

**ADDIS ABABA UNIVERSITY
FACULTY OF VETERINARY MEDICINE**

**CAUSES OF VILLAGE CHICKEN MORTALITY AND INTERVENTIONS BY
FARMERS IN ADA'A DISTRICT, ETHIOPIA**

By

SELAM MESERET

**JUNE 2008
DEBRE ZEIT, ETHIOPIA**

**ADDIS ABABA UNIVERSITY
FACULTY OF VETERINARY MEDICINE**

**CAUSES OF VILLAGE CHICKEN MORTALITY AND INTERVENTIONS BY
FARMERS IN ADA'A DISTRICT, ETHIOPIA**

A thesis submitted to the School of Graduate Studies of Addis Ababa University, Faculty of Veterinary Medicine in partial fulfillment of the requirements for Master of Science in Tropical Animal Health and Production

**BY
SELAM MESERET**

**JUNE 2008
DEBRE ZEIT, ETHIOPIA**

**CAUSES OF VILLAGE CHICKEN MORTALITY AND INTERVENTIONS BY
FARMERS IN ADA'A DISTRICT, ETHIOPIA**

**BY
SELAM MESERET**

Board of Examiners

Signature

1. Professor S. K. Kahr

2. Dr. Adugna Tolera

3. Dr. Tesfaye Kumsa

Advisor

Dr. Kelay Belihu

DEDICATION

This piece of work is dedicated to the memory of my sister **Senait Meseret** who passed away with out seeing my success

BIOGRAPHICAL SKETCH

The author, Selam Meseret, was born in Bahir Dar, Amhara Regional State, in October 1984 GC. She began her education in September 1989, at Shimbet Elementary and at Fasilo Junior Secondary School. She completed her Secondary School at Tana Haik, Bahir Dar in the 1999/2000 and then she joined Debub University, Awassa College of Agriculture in 2000/2001 and graduated with Bachelor of Science Degree in Animal production and rangeland management in July, 2004. The author has served in Mertule Mariam Agricultural Technical Vocational Educational Training, as junior instructor.

ACKNOWLEDGEMENTS

I express my deepest and heart-felt gratitude to my major advisor Dr. Kelay Belihu for his valuable advice, constructive ideas and proper guidance during the data collection and critical reading of the manuscript and valuable suggestions during the write up of the thesis. I am also indebted to the SIDA/SAREC and Addis Abeba University for their financial support of the research project. My deep gratitude goes to my lovely families for their encouragement and financial support. I would like to appreciate and acknowledge the farmers of the Ada'a district for giving me their valuable knowledge. Special thanks go to all developmental agents working in the study area for their support and assistance during data collection. Special thanks and appreciation also goes to Ms. Fikir Messeret, Ms. Abiyot Semeles and Mr. Gashaye Nuressa for their encouragement through out the work. I would like to extend my special thanks to all my friends for their comments, suggestions and encouragement. It is very difficult to make a whole list of individuals who helped me to complete this study and it is preferred to express my sincere thanks to all of them. Above all, I praise the almighty God who gave me the ability to finalize this study with out him this work was impossible and he gave me peace and success in Jesus Christ.

TABLE OF CONTENTS

BIOGRAPHICAL SKETCH	v
ACKNOWLEDGEMENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
ABSTRACT	xii
1. INTRODUCTION	1
2. LITERATURE REVIEW	3
2.1. The role of poultry in rural areas	3
2.2. Village chicken production systems and productivity	3
2.3. Causes of chicken mortality	5
2.3.1. Management problem	5
2.3.2. Predation	6
2.3.3. Diseases	6
2.4. Solution for loss of chicken	7
2.4.1. Disease prevention and control.....	7
2.4.2. Predation control.....	8
3. MATERIAL AND METHODS	10
3.1. Study area	10
3.2. Study population	11
3.3. Study design	11
3.3.1. Sample size determination and sampling procedure.....	12
3.3.2. Data collection	12
3.4. Data analysis	13
4. RESULTS	14
4.1. Socio economic characteristic	14

