agreement with that of Meseret (2010), Asefa (2007) and Mekonnen (2007) who reported 97.8, 95 and 98.1% of the small scale household poultry producers in Gomma *Woreda*, Awassa Zuria and Dale *Woreda* offers supplementary feeding along with scavenging to their chickens, respectively. According to Tadelle and Ogle (1996a and b), the relative proportion of nutrients that comes from grain supplementation and scavenging varies with agricultural activities such as land preparation and sowing, harvesting, grain availability in the household, seasons and the life cycles of insects and other invertebrates. Similarly, scavenging feed resource base and supplementary feeds in the study area is not constant throughout the year. The most available scavenging feed resource of the indigenous chickens in the study *Woreda* might be worms and insects during the rainy season and during the drier season the source might be some leftover of cereals aftermath.

The result of this study illustrate that about 60.6 % and 18.9% of the respondents offer supplements once a day either in the morning or in the evening. Similarly, it is recommended that the best time to offer supplementary feed is in the late afternoon before the chickens are penned overnight in-order to avoid starvation of the chickens until the scavenging time (morning) ([aci-ar.gov.au](http://aci-ar.gov.au)). The majority of the respondents (90%) offer supplementation to all the birds indiscriminately on bare ground without the use of feeding utensil. About 73.3 % of the respondents reported to provide either borehole, stream or

river water to their chickens once a day. The remaining 26.7% of the respondents fill and put the water container near to the scavenging area or the corner of the living house.

Table 4 Feed resources and feeding practices for indigenous chickens

	Parameters	Frequency	Percent
Ways of Feeding	Using feeder	6	3.3
	Throw on the ground	174	96.7
Frequency of Feeding	Morning only	109	60.6
	Afternoon only	7	3.9
	Evening only	34	18.9
	Morning and afternoon	2	1.1
	Morning and evening	24	13.3
	Morning evening and afternoon	4	2.2
Feeding System	Separate to different classes	18	10
	Together for the whole group	162	90
Source of the supplementary	Purchased	6	3.3
Feed	From the house	96	53.3
	Purchased and from the house	78	43.3

#### 4.3.1.2. Housing

Separate poultry house protects the birds from the predators, injury and theft. However, the result of this survey revealed that 85 % of the respondents do not have separate poultry house. Similarly Meseret (2010) and Mekonnen (2007) from Gomma and Dale *Woreda* reported that 94.4% and 97.6 % of the respondents do not have separate houses for their chickens, respectively. Among the households who have no separate poultry houses, about

66.7, 19.6 and 13.7% of the respondents indicated that their birds perch in the kitchen, family dwelling and in the cattle yard during night time, respectively (Figure 2).

The results of the focus group discussion and the survey with the key informants indicated that high prevalence of predators, fear of theft and small number of chicken were the main reasons for not constructing separate poultry houses in the Kerssa *Woreda*. From the questionnaire survey, it was revealed that, about 15% of the respondents reported to have constructed separate poultry house in Kerssa *Woreda*, of which about 63% and 37% reported to use mud block wall with thatch (grass) and iron sheet roof in combination with mesh-wire as poultry house construction materials, respectively. According to Meseret (2010) 80 and 20% of Gomma *Woreda* respondents reported to have used corrugated iron and thatch (grass) roof as poultry house construction materials, respectively. Philip (2009) reported that grass thatch provide very good insulation from both heat and rain. The result also indicated that the respondent who have separate poultry house, reported to practice cleaning for about 3.66 hours per a week.

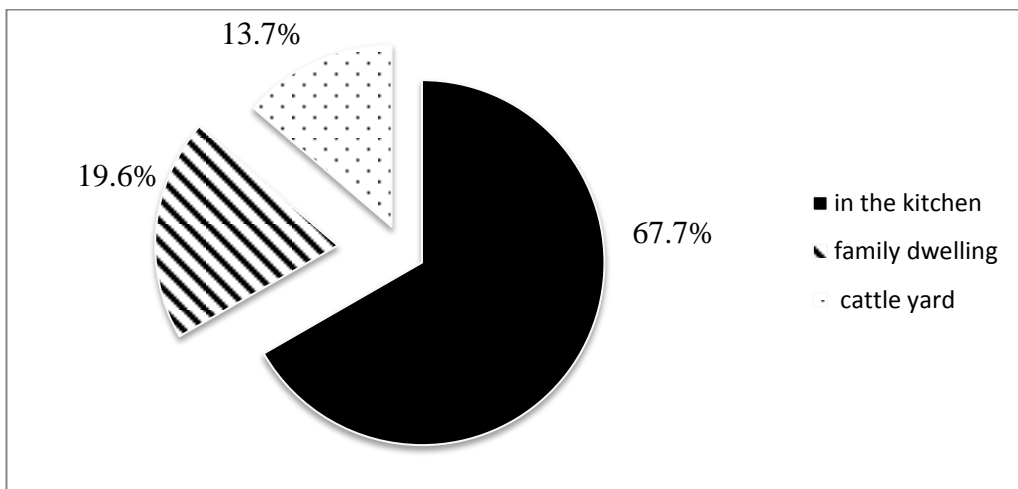


Figure 2 Places of night time sheltering for those who have no separate poultry house.

#### 4.3.1.3. Disease and predation

About 80 % of the respondents reported serious and occasional disease outbreak in the study area. About 38.9, 21.1, 20.6 and 19.4 % of the respondents (using their indigenous knowledge with the confirmation of the development agents) reported (*Gunfan*) infectious bronchitis and avian cholera, (*Cholera*) avian cholera, (*Tekmat*) coccidiocis, and (*Fungel*)



Newcastle disease to be disease of economic importance in the *Woreda*, respectively. Similarly, Meseret (2010) mentioned these three (Newcastle disease, infectious bronchitis and coccidiocis) as poultry diseases of economic importance in Gomma *Woreda*. Research work in some other African countries such as Burkina Faso (Bourzat and Saunders, 1990), Cameroon (Chabeuf, 1990), Benin (Chrysostome *et al.*, 1995) and Mauritania (Bell *et al.*, 1990) reported that Newcastle disease is the most devastating disease of village chickens. On the contrary, the results of this study indicate Newcastle disease accounts the lowest (19.4%) proportion among the others, in the study area even if it is an economically important disease.

According to the result of this study, 70 % of the respondents reported that predation is the major constraint of chicken production in Kerssa *Woreda*. Among the predators monkeys (*Zinjero*), birds (*Chulule*) and Weasels (*Shelemtmat*) are the major and common predator which causes substantial loss of chickens. In agreement with this result Mekonnen (2007) reported that predation accounted for 65.7% of loss of chicken in Dale *Woreda*. According to the survey result, most (56.7%) of the farmers reported to treat their chickens based on symptoms of disease (Figure 3). Similarly Mekonnen (2007) reported that 72% of the respondent of Dale *Woreda* treats their birds by their own.

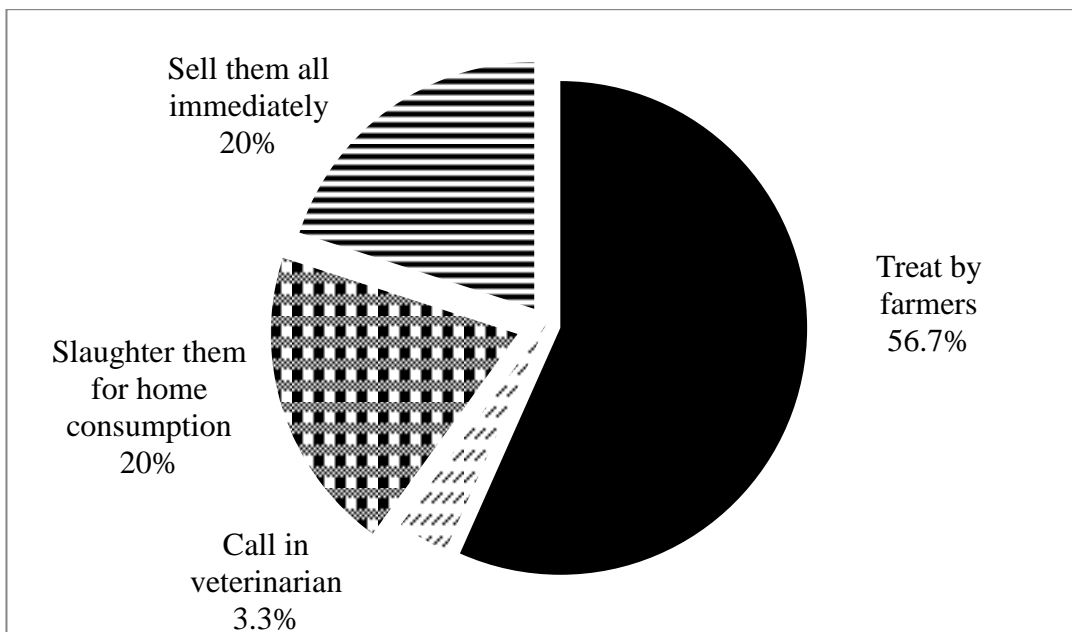


Figure 3 Fate of sick chickens in Kerssa *Woreda* of Jimma zone.

#### 4.3.1.4. Incubation and broody hen management

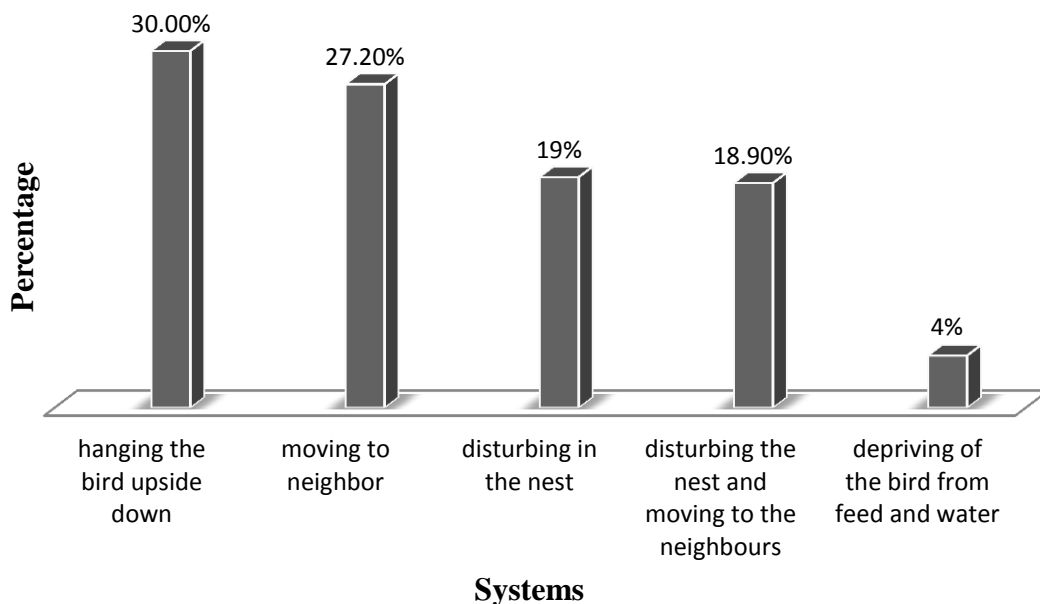
In the study area, natural incubation is the only method used for replacing and increasing the size of the flocks. Almost all (98.9%) of the respondents use natural brooding system and the other 1.1% of the respondents said to have used hay-box brooder in raising day old chicks. Cereal straws were used as a bedding material either on a clay pot or on a bare ground during incubation. Moreover, farmers in the Kerssa Woreda seem to be very conscious and concerned in the preparation of appropriate incubation nest box and appropriate place to set the box for incubation. About 65% of the respondents incubate home laid eggs and the other 20 and 15 % of the respondents reported to incubate eggs purchased from the local market and eggs purchased from neighbours, respectively (Table 5). On the contrary, Mekonnen (2007) reported that 98.13% of the respondents of Dale *Woreda* use home laid eggs for incubation. The majority of the respondents (85%) incubate their eggs during the dry season showing that they had an experience of good hatchability performance during dry season. About 41.7% of the respondents don't mind about the position of incubation of eggs (Table 5), the results of which is in agreement with that of Meseret (2010) who reported that 87.2% of the respondents of Gomma *Woreda* don't mind about the position of incubation of eggs.

Table 5 Management of the broody hen and incubation practices

Parameter		Frequency	Percent
Managing broody hen at a Time of incubation	Feed and water near to brooding nest	75	41.7
	Protect from predator attack	36	20.0
	Avoid disturbance	18	10.0
	Avoid disturbance and Protection from predator	51	28.3
Position the egg while incubation	Position on the side way	105	58.3
	Don't mind the position	75	41.7

Source of egg for incubation	Laid at home	117	65.0
	Purchased from market	27	20.0
	Purchased from neighbor	36	15.0
Season of incubation	Dry season	153	85.0
	Wet season	9	5.0
	Any season	18	10.0

The result of the current study indicates that about 41% of the respondents manage their broody hen by providing feed and water near the brooding nest at the time of incubation (Table 5). Similarly Meseret (2010) from Gomma *Woreda* reported that 16.1% of the



respondents provide feed and water near to the brooding nest. The traditional broody hen management system practiced in the Kerssa *Woreda* is shown in Figure 3. Traditionally, all the households communicated reported to increase egg production by stimulating broody hen resume laying. About 30% and 27.2% of the farmers reported to practice hanging the bird upside down and moving to neighbours in-order to shorten the period of broodiness respectively (Figure 4). Similarly Mekonnen (2007) from Dale *Woreda* reported that 28.9% and 39% of the respondent used to practice hanging the bird upside down and moving to neighbours to avoids encourage laying. However, Fisseha (2009) reported that hanging the hen upside down is undesirable and might result in death of the hen.

Figure 4 Traditional systems to avoid broody behavior by the farmers.

#### 4.4. Marketing

##### 4.4.1. Characteristics of chicken and egg market

There is no formal poultry and poultry product marketing in the Kerssa *Woreda* and informal marketing of live birds and eggs involving open and road side markets are common throughout the *Woreda*. Tuesday and Saturday are reported to be the two major market days in the *Woreda* of which, Tuesday, is reported to be the biggest market day. An average of 1.41 hours was reported to be travelled to reach the *Woreda* market place of live chickens and eggs. Seasonal variation, unstable price and inefficient transportation are the problems of egg and live chicken marketing of the study area. It was reported that seasonal variation and inefficient transportation accounts for about 78.3% and 67.2% of live bird and egg market in the *Woreda*, respectively (Figure 5). Similarly, Meseret (2010) from Gomma *Woreda* reported that unstable price and demand seasonality are the problems of egg and live chickens marketing.

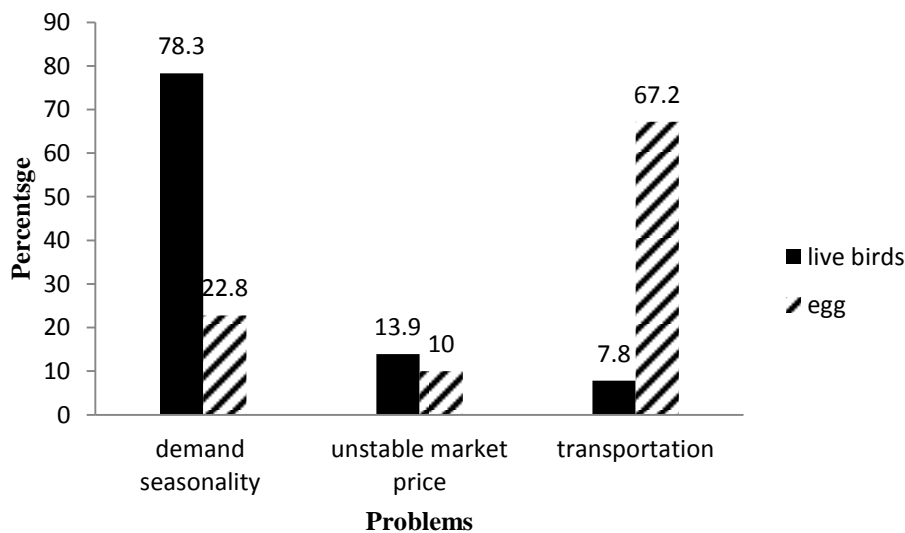


Figure 5 Problems of egg and chicken marketing.

According to the results of this study, there is variation in price of eggs and live birds attributed to disease outbreak, size of the bird, sex of the bird and holidays and festivals. According to the survey result the largest birds attain the highest price than the smaller and

medium ones (Figure 6). The variation of the price on the day of holidays and festivals could be attributed to the highest demand of chicken meat during holidays and festivals in Ethiopian. Similarly Fisseha *et al.*, (2010) and Halima (2007) reported that the price, demand and supply of chicken are highly related to religious festivals. Farmers or producers get better price both for live birds and eggs during holidays and festivals. The current market price of the largest male and an egg during the Ethiopian New Year is reported to be about 122.66 and 1.75 birr respectively (Figure 6). Meseret reported market price of Birr 47.3 and 1.1 for large male and an egg during the Ethiopian New Year in 2010, respectively indicating that the market price of live bird and an egg showed significant increase during the last 2 years.

Live birds and eggs are transported by foot over long distance (1.41 hours). About 66.7 % of the respondents store market egg on the laying nest. The remaining 33.3% of the respondents store either in the plastic bag or in the basket. On the average market eggs are reported to be stored for 7.45 days before sale. The market egg storage period reported in this study is shorter than those reported by Meseret (2010) from Gomma *Woreda* (mean 12.15 days before sale.).

Moreover the live bird market of Kerssa *Woreda* is found to be small unhygienic selling space characterized by lack of shelter, feed and water for the chickens. This result agree with Meseret (2010) who reported that in Gomma *Woreda* live bird market is characterized by small unhygienic space and lack of feed and water.

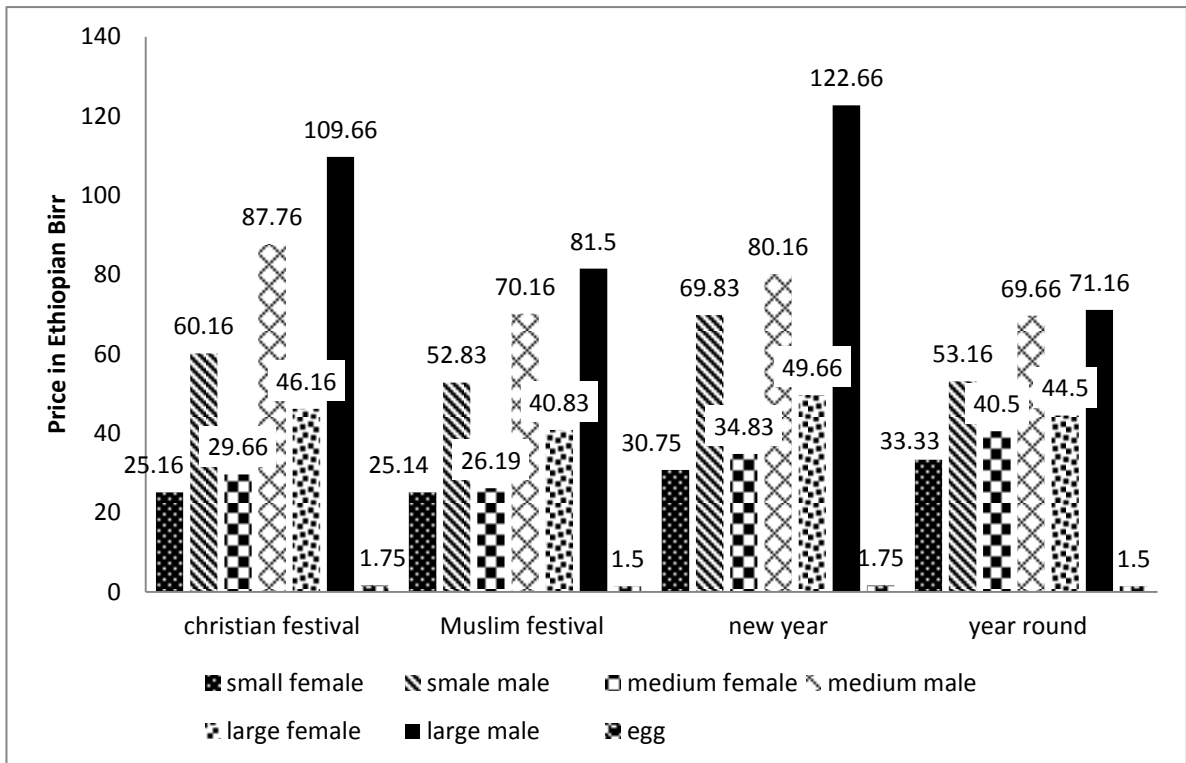


Figure 6 Price of chickens and eggs with different size and sex groups at different festival time of the year.

According to the result of this study only 10.6% and 35.6% of egg and live chickens are sold directly to the consumer, respectively (Figure 7). Similarly, Awol (2010) from Dale and Alaba *Woredas* reported 16.5% and 5.5% of eggs and live birds are sold directly to consumers, respectively. The largest proportions (40.6%) of eggs are sold to the collectors in local market. This result is in agreement with that of Meseret (2010) from Gomma *Woreda* who reported that 41.7% of the total eggs produced are sold for the collectors in the market.

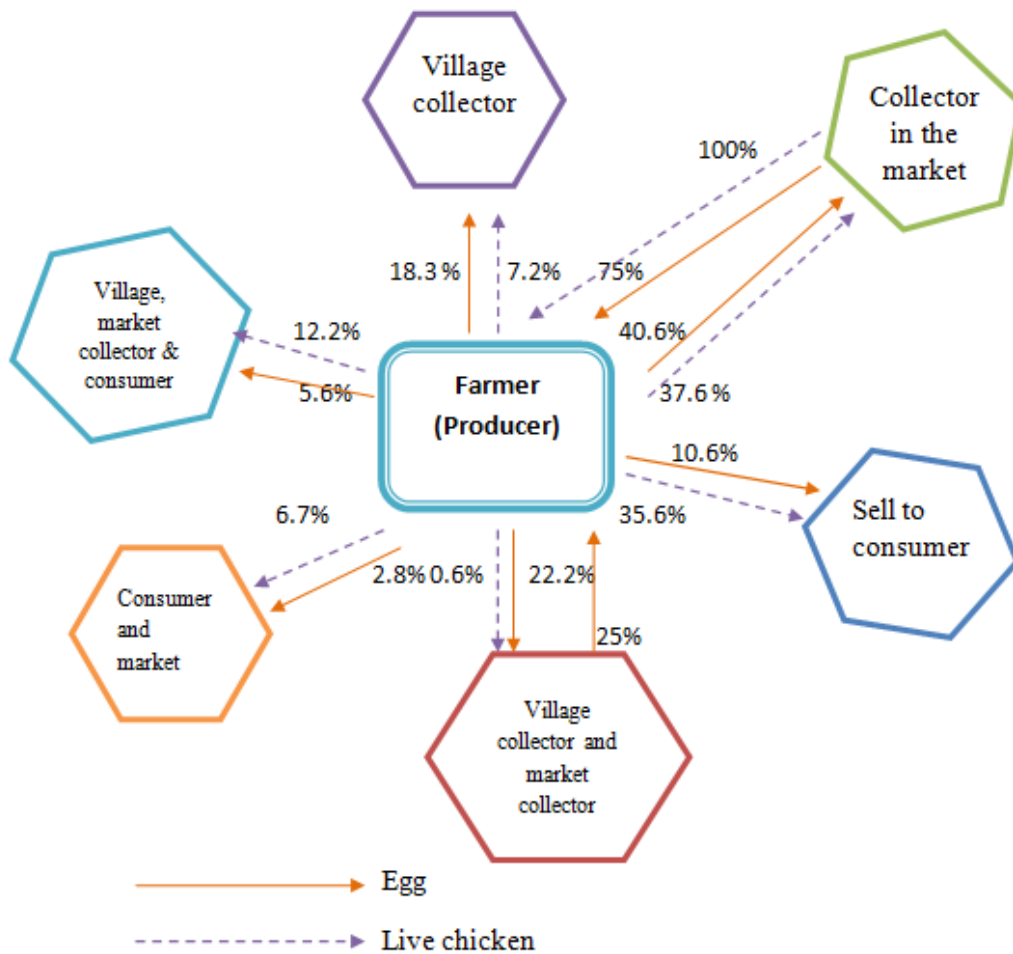


Figure 7 Marketing channels of live birds and egg market in the study area.

## 4.5. Productivity of Local Chicken

### 4.5.1. Age at first egg

Age at first egg of the indigenous chickens of Kerssa *Woreda* ranges from 5 to 10 months with an overall mean value of 6.85 month, without showing no significant difference ( $P>0.05$ ) between the six *Kebeles* of the study *Woreda* (Table 6). This result of age at first egg reported from the current study is longer than that of Meseret (2010) who reported 6.33 months of average age at first egg from Gomma *Woreda*. However, the result of this study is shorter than that report by Mekonnen (2007) who have reported age at first egg 7.07 months from Dale *Woreda*. Sexual maturity as measured by age at first egg was reported to be 7 months in Tanzania (Katule, 1992), 6 months in Nigeria (Sonaiya and Olori, 1989), 8 months in Sudan (Wilson, 1979) and 6.25 months in Senegal (Sall, 1990).

The mean slaughter age for the male chickens in the study area was 7.08 months. Meseret (2010) reported age at slaughter weight of 8.62 months from indigenous male chickens of Gomma *Woreda* the value of which is longer than that of Kerssa *Woreda* by 1.54 months.

#### **4.5.2. Egg production performance**

According to Table 6, the average number of days per clutch of the indigenous chickens of Kerssa *Woreda* was 24.43 and ranged from 14 to 35, average number of clutches per year being 3.11. Mekonnen (2007) reported that the average number of clutches per year was 3.7 and ranged from 2 to 5 with an average clutch length of 26.2 days. Likewise, Ssewanyana *et al.*, (2004) reported average number of clutch of 3.1 per year for village chicken in Uganda. The average number of egg per clutch reported from Kerssa *Woreda* was (13.11). Average number of egg per clutch reported from Gello *Kebele* (13.90) was significantly higher than Kitimbile ( $P < 0.05$ ). The mean annual egg production/head/ of local hen of Kerssa *Woreda* kept under the existing management condition, was estimated to be 56.67 eggs (Table 6), the value of which is lower (60 eggs/year/head) than those reported from Bure *Woreda* (Fisseha, 2009) but higher (43.8 eggs/year/head) than those reported from Gomma *Woreda* (Meseret, 2010). The mean annual egg production of the indigenous chicken of Kerssa *Woreda* is also higher than those reported from Dale *Woreda* (Mekonnen, 2007). This indicates that there is a better egg production potential of the indigenous chickens of Kerssa *Woreda* compared to the others. As indicated in Table 6, there was a highly significant difference ( $P < 0.001$ ) between the six *kebeles* of the Kerssa *Woreda* in egg production of the indigenous chickens attributed to the difference in management practices like weaning of chicks, supplementary feeding and protection against predators and disease. Feed supplementation of broody hens during incubation may also represent the basis of variation in productivity.



Table 6 Reproductive and productive performances of the local hen based on hen history data obtained from the study *Kebeles*.

Parameter	Gello Mean ± SE	Bulbul Mean ± SE	Merewa Mean ± SE	Ankeso Mean ± SE	Tikurbalto Mean ± SE	Kitimbile Mean ± SE	overall Mean	P- value
Egg per hen per year	66.56±2.78 <sup>a</sup>	65.63±3.02 <sup>a</sup>	49.16±2.07 <sup>c</sup>	57.36±1.82 <sup>b</sup>	52.43±1.4 <sup>bc</sup>	48.86±1.76 <sup>c</sup>	56.67±1.04	0.000
Clutches per year	3.13±0.10	3.16±0.14	3.06±0.11	3.00±0.08	3.23±0.12	3.10±0.16	3.11±0.51	0.84
Age at first egg (month)	6.53±0.17	7.06±0.17	6.86±0.19	6.80±0.18	6.83±0.17	7.03±0.21	6.85±0.07	0.39
Number of egg per clutch	13.90±0.67 <sup>a</sup>	13.03±0.48 <sup>ab</sup>	13.76±0.69 <sup>ab</sup>	12.33±0.52 <sup>ab</sup>	13.66±0.67 <sup>ab</sup>	11.96±0.48 <sup>b</sup>	13.11±0.24	0.03
Number of days per clutch	24.33±0.91	25.00±1.00	24.40±0.95	23.16±1.15	24.53±0.94	25.16±0.82	24.43±0.39	0.75
Age for slaughter (month)	6.06±0.17	6.50±0.22	7.13±0.28	8.60±2.02	6.60±0.22	7.60±0.27	7.08±0.34	0.34

Means within a row with different superscript differ significantly (P < 0.05)

### 4.5.3. Hatchability and chick mortality

Hatchability and chicken mortality are one of the determinant factors in poultry production. The average hatchability reported from eggs of the indigenous chickens of the study area was 67.08 % with no significant difference ( $P>0.05$ ) between the six *Kebeles* (Table 7), the value which is higher (22%) than that reported by Meseret (2010) from Gomma *Woreda*, but lower (89.1%) than that report by Mekonnen (2007) from Dale *Woreda*. Mean hatchability reported from the current study is also lower (80.9%) than that report by Tadelle and Ogle (1996a.) from the central highland of Ethiopia. Hatchability reported from the current study was also lower than those reported from (82%) from Zimbabwe by Kusina *et al.*, (2000), (78%) Sudan by Khalafalla *et al.*, (2000), and (60-90%) from Burkina Faso by Bourzat and Saunder (1990). Mean chick mortality from the indigenous chicks of Kerssa *Woreda* to an age of 8 weeks was reported to be 50.15% (Table 7). There was no significant difference between the six *Kebeles* ( $P> 0.05$ ) in mean chick mortality to an age of 8 weeks. The result of chick mortality obtained from this study was higher (41%) than those reported by Meseret (2010) from Gomma *Woreda*, but lower (55%) and (61%) than that reported from Dale *Woreda* by Mekonnen (2007), and from the central highland of Ethiopia by Tadelle and Ogle (1996a).

Table 7 Hatchability and Rate of Chick Mortality

Study area	ANEI	ANEH	AVHP (%)	CM%
	Mean $\pm$ SE	Mean $\pm$ SE	Mean $\pm$ SE	Mean $\pm$ SE
Bulbul	12.43 $\pm$ 0.33 <sup>a</sup>	8.03 $\pm$ 0.27	65.10 $\pm$ 2.10	53.50 $\pm$ 1.95
Gello	12.10 $\pm$ 0.35 <sup>ab</sup>	7.73 $\pm$ 0.24	64.84 $\pm$ 2.17	47.63 $\pm$ 2.86
Ankeso	11.93 $\pm$ 0.27 <sup>ab</sup>	7.80 $\pm$ 0.22	65.78 $\pm$ 1.83	49.43 $\pm$ 2.50
Marawa	11.56 $\pm$ 0.28 <sup>ab</sup>	7.83 $\pm$ 0.29	69.07 $\pm$ 1.61	50.13 $\pm$ 2.47
Tikur Balto	11.40 $\pm$ 0.22 <sup>b</sup>	7.90 $\pm$ 0.25	69.50 $\pm$ 1.94	50.36 $\pm$ 2.70
Kitimble	11.23 $\pm$ 0.23 <sup>b</sup>	7.63 $\pm$ 0.27	68.22 $\pm$ 1.71	49.83 $\pm$ 2.77
Overall	11.77 $\pm$ 0.12	7.82 $\pm$ 0.10	67.08 $\pm$ 0.78	50.15 $\pm$ 1.03
Range	8-17	4-11	40-90.91	20-75
<b>P-value</b>	0.032	0.928	0.315	0.735

ANEI=Average number of egg incubated; ANEH= Average number of egg hatched; AVHP= Average hatchability performance; CM= Chick mortality

## **4.6. Socio Economic and Intra Household Dynamics**

### **4.6.1. Socio economic aspects of chicken production**

There is no cultural taboo on the consumption of poultry and poultry products in Kerssa *Woreda*. About 3.3% of the respondents reported that household consumption of egg was 1-5 times / year while about 70.6% of the respondents reported to eat chicken twice a year, indicating that egg is frequently consumed than chicken in Kerssa *Woreda* attributed probably to the lower and affordable price of eggs compared to chickens. In the study area the main purpose of keeping poultry was reported be (61.1%) for sale, (33.3%) replacement and (5.6%) for consumption. On the contrary Alemu, (2003) reported that 50% of eggs produced are incubated in order to replace new stock.

Even if there are barriers to the expansion of flock size and increase in production performance (Figure 8) all the respondents of the study area are interested to improve their poultry production performance aimed at increasing household benefit. Similarly, many economic researches in developing country indicated that this sector as a viable and promising alternative source of income for rural households (Oh, 1990). However, in the study area there are some barriers to expand poultry production. Among the barriers, predator takes the largest proportion (56.7 %). According to Meseret (2010) from Gomma *Woreda* reported predator, disease and land scarcity takes the largest proportion (33%) among the barriers for future expansion of poultry.

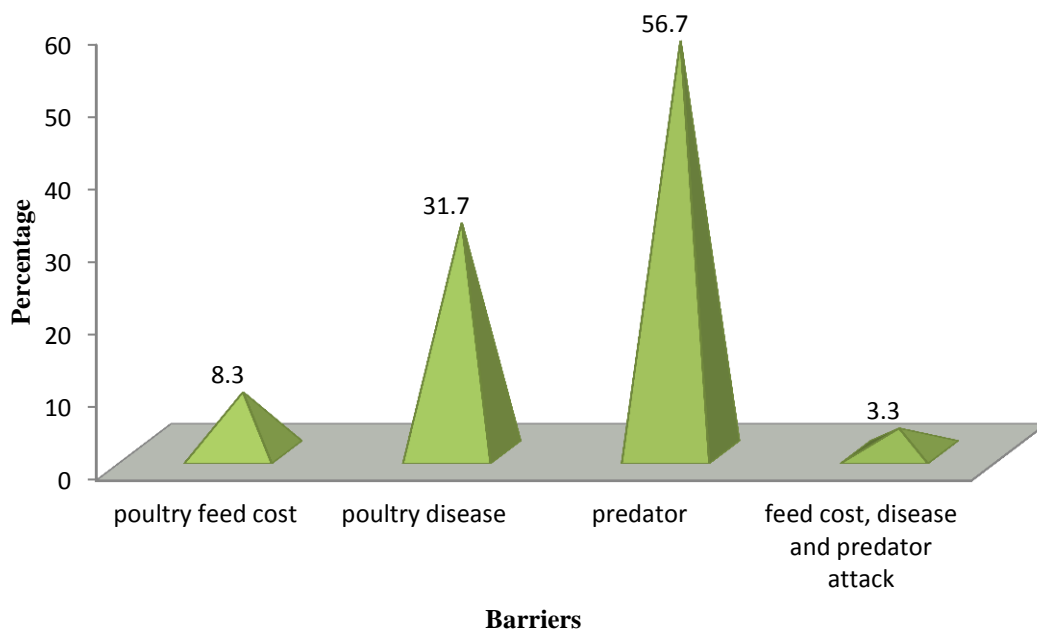


Figure 8 Barriers of poultry production in Kerssa Woreda.

According to the result of this study, an estimated average annual earnings from chickens and their products were calculated to be 397.33 birr (1US \$=17.64ETB) per year. About 28% of the respondents spent earning from poultry on purchase of agricultural inputs, 16.7% spend on children's school expense, 21.7% on purchase of home expenditures, 3.3% on purchase of medicinal expense and the other 30% spend on purchase of agricultural inputs, children's school expense, purchase of home expenditures and purchase of medicinal expense (Table 8).

Table 8 Expenditure of the income from sale of chickens and their products

Expenditures	Frequency	Percentage
Purchase of agricultural inputs	51	28.3
Children's school expense	30	16.7
Purchase of home expenditures	39	21.7
Purchase of medicinal expense	6	3.3
All of the above	54	30.0

#### **4.6.2. Intra household dynamics and labor profile**

Intra-household dynamics refers to the way in which members of the household react and behave to each other regarding chicken production aspect. These include ownership, decision-making, division of labour etc. The ownership of village chickens in most African societies is a product of social and cultural aspects of the societies (Sonaiya, 1990a). According to the result of the current study, about 63.3% of the ownership of the indigenous chicken of Kerssa *Woreda* is held by wife, 20.0% by husband and wife, 10.0% by husband and 6.7% by children. On the contrary Meseret (2010) reported that 96.7% of ownership of indigenous chickens of Gomma *Woreda* was held by women. However, this value is higher than the value reported by Hoyle (1992) who reported elder men and women accounted for 30% and 47% ownership, respectively in Welaita area. The ownership pattern was usually linked to decision making in selling and consumption of chicken and eggs. About 92.6% of poultry house construction was covered by husbands. Likewise, according to Fisseha (2009), this value was 97.5% for men. However, wives take the highest share in achieving other side of poultry management activities including cleaning chickens west in their night time shelter (65% %), provision of supplementary feed and water (51.7%), and selling of chickens and eggs (91.7%). This result indicates the fact that in smallholder chicken production systems management is mostly the responsibility of women (Figure 9).

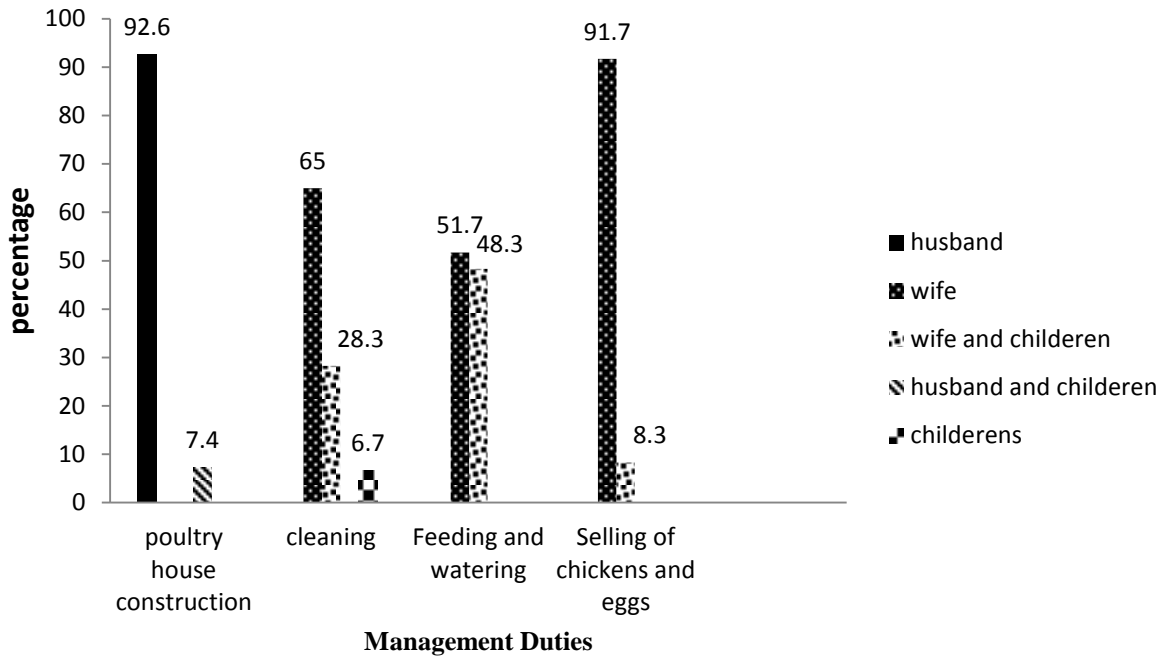


Figure 9 Intra household labor share among family members with regard to various management duties in chicken production.

#### 4.7. Household characteristics of Farmers who Adopted Hay-box Brooder

Household characteristics Farmers who have Adopted Hay-box Brooder is presented in Figure 10. About 17% and 83% of the respondents who have adopted hay-box chick brooding technology were male and female, respectively and the average age of the respondents was 37.30. The largest proportions of the respondents (93.3%) were married. About 66.7% of the respondents were Muslim whereas the remaining 33.3% are Orthodox Christian. Regarding educational level, 43.3% of the respondents are illiterate among the literate members 20.0% have basic education (reading and writing), 13.3% have elementary education (1-8) and 23.3% have first cycle secondary education (9-10).

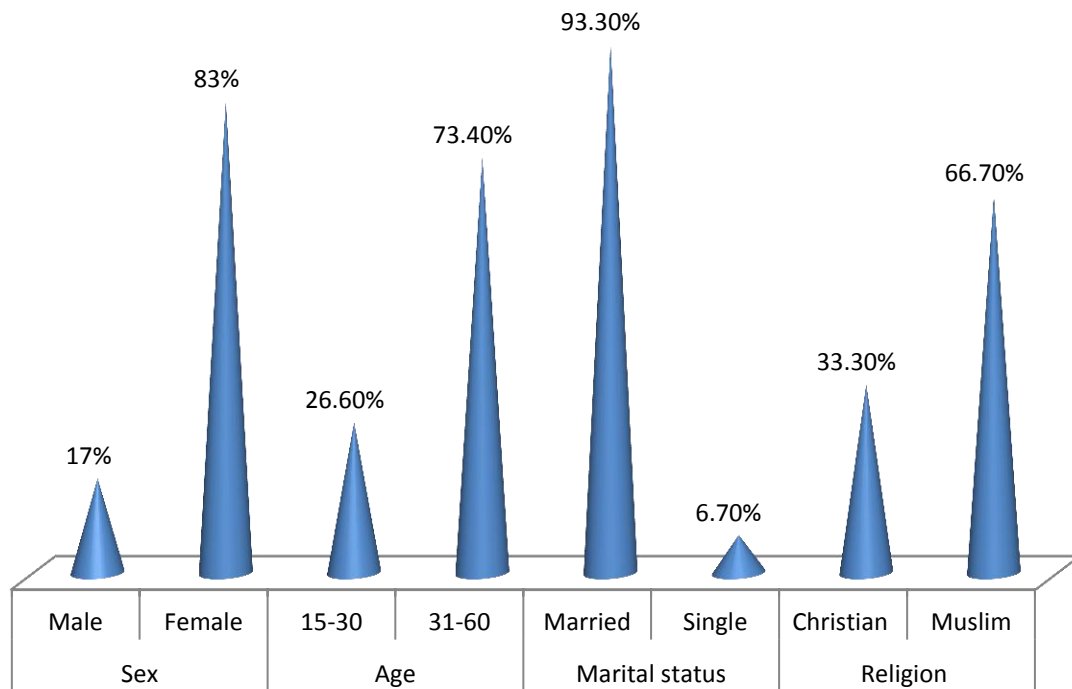


Figure 10 Respondent's profile who have adopted Hay-box chick brooding technology

#### 4.8. Experience with hay-box brooder technology

The largest proportion (36.7%) of the respondents had two years' experience in using hay-box brooder whereas; 33.3, 16.7 and 13.3% of respondents reported to have 3, and 4 years of experiences in using the technology respectively. The majority (73.3%) of the respondents had the experience of using the hay-box brooder during dry season while 26.7% of the respondents had an experience of using the brooder in both dry and wet seasons.

The result of the study shows that most (76.7 %) of the respondents reported to attain very low chick survival (30-59%) to an age of 8 weeks, under natural brooding conditions. This result was in agreement with that of Hoyle (1992) who reported that mean survival rate to an age of 3 months of chicks kept under natural brooding condition ranged between 27% and 53% from a survey conducted on small scale poultry keeping in Wolaita. Majority of the respondents 66.7% reported that predator attack were the main cause of chick mortality under natural brooding practices followed by disease (26.7%) and both

predator and disease (6.7%) (Figure 11). Similarly, Solomon (2007) reported high prevalence of predators in rural areas such as birds of prey, pets and some wild animals, all of which are listed as the major causes of premature death of chicks in Ethiopia.

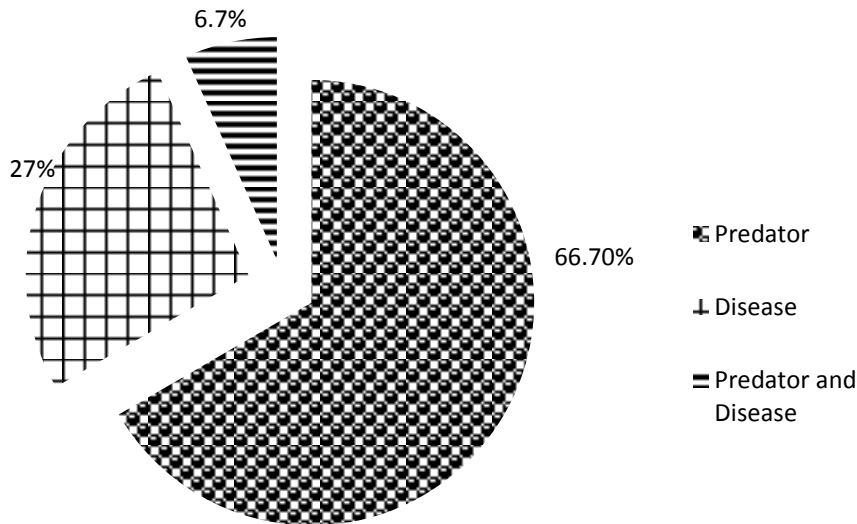


Figure 11 Cause of chicken mortality under natural brooding practice.

#### 4.9. Performance of Hay-Box Chick Brooder

##### 4.9.1. Survival rate of exotic chickens (Fayoumi Breed)

The majority (90%) of the respondents reported that the survival rate of exotic chickens to an age of eight weeks with the use of hay-box brooder was 60-89% (Figure 12). Likewise, Negussie *et al.* (2003) reported mortality rate of 18.3% of chicks raised with the use of hay box brooder to an age of 8 weeks. Solomon (2007) reported mean survival rate of chickens to an age of eight weeks using hay box brooder to be 80%. However, the survival rate obtained from the current study was higher than the survival rate of Fayoumi chicks reported (68%) from northern Ethiopia by Abraham and Yayneshet, (2010).



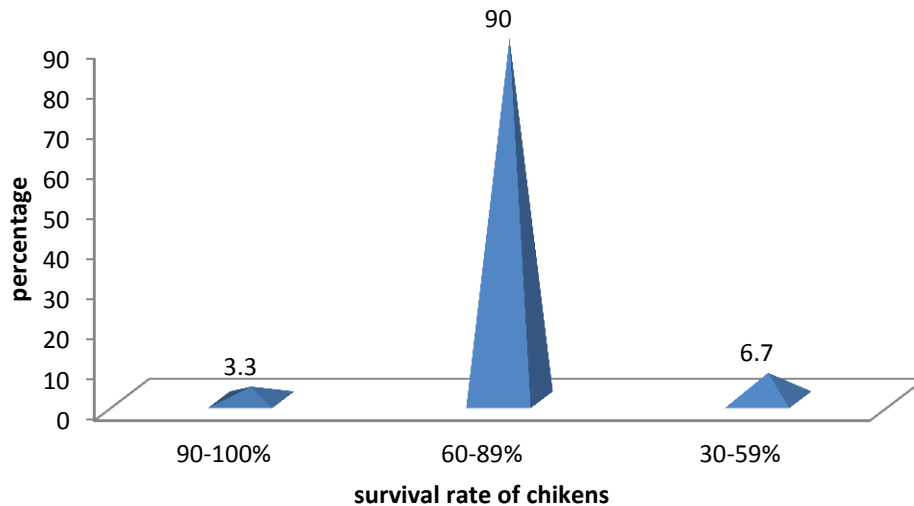


Figure 12 Rate of exotic chickens' survival using hay-box brooder to an age of eight weeks.

#### 4.9.2. Productivity of exotic chicken (Fayoumi Breed)

The results of this study showed that the mean age at first egg of Fayoumi chicken (age at sexual maturity) was 5.53 months, which is shorter than the mean age at sexual maturity (6.85 months) of indigenous chickens of the Kerssa *Woreda*, the value of which is slightly longer than those reported (5.45 months) from Fayoumi chicken in Bangladesh (Khan *et al.*, 2006). The result of age at first egg recorded from this study was also longer than the mean age of sexual maturity (5.2 months) of the *Isa Brown* chicken of Gomma *Woreda* (Meseret, 2010). However the value is shorter than those reported from (7.7 months) of Fayoumi chicken in Northern Ethiopia (Abraham and Yayneshet, 2010).

The mean total egg production of exotic breed (Fayoumi) of chickens adopted by the farmers under Plan Ethiopia project was (159.66egg/hen/year). The result of the study was also higher than the total egg production (56.67egg/hen/year) of indigenous chickens of the study area. The result of this study was higher than those reported from (144 egg/hen/year) exotic chicken (Fayoumi breed) in northern Ethiopia (Abraham and Yayneshet, 2010). However, the value was lower than (0.7 egg/hen/day) of the *Isa Brown* chicken of Gomma *Woreda* (Meseret, 2010). Due to the good performance on the survival

rate of chicks compare to the natural brooding practice all the respondents of the study area likes and prefers the use of hay-box brooder.

The respondents were interviewed about the constraints of the hay-box brooder. About 66.7% of the respondents reported that they have faced death without knowing the reason while they were using the hay-box and 33.3% of the respondents reported that the management of the hay box was difficult comparing to the natural brooding. This could be because of the requirement of moving the hay-box 3-4 times a day to enable the chick to feed on green grass. About 26.7% of the respondents reported that there should be improvement on the day time run and 73.3% of the respondents reported that the improvement must be on the night time box.

## 5. SUMMARY AND CONCLUSIONS

This research was conducted to characterize poultry production and marketing system in Kerssa *Woreda* of Jimma Zone. The result obtained showed that mean flock size per household of (8.37 chickens) Kerssa *Woreda* was higher than those reported from different parts of the country, indicating that village chicken production occupies a unique position in the *Woreda*. The mean annual egg production of the local hen was 56.67 whereas mean hatchability and chick mortality to an age of 8 weeks of the indigenous chickens of the Kerssa *Woreda* was calculated to be 68 and 51% respectively. There was variation on the price of eggs and live birds attributed to disease outbreak, holidays and festivals. The result of this study also revealed that the highest price (122.66 Birr) of large male live birds recorded during Ethiopian New-Year. The estimated average annual earnings from chickens and their products were calculated to be 397.33 birr per year.

On the follow-up study of the performance of hay box and exotic chickens, the majority (83%) of the respondents were female with average age of 37.30. The largest proportion (36.7%) of the respondents had two years' experience of using hay-box brooder. According to the survey result majority of the respondents 90.0% reported that the survival rate of exotic chickens to an age of eight weeks using hay-box brooder was 60-89%. The mean total egg production of exotic breed (Fayoumi) of chickens adopted by the farmers under Plan Ethiopia project was (159.66 egg/hen/year) with 5.53 months of sexual maturity.

Based on the result of this study, production performance of the indigenous chickens of Kerssa *Woreda* looks good as compared to that of the indigenous chickens of southern and central highlands of Ethiopia. In summary the results of this study tends to suggest the following recommendations.

- ✓ Provision of appropriate marketing information and transportation to village chicken producers could be important for the improvement of chicken and egg marketing system of the study *Woreda*.

- ✓ Training is needed for both farmer and extension staffs focusing on disease control, improved housing and feeding practice.
  
- ✓ The *Woreda* Agricultural office should encourage and support the farmers by providing hay-box brooder and also by providing training on the construction of the brooder in order to increase the productivity of chickens and to decrease the death attending to predation.
  
- ✓ The *Woreda* government office should take into account the sanitary condition of the market places of live birds and eggs, in order to address the bio-security.

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## **7. APPENDICES**

## Appendix A. Analysis of Variance and Other Tables

Appendix I. Comparative productivity indicators of the traditional, breeding centers and commercial poultry production systems in Ethiopia.

Item	Traditional (Indigenous)	Breeding centers	Commercial farms
Average egg weight (g)	38	56	56
Mean laying period/ hen (days)	20	>200	>200
Eggs/hen per year	60	200	230
Natural incubation period (days)	21	NA	NA
Natural brooding period (days)	56	NA	NA
Mean total days out of laying	96	NA	NA
Chick mortality (%)	40	5-10	5-6
Fertility (%)	75	80	90
Hatchability (%)	70	65	80
Age at first egg (days)	180	150	145
Slaughter weight at 12 months (kg)	1.5	NA	NA
Mortality of adult flock (%)	20-30	6-8	5-6
Mortality of broilers (%)	NA	NA	10-15
Slaughter weight at 8 weeks (kg)	1.5	NA	1.8
Adult weight (kg)	NA	NA	NA

*Source:* CACC 2003 and Alemu Yami 1997 cited by Solomon, 2007

Appendix II. Estimated number of indigenous chickens by category for rural and urban holdings (2003)

<b>Category</b>	<b>Rural</b>	<b>Mean</b>	<b>Urban</b>	<b>Mean</b>	<b>Total</b>	<b>Percentage</b>
Cocks	3,628,062	8.45	148,570	0.35	3,776,632	8.80
Cockerels	3,158,193	7.36	123,689	0.29	3,281,882	7.65
Pullets	4,491,021	10.46	172,636	0.40	4,663,657	10.87
Non laying hens	1,903,043	4.43	256,088	0.60	2,159,131	5.03
Chicks	17,420,187	40.59	477,805	1.11	17,897,992	41.7
Laying hens	10,329,121	24.07	807,212	1.88	11,136,333	25.93
<b>Total</b>	<b>40,929,629</b>	<b>95.4</b>	<b>1,986,000</b>	<b>4.63</b>	<b>42,915,629</b>	<b>100</b>

*Source:* CACC, 2003, cited by Solomon, 2007

Appendix III. Reproductive and productive performances of the local hen based on hen history data obtained from the study *Kebeles*.

Parameter	Gello Mean ± SE	Bulbul Mean ± SE	Merewa Mean ± SE	Ankeso Mean ± SE	Tikurbalto Mean ± SE	Kitimbile Mean ± SE	overall Mean	P- value
Egg per hen per year	66.56±2.78 <sup>a</sup>	65.63±3.02 <sup>a</sup>	49.16±2.07 <sup>c</sup>	57.36±1.82 <sup>b</sup>	52.43±1.4 <sup>bc</sup>	48.86±1.76 <sup>c</sup>	56.67±1.04	0.000
Clutches per year	3.13±0.10	3.16±0.14	3.06±0.11	3.00±0.08	3.23±0.12	3.10±0.16	3.11±0.51	0.84
Age at first egg (month)	6.53±0.17	7.06±0.17	6.86±0.19	6.80±0.18	6.83±0.17	7.03±0.21	6.85±0.07	0.39
Number of egg per clutch	13.90±0.67 <sup>a</sup>	13.03±0.48 <sup>ab</sup>	13.76±0.69 <sup>ab</sup>	12.33±0.52 <sup>ab</sup>	13.66±0.67 <sup>ab</sup>	11.96±0.48 <sup>b</sup>	13.11±0.24	0.03
Number of days per clutch	24.33±0.91	25.00±1.00	24.40±0.95	23.16±1.15	24.53±0.94	25.16±0.82	24.43±0.39	0.75
Age for slaughter (month)	6.06±0.17	6.50±0.22	7.13±0.28	8.60±2.02	6.60±0.22	7.60±0.27	7.08±0.34	0.34

Means within a row with different superscript differ significantly (P<0.05)



Appendix IV. ANOVA of productive and reproductive performances of indigenous chicken at six *kebeles* of Kerssa *Woreda*, Ethiopia.

Variables	DF	Mean Square	F-value	Sig
Age at first egg (Months)	5	1.102	1.050	0.390
Number of days per clutch	5	14.907	0.524	0.758
Age of Local breed for Slaughter (Months)	5	25.063	1.143	0.340
Number of clutches per year	5	0.006	0.040	0.849
Number of egg per clutch	5	19.689	1.850	0.034
Number of eggs per year	5	1689.316	11.347	0.000

**Appendix B Photo taken on marketing day of live birds and eggs in Kerssa Woreda market place.**



**Appendix Plate I. A women's selling their chickens**



**Appendix Plate II. Collector in the market buying a cock.**



Appendix Plate III. A boy selling chickens



Appendix Plate IV. A woman selling eggs along with other products



Appendix Plate V. Collector in the market buying eggs.



Appendix Plate VI. Farmers method of transporting market eggs.

**Appendix C Questionnaire for the characterization of poultry types and rural poultry production and marketing systems in Kerssa Woreda of Jimma Zone, Ethiopia.**

Farmer’s Name..... Region..... District.....*Kebele*.....

Enumerator’s Name-..... Date of interview.....

**A. Socio-economic characteristics**

1. Sex and age of the respondent a). Male b). Female c). Age\_\_\_\_\_

2. Major occupation.....

3. Educational level of the respondent

- a). Can’t read and write    b). Read & write    c). Elementary (1-8)
- d). First Cycle Secondary (9-10)    e). Second Cycle Secondary (11-12)

4. Religion.....

5. Marital status .....

6. Land size (ha).....

7. Family size.....

	<b>Male</b>	<b>Female</b>	<b>Total</b>
a) Ages under 14 years	_____	_____	_____
b) Ages between 15 to 30 years	_____	_____	_____
c) Ages between 31 to 60 years	_____	_____	_____
d) Ages above 60 years	_____	_____	_____
e) Total number	_____	_____	_____

9. Animal ownership, sale and consumption by the household

Type	Number per family	Purpose		
		Consumed	Sold	For other purpose
Cattle				
Small ruminant				
Equines				
Poultry/Chickens				

**B. Production system/Husbandry practices –**

1. Livestock ownership and division of labor

Type	Owner	Responsible member of the family
Cattle		
Small ruminant		
Equines		
Poultry/Chickens		

2. State the member or members provide care for Poultry? (Based on sex & age group)

<b>Age group</b>	<b>Male</b>	<b>Female</b>
Under 14 years		
Age between 15 and 30 years		
Age between 31 and 60 years		
Age above 61 years		

3. How long has poultry been kept in the household? .....

4. What Chicken types do you raise? .....

<b>Chicken types</b>	<b>Sex of the Owner</b>		<b>N<sub>o</sub> of Poultry</b>	<b>Total N<sub>o</sub></b>	<b>Source of foundation stock</b>	<b>Source of Replacement stock</b>
	<b>M</b>	<b>F</b>				
Starter (0-8wks)						
Grower (8-20wks)						
Finisher(>20wks)						
Layer/hen						
Breeder/cock						

5. Household

Type	No	Breed	Ownership	Responsible member of the family
Chicks (0-8wks)				
Pullets(8-20wks)				
Cockerels(0- 8wks)				
Adult cocks(>20wks)				
Laying hens(> 20wks)				
Breeder/cock (>20wks)				

6. Have you ever spent money on the purchase of

- |                 |         |  |         |
|-----------------|---------|--|---------|
| a). Baby chicks | Yes, No | e).chicken feed                          | Yes, No |
| b). Pullets     | Yes, No | f). Veterinary Products                  | Yes, No |
| c). Cockerels   | Yes, No | g). Poultry house construction materials | Yes, No |
| d). Laying hen  | Yes, No | h). Poultry feed                         | Yes, No |

7. If your answer to any of the items listed under question 6 is yes please indicate the source of the money (Source of money to finance your poultry farming?).

- |                    |                          |                  |
|--------------------|--------------------------|------------------|
| a) Poultry sales   | e). Crop sales           | h). Money lender |
| b) Bank            | f). Off-farm work        | i). Egg sales    |
| c) Livestock sales | g). Family or friends    | j). Cooperatives |
|                    | k). Others, specify_____ |                  |

8. On average how many hours per week do you & your family spends to take care of the birds?

- a). 1      b). 2      c). 3      d). 4      e). 5      f). 6      g). 7

9. Do you feel there is need to improve your poultry production? Yes No



If yes, why? (Prioritize the opportunities)

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

If no, why? (Prioritize the problems)

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

10. Is there any taboo/regulation concerning the raising, consumption and sale of poultry which has special feature?                      1. Yes                      2.No

- If yes,     1. What type of taboo/regulation is this
2. To which type of birds this taboo/regulation applies
3. To which category of people this taboo/regulation applies

## **C. Biological data**

### **I. Housing**

1. What type of management system do you practice for your poultry rising?

- a) Extensive b) Intensive c) Semi-intensive d) Others

2. Do you have separate poultry house (other than family dwellings)?

- a). Yes     b). No

3. If your answer to question 2 is no, what is/are a problem in the construction of separate

Poultry house (Prioritize theme)

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

4. If your answer to question 2 is no, where does your birds stay at night?

- (a) In the kitchen      (b) Family dwellings      (c) Perch on trees  
(d) Under basket      (e) In cages      (f) Others specify –  
(g) In the house purposely made for chicken

5. If your answer to question 2 is no, where does your birds stay during day times?

\_\_\_\_\_

6. Do you believe it is advantageous to construct separate poultry house?

- a). Yes      b). No

7. If your answer to question 6 is yes, state the advantages of separate poultry house.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. If they rest in basket or cage, or in a separate house, do you practice cleaning of poultry house?      a) Yes      b) No

9. If your answer to question 8 is yes, how often you clean poultry house (How many days in a week) \_\_\_\_\_

10. If your answer for question number 4 is choice g, the house is made from

- a) Mud of blocks      b) iron sheet roof & wood  
c) other.....

11. Specify any special care given/associated with birds in the area.....

## II. Feed Resources and Feeding Strategy

1. Do you practice purposeful feeding of your chicken in confinement?

- 1) Yes      2) No

2. Do you practice supplementary feeding of your chicken? 1) Yes      2) No

3. Indicate the ingredients you use for poultry feeding using

---

---

---

4. If you provide concentrates/industrial by-products, where do you buy these feeds?

- (a) Factories    (b) Retailers    (c) Commercial farms    (d) Feed mills

(e) Other (Specify)

5. If your answer to question 2 is yes, when do you usually offer the supplement?

(a) In the morning before they go out for scavenging

(b) In the evening after scavenging      (c) In the afternoon while scavenging

(d) Any time during day times      (e) Others, specify.....

6. If your answer to question 1 is yes, how frequent do you feed your birds daily?

1. In the morning: (a) None    (b) Once    (c) Twice    (d) Three times or more

2. In the afternoon: (a) None    (b) Once    (c) Twice    (d) Three times or more

3. In the evening: (a) None    (b) Once    (c) Twice    (d) Three times or more

7. If your answer to question 1 and 5 are yes, how do you feed your birds?

(a) In a feeder (b) on the bare ground (c) Others, specify.....

8. How do you give the extra feeds?

- (a) Separate to different classes
- (b) Together for the whole groups (for group feeding)

9. What is the basis of your giving supplements?

- (a) Egg yield
- (b) Meat yield
- (c) Broodiness (during incubation)
- (d) Age
- (e) Other, specify.....

10. Indicate seasonal extra feeding of your chicken using the following table. (At which season(s) do you offer more extra feed to your birds?) (Use asterisks)

<b>Class</b>	<b>Short-rainy (Feb-March)</b>	<b>Short-dry (Apr-May)</b>	<b>Long-rainy (June-Sep)</b>	<b>Long-dry (Oct-Jan)</b>
Layer				
Pullets				
Cocks				
Chicks				

11. Indicate priority of supplementation (Management and care) of the different classes (Rank 1 to 4) using the following table

<b>Class</b>	<b>Short-rainy (Feb-March)</b>	<b>Short-dry (Apr-May)</b>	<b>Long-rainy (June-Sep)</b>	<b>Long-dry (Oct-Jan)</b>

Layer				
Pullets				
Cocks				
Chicks				

12. If your answer to question 2 is no, what is the reason?

- (a) Lack of awareness about feed
- (b) Unavailability of feed and feed ingredients
- (c) High cost of feed and feed ingredients
- (d) Shortage of time
- (e) Lack or shortage of financial resource
- (f) Others, specify-----

13. Do your birds scavenge? 1) Yes 2) No

14. Do you give water to your birds? 1) Yes 2) No (why) .....

15. If you give water for the chickens, where do you get the water from?

- (a) Rain water
- (b) River
- (c) Tap water
- (d) Other, specify.....

16. If you give water for the chickens, what type of container do you use to supply water?

---

---

17. If you give water for the chickens, how frequent do you wash the container? (per week) ---

---

---

18. If you give water for your chickens, how frequent do you provide?

- (a) Every other day (b) Once/day (C) Twice/day (d) Adlib

### III. Culling

1. Do you purposely cull your birds at any time? 1) Yes 2) No

2. For what purpose do you cull the poultry?

- (a) Consumption (b) For sale (c) For sacrifice (d) other specify

3. What factors determine which bird you will cull?

- (a) Poor productivity (b) Sickness (c) Lack of broodiness

- (d) Old age (e) Frequent broodiness (f) other, specify

4. If you culled old age birds, at what age of the bird do you decide to cull it? \_\_\_\_\_

5. If you culled poor productive birds, what is their level of productivity?

- a) Number of eggs/clutch b) number of clutch/year

- c) Number of eggs/year

### IV. Productivity

2. What is market and/or slaughter age of cock (male)? .....

3. What is market and/or slaughter age of hen (female) .....

4. Current flock size? .....

5. Frequency of egg consumption at household level? .....

6. Frequency of poultry meat consumption at household level? .....

8. Mortality of adult birds including predation? a) High b) low

9. Flock size/ household .....

10. Egg characteristics

10.1 Dominant color of the shell

(a) White (b) Pale white (c) Pale (d) Pale brown (e) Dark brown (f) Others,

10.2 Dominant size of egg 1) small 2) medium 3) big

10.3 Dominant yolk color

1) light yellow 2) yellow 3) deep yellow

11. State the major potential threat/ Production constraints to chicken production and Productivity in order of economic importance

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

5<sup>th</sup> \_\_\_\_\_

6<sup>th</sup> \_\_\_\_\_

12. What do you think about the trend of the clutch period as the age of the bird increases?

a). Increase b). Decrease c). No change

13. After which clutch period the hen is supposed to set eggs for hatching chicks\_\_\_\_\_

## V. Health and disease control

1. 1. Do you experience serious disease outbreaks? a) Yes b) No

2. If yes, describe the common diseases you have experienced in your flock-

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

5<sup>th</sup> \_\_\_\_\_

3. How do you recognize sick birds? \_\_\_\_\_

4. What do you do when birds are sick?

(a) Treat them myself

(b) Call in veterinarian





## D. Marketing

1. What is the current market price of eggs? \_\_\_\_\_
2. Which of the followings is the major determinant of market price of egg in your locality?
3. (Use 1<sup>st</sup>      2<sup>nd</sup>      3<sup>rd</sup>)
  - a. i) Shell color      ii) Size of egg      iii) Yolk color
4. Is there variation of market price of eggs in your locality? 1)Yes      2)No
5. If your answer is yes, please write-down the causes of variations in market price of eggs in terms of importance.
  - i. 1<sup>st</sup> \_\_\_\_\_
  - ii. 2<sup>nd</sup> \_\_\_\_\_
  - iii. 3<sup>rd</sup> \_\_\_\_\_
  - iv. 4<sup>th</sup> \_\_\_\_\_
6. Where do you sale your eggs? \_\_\_\_\_
7. If you sale your eggs at local market how long do you transport to reach the market point?  
\_\_\_\_\_ (m or km or hr)
8. How do you transport the eggs? \_\_\_\_\_
9. How long do you store your egg before sale? \_\_\_\_\_ (days or weeks)
10. Where do you store market eggs? \_\_\_\_\_
11. Who is your regular client (buyer) of eggs? \_\_\_\_\_
  - i. Village collectors/neighbors      ii. Collector in the market
  - iii. Sell to consumers      iv. Others
12. Why do you sale eggs?
  - i. 1<sup>st</sup> \_\_\_\_\_
  - ii. 2<sup>nd</sup> \_\_\_\_\_
  - iii. 3<sup>rd</sup> \_\_\_\_\_
  - iv. 4<sup>th</sup> \_\_\_\_\_
13. Who is responsible for the sale of eggs within the family?  
1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

14. What proportion of the eggs produced is sold? \_\_\_\_\_

15. 14. Do you purchase table eggs from market for home consumption?

a) Yes b) No

16. 15. If your answer to question 14 is yes, do you test for quality before purchase?

a) Yes b) No

17. State the average unit price of any of the following products that you sell

Time of the year	Male bird			Female bird			Eggs
	Small Size	Medium size	Large	Small Size	Medium size	Large	
Christian festivals							
Muslim festivals							
New Year							
Traditional festival							
Year round							

18. If your answer to question 15 is yes, how do you test it? -----

19. What is the current market price of adult male bird? \_\_\_\_\_

20. Is there variation of market price of live bird in your locality? Yes----- No-----

21. If your answer for question 21 is yes, which of the followings is the major determinant of market price of live chickens in your locality? (Use 1st 2nd 3rd)

i. Feather color \_\_\_\_\_ (which color is the most preferable)

\_\_\_\_\_

ii. Comb type \_\_\_\_\_ (which type is the most preferable)

\_\_\_\_\_

iii. Shank color \_\_\_\_\_ (which color is the most preferable)

\_\_\_\_\_

iv. Body weight \_\_\_\_\_ (which weight is the most preferable)

\_\_\_\_\_

v. Sex \_\_\_\_\_ (which sex is the most preferable)

\_\_\_\_\_

22. Where do you sale your chickens? \_\_\_\_\_

23. If you sale your Live bird at local market, how long do you transport to reach the market point? \_\_\_\_\_ (m or km or hr)

24. How do you transport live birds to market area? \_\_\_\_\_

25. Who is your regular client (buyer) of live bird? \_\_\_\_\_

i. Village collectors/neighbors    ii. Collector in the market

iii. Sell to consumers

26. Why do you sale live bird?

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

27. Who is responsible for the sale of live bird within the family?

\_\_\_\_\_

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

28. Do you purchase live bird from market?      a)Yes      b) No

29. If your answer to question 29 is yes, how do you select the bird to be purchased? --

----

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

30. Write down the major problems of egg marketing in your locality in terms of importance

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

31. Write down the major problems of live bird marketing in your locality in terms of importance

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

32. What are the problems relating to live poultry marketing in your experience?

i) Unstable bird price

ii) Poor sales (demand seasonality)

iii). Lack of market place

iv) Poor infrastructure (road, market)

v) Lack of information

vi) Others, specify-----

33. What are the problems relating to egg marketing in your experience?

a) Unstable egg price

b) Poor sales (demand seasonality)

- c) Lack of market place
- d) Poor infrastructure (road, market)
- e) Lack of information
- f) others, specify\_\_\_\_\_

34. How far the market place from the residence area\_\_\_\_\_ (m or km or hr)

**E. Extension contact and services**

1. Have you ever discussed your poultry production & related problems with extension agents?

- a). Yes
- b). No

2. If yes, how frequently do you contact the agent (days in a month)

\_\_\_\_\_

3. If no, state the reasons for not contacting the extension agent in terms of importance

(a) Have no idea about the extension in poultry (b) Could not easily reach them

(c) There is no need to contact the agent

(d) Other, specify\_\_\_\_\_

4. Have you ever heard about improved poultry production practices?

- a). Yes
- b). No

5. If yes, what is your major source of information on improved poultry production practices?

(a) Extension agents farmers (b) Relatives (c)Other

(d) Newspaper (e) Market (f) Radio

(g) Neighbors leader (h) Television (i) Co-operative

(J) Other specify

**G. Breed/Breeding**

1. Number and breeds of Poultry

<b>Class</b>	<b>Local</b>	<b>Exotic</b>	<b>Cross</b>	<b>Total number</b>
Hens(Layers)				
Cocks				
Pullets				
Cockerels				
Chicks				
Total number				

2) Do you select chicken for breeding?      1) Yes      2) No

3) If yes, on which sex do you practice selection? Male Female Both

4) Selection criteria for breeding

---

<b>Character</b>	<b>Selected</b>	<b>If yes, your preference (describe or choice are given)</b>
------------------	-----------------	---

---

Feather color	Yes	No
---------------	-----	----

Body weight	Yes	No	Heavy	Medium	Small
-------------	-----	----	-------	--------	-------

Egg production	Yes	No
----------------	-----	----

Broody behavior	Yes	No	1) Frequent brooder	2) slow brooder
-----------------	-----	----	---------------------	-----------------

3) Not brooder at all

Mothering ability      Yes    No

- 1) good ability of sitting during hatching
- 2) Good feeder of the chickens after hatching
- 3) Good hatching history
- 4) Good protector from predator/aggressive weaning the bird

Comb type                      Yes    No

- Single                      Double
- Others, specify \_\_\_\_\_

Other (Specify)

---

5. Specific considerations during selections of hens for brooding/incubation

- a) Select hens with larger body size
- b) Select hens with ample plumage feather cover
- c) Select on the basis of previous hatching      d) Broodiness
- e) Other criteria

6) Are you interested to have exotic chickens?      1) Yes              2) No

7) If you have the opportunity to buy exotic chickens, which breed do you like to have?

- (a) WLH              (b) RIR              (c) Both
- (d) Other (Specify) \_\_\_\_\_

8) Why did you choose the above breed?

- 1<sup>st</sup> \_\_\_\_\_
- 2<sup>nd</sup> \_\_\_\_\_
- 3<sup>rd</sup> \_\_\_\_\_
- 4<sup>th</sup> \_\_\_\_\_

11) Do you limit the number of males running with females?      a) Yes              b) No

12) If yes, would you mention the ratio of male: female you normally have in your farm?

\_\_\_\_\_ Male to \_\_\_\_\_ Female.

13) How many chicken can you afford to manage under your condition?

\_\_\_\_\_

14. State the major factors limiting the number of chickens to be kept in order of importance (Why not more?)

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

6<sup>th</sup> \_\_\_\_\_

7<sup>th</sup> \_\_\_\_\_

15) Productivity report/Reproductive characteristics using the following table

Productivity	Breed		
	Local	Exotic	Crosse breed
Approximate age of sexual maturity,			
Approximate age for slaughter			
No of clutch in a year			
No of eggs per year			
Weaning age of chickens			



Length of productive life(Years),			
--------------------------------------	--	--	--

16) How is the preference of local cock towards exotic hen?

- 1) Good      2) Normal      3) Poor compared to the local hens

17) Preference exotic cocks towards the local hens (compared to the exotic hens)

- 1) Good      2) Normal      3) Poor compared to the exotic hens

### **H. Incubation, brooding and rearing**

1. Incubation of eggs      1) broody hens      2) Artificial      3) Any other\_\_\_\_\_

2. Do you have your own breeding cock?      1) Yes      2) No

3. If your answer to question 2 is no, how do you mate (breed) your laying hens\_\_\_\_\_

4. If your answer to question 2 is yes: Indicate the age of sexual maturity for the use of cock for breeding purpose? \_\_\_\_\_

5. How long do you use the cock for breeding purpose? \_\_\_\_\_

6. How many layers do you assign /breeding cock? \_\_\_\_\_

7. How many times do you incubate eggs per year? \_\_\_\_\_

8. What do you use as egg setting material\_\_\_\_\_?

a) clay pot & straw bedding      b) clay pot only/without bedding

c) Teff straw d) wheat straw

e) other (Specify)\_\_\_\_\_

9. How long do you store eggs before incubation? \_\_\_\_\_

10. Where do you store eggs before incubation\_\_\_\_\_

11. What do you use as hatching eggs storage materials? \_\_\_\_\_

12. Do you select eggs at a time or before incubation? 1) Yes 2) No

13. If yes to question 10 state the criterion of selecting eggs for incubation

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

14. Do you select any specific color of eggs for incubation? 1) Yes 2) No

15. If yes which color do you prefer? Brown White Others \_\_\_\_\_

16. Do you practice any special treatments of eggs before incubation? 1) Yes  
2) No

17. If yes, how do you treat?

i. Wash with cold water      ii. Wash with warm water      iii. Test fertility

iv. Clean using cloths or other materials      v. Other \_\_\_\_\_

18. Do you select size of hens for brooding? a) Yes b) No  
c) Do not consider the size

19. If yes, which one do you prefer? 1) Bigger 2) Medium size 3) Smaller

20. Do you select the mother hen incubating the eggs? 1) Yes 2) No

21. How many eggs do you incubate under a single hen at a time?  
\_\_\_\_\_

22. How many normal chicks do you collect from a single incubation?  
\_\_\_\_\_

23. State the major causes for failure of hatching in order of importance

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

24. How do you manage broody hen at a time of incubation?

\_\_\_\_\_

25. Sources of eggs for incubation

i. Purchased from market

ii. Purchased from neighbour

iii. Laid at home

iv. Other

26. Do you incubate eggs purchased from market?

1) Yes

2) No

27. Do you test eggs for fertility?

1) Yes

2) No

28. If yes to question 25 how do you test? \_\_\_\_\_

A) Before incubation

B) after incubation (at what days \_\_\_\_\_)

29. How do you position the eggs while incubating?

i. Pointed end downwards

ii. Pointed end upwards

iii. Position on inside

iv. Do not mind position

30. Where do you set/place the broody hens?

i. In dark and protected corner

ii. In light and protected corner

iii. Anywhere in the house

31. Practices to avoid broody behavior

a) Hanging the bird upside down

b) Depriving of the birds from feed & water

c) Disturbing in the nest

- d) Moving to neighbors
- e) Others \_\_\_\_\_
32. How do you store eggs to improve their shelf lives?
- a. In cold room                      b. Inside cold container
- c. Any place                              d. Other practices \_\_\_\_\_
33. When do you usually incubate eggs (indicate season of incubation)?  
\_\_\_\_\_
34. Is there seasonal variability on hatchability?    1) Yes            2) No
35. If yes, at which season did you have the worst (lowest) hatchability?  
\_\_\_\_\_
36. When do you achieve the best results (indicate season)? \_\_\_\_\_
37. Do you use the mother hen in raising the chicks? 1) Yes                      2) No
38. If yes how long the hen spends weaning the chicks (in weeks)? \_\_\_\_\_
39. What do you feed them? \_\_\_\_\_
40. When the highest chick mortality does occur after hatching? During
- a) The1st week      b) The2nd week      c) The 3rd week      d) The4th week
- e) The5th week      f) The6th week      g) The7th week      h) The8th week
41. How many chicks survive to an age of 2 months? \_\_\_\_\_
42. State the cause of the highest chick mortality in order of importance
- 1<sup>st</sup> \_\_\_\_\_
- 2<sup>nd</sup> \_\_\_\_\_
- 3<sup>rd</sup> \_\_\_\_\_
- 4<sup>th</sup> \_\_\_\_\_

43. How many chicks survive to an age of sexual maturity (5 months?) \_\_\_\_\_

44. State the cause of the highest adult bird mortality in order of importance

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

45. Hatchability

Size of broody hen	Eggs from Local hens		Eggs from RIR hens		Eggs from WLH hens		Eggs from crosses	
	No set	No hatched	No set	No hatched	No set	No hatched	No set	No hatched
Small								
Medium								
Large								

Size determined by the farmers: \_\_\_\_\_

46. What are your selection criteria of eggs before incubating?

Criterion	Selected	Why?
Egg size	1) Big 2) Medium 3) Small	

Egg shape	1) oval 2) circular (Kib)	
Age of egg	1) 1 week 2) 2weeks 3) 3weeks	
Type of eggs	1)From local pullet 2) From mature local hen 3)From RIR pullets 4)From mature RIR hens 5) Other	

48. Placement of the eggs in the brooder hen

- a) Eggs positions sideways                      b) Eggs positions pointed end down  
c) Eggs positions blunt end down              d) Do not mind about positioned eggs

49. How do you test and prepare eggs before incubation?

- a) Visual examination through the sun light  
b) Floating eggs in a bucketed filled with water  
c) Eggs will be cleaned before incubation              d) Other (Specify)

**I. Other General Issues**

1. Do you intend to expand poultry production as a business?              1) Yes              2) No

2. If yes, indicate flock size of your interest \_\_\_\_\_

3. What are your barriers to future expansion of poultry production?

1<sup>st</sup> \_\_\_\_\_

2<sup>nd</sup> \_\_\_\_\_

3<sup>rd</sup> \_\_\_\_\_

4<sup>th</sup> \_\_\_\_\_

6<sup>th</sup> \_\_\_\_\_

7<sup>th</sup> \_\_\_\_\_

4. What do you think the government should do to improve poultry keeping, Particularly in rural areas? \_\_\_\_\_

**II. Other information**

1. Household Structure Household head Name \_\_\_\_\_ Sex \_\_\_\_\_ Age \_\_\_\_\_

2. Types of farming

a) Crop-Livestock

b) Only livestock

c) Only Crop

3. Measurement System

a) Intensive (Confined)

b) Semi intensive (Partially confined)

c) Extensive (Kept outdoor & confined)

4. Purpose of keeping poultry

a) Home consumption

b) Sale

c) religious

d) Scarifies e) other

5. What is the role of the family in the production and sale of the chicken?

Tasks	Men (husband)	Women (wife)	Boys	Girls
Owner of chickens				
House construction				

Feeding, watering				
Cleaning				
Slaughtering				
Treating sick birds				
Decision(selling, buying, gift)				
Others				

#### 6. Poultry ownership

Class	Number	Ownership position		Sources			
		Owned	Shared	Hatched	Purchased	Gift	Other
Chicken<8 weeks							
Pullet,8-20 weeks							
Layers,>20 weeks							
Cockerels, (8-20 weeks)							
Cocks,>20 weeks							



7. Trend of livestock population (Since the last 2 years)

Species	Increasing	Stable	Decreasing	By how much	Reason
Cattle					
Sheep					
Goat					
Equines					
Poultry(local)					
Poultry(Exotic)					

8. Are there any institutions giving credit service to you?      a) Yes      b) No

9. If yes, what is the name of the institution? \_\_\_\_\_

10. If yes, what is the objective of the institution? (for what purpose are giving?)

a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

d) \_\_\_\_\_

11. Are there any development/ research projects working in poultry in the area?

1) Yes      2) No

12. If yes Name of the Institution Types of service support

\_\_\_\_\_

\_\_\_\_\_

13. How much time do you spend each day on poultry keeping?

- (a) Half of a day      (b) quarter of a day
- (c) others specify \_\_\_\_\_

14. Do you have any access to extension services? Yes No

15. If yes, in what aspects?

- (a) Crop production      (b) Dairy production
- (c) Sheep/goat production
- (d) Poultry production
- (e) others, specify \_\_\_\_\_

16. If you are receiving extension services in what form?

- (a) Advice only      (b) Provision of improved breeds of chickens
- (c) Provision of feed and veterinary service      (d) complete national poultry package
- (e) Others, specify \_\_\_\_\_

17. What is your estimated annual income from the sale of poultry and poultry products?

\_\_\_\_\_

18. For what purpose or how do you use the money from sell of poultry and poultry products

- (a) Purchase of agricultural inputs      (b) Payment of school fee for children
- (c) To cover household expense      (d) To cover medical expense
- (e) Others, specify \_\_\_\_\_

**Appendix D. Structure of questionnaire on the follow up of hay box  
chick brooder and exotic chickens**

Farmer's Name..... Region..... District.....  
Kebele.....

Enumerator's Name-..... Date of interview.....

**A. Socio-economic characteristics**

1. Sex and age of the respondent a). Male b). Female c). Age\_\_\_\_\_

2. Major occupation.....

3. Educational level of the respondent

a). Can't read and write b). Read & write c). Elementary (1-8)

d). First Cycle Secondary (9-10) e). Second Cycle Secondary (11-12)

4. Religion.....

5. Marital status .....

6. Land size (ha).....

7. Family size.....

	<b>Male</b>	<b>Female</b>	<b>Total</b>
a) Ages under 14 years	_____	_____	_____
b) Ages between 15 to 30 years	_____	_____	_____
c) Ages between 31 to 60 years	_____	_____	_____
d) Ages above 60 years	_____	_____	_____
e) Total number	_____	_____	_____

9. Animal ownership, sale and consumption by the household

Type	Number per family	Purpose		
		Consumed	Sold	For other purpose
Cattle				
Small ruminant				
Equines				
Poultry/Chickens				

**B. Production system/Husbandry practices**

1. Livestock ownership and division of labor

Type	Owner	Responsible member of the family
Cattle		
Small ruminant		
Equines		
Poultry/Chickens		

2. Who is responsible for poultry keeping within the household? \_\_\_\_\_

3. How long has poultry been kept in the household? .....

4. What Chicken types do you raise? .....

<b>Chicken types</b>	<b>No of Poultry</b>	<b>Total No</b>	<b>Source of foundation stock</b>	<b>Source of Replacement stock</b>
Starter (0-8wks)				
Grower (8-20wks)				
Finisher(>20wks)				
Layer/hen				
Breeder/cock				

**B. General questions on hay box**

1. How did you brood (raise) day old chick to an age of 8 weeks?
  - a. With use of broody hen (natural)
  - b. Without broody hen (artificial or hay box)
  - c. Others specify \_\_\_\_\_
2. If the answer for question number 1 is (b) how long have you been using the hay box brooder? \_\_\_\_\_
3. Where did you get the hay box brooder
  - a. From development agents
  - b. Constructed for my self
  - c. Purchased from others
  - d. Others, specify \_\_\_\_\_
4. What type of breeds do you have or rise using the hay box brooder?
  - a. Indigenous
  - b. exotic

5. If it is exotic type of breed what is the name of the breed? \_\_\_\_\_
6. What is the approximate age of sexual maturity (age at first egg) of the breed in a month? \_\_\_\_\_
7. How many eggs did you collect per year from the exotic breed raised by hay box brooder? \_\_\_\_\_
8. The survival rate of your chicks kept under hay box brooder? \_\_\_\_\_
9. The survival rate of your chicks kept under natural brooding? \_\_\_\_\_
10. What is the major cause of mortality of chicks kept under natural brooding?
  - a. Disease
  - b. predator
  - c. Both predator and disease
  - d. Other, specify \_\_\_\_\_
11. Please indicate some short coming of the existing ay box brooder
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
12. Please indicate the disease condition associated with the use of hay box brooder?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
13. Where did you keep the hay box containing the chicks during night time?
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
  - e. \_\_\_\_\_
14. Is the management of hay box difficult?
  - a. Yes
  - b. No

15. Did you like hay box brooder

- a. Yes    b)No

16. Which of the following component of the hay box brooder need improvement or adjustment

- a. The day time run
- b. The night time box
- c. Other, specify \_\_\_\_\_

Thank You