4.2. Livestock ownership	15
4.3. Poultry production system	16
4.3.1. Establishment and objectives of poultry keeping	16
4.3.2. Chicken flock composition and dynamics	17
4.4. Management of chicken.....	19
4.4.1. Decision making	19
4.4.2. Housing system.....	20
4.4.3. Feeding system and feed resources.....	20
4.5. Breeding and reproduction	22
4.6. Performance of chicken.....	22
4.7. Mortality of chicken.....	23
4.8. Interventions measures to reduce chicken mortality.....	26
4.8.1. Disease control.....	26
4.8.2. Predation control.....	27
4.8.3. Controlling bad weather.....	28
5. DISCUSSION	29
6. CONCLUSIONS AND RECOMMENDATIONS	32
7. REFERENCES.....	33
8. ANNEX I.....	39
9. DECLARATION SHEET	45

LIST OF TABLES

	Page
Table 1. Comparison of performances of scavenging and commercial chickens.....	4
Table 2. Demographic profile of respondents in the study areas (n =180).....	14
Table 3. Mean and standard deviation of different group of chicken and breed type among smallholder farmers	18
Table 4. Major causes of chicken mortality above the age of 7 days	23
Table 5. Causes for chick mortality in the selected households in the study areas	24
Table 6. Different signs and diseases noticed by respondents as causes of mortality in chicken in the study areas	25
Table 7. Type of predators causing loss of chicken in the selected households in the study areas	26
Table 8. Different material used as traditional medicines by farmers in the study area....	27

LIST OF FIGURES

	Page
Figure 1. Map of the study area	11
Figure 2. Farm land size distribution between households headed in the district	15
Figure 3. Mean number of livestock by species owned per smallholder household in the study district.....	16
Figure 4. Main purpose of poultry keeping in the study areas	17
Figure 5. Chicken flock dynamics and major causes of additions and disposals of chicken from the flock.....	19
Figure 6. The proportion of households practicing different types of feeding system	21
Figure 7. Average number of egg in one clutch per hen in the study areas.....	23

LIST OF ABBREVIATIONS

AACMC	Australian agricultural consulting and management company
ANOVA	Analysis of variance
CSA	Central statistical authority
FA	Farmers association
n	Number of respondents
NCD	New castle disease
NGO	Non governmental organization
NMSA	National metrological center agency
SD	Standard deviation
SPSS	Statistical package for social sciences

ABSTRACT

The present research was conducted in Ada'a District of the Eastern Shoa Zone, Oromia Regional State, Ethiopia. This study was undertaken to investigate the major causes of chicken mortality under village production system and the intervention measures by farmers against the major causes of chicken mortality under village conditions. Data were collected through structured questionnaire from 180 households from 6 peasant associations. Simple random sampling method was used to select the peasant associations and the households. A structured questionnaire was used to collect data on farming system characteristics, chicken flock size, composition and dynamics and major causes of chicken mortality and intervention methods employed by farmers. The farming system was characterized by crop-livestock farming systems. Most of the respondents (81.1%) kept poultry 15 years ago and local chicken were common in the study area (72.73% of the total flock size). The majority of the respondents (92.8%) kept their bird as scavenging birds. Wives were more responsible for the management of chickens and they are decision makers in most of the cases (78.9%). The results of the study on flock dynamics revealed that the disposal rate (16.57%) was higher than the increment (5.45%). Chickens were disposed from the flock due to different factors such as disease (86.4%), predation (91.9%), mismanagement (29.4%), bad weather (6.1%), sell and slaughter (56.67%). The most important predators mentioned by the farmers were domestic cat (71.1%), vultures (65%) and mongoose (42.8%). The most common disease problems mentioned by the farmers were Newcastle disease (72.2%), diarrheic diseases (65.8%), diseases characterized by depression and subsequent death (48.4%). Significant proportion of the respondents (48.3%) did not provide modern medicine and those using utilize mainly broad spectrum medicines without consulting veterinarians. The traditional medicaments included different medical leaves of plants, spices, and others. The materials used as medicine are usually mixed with feed and fed to sick birds. Gas oil and smoking leaves of *Otostegia integrifolia* were used to reduce the chicken loss due to external parasites. It can be concluded that farmers in the study areas are using still traditional type management based on indigenous chicken breeds and scavenging feed resource base and are highly affected by mortality due to predation and diseases. So appropriate management should be taken to control the incidence of disease and reduce the loss of chicken kept under village chicken production systems due to predation and mismanagement.

Key words: Chicken, disease, loss, mismanagement, predation, village

1. INTRODUCTION

In many countries of the world, poultry are kept as scavengers in and around the residence areas at village and family level (Kitalyi, 1998). Almost every village household keeps domestic chicken (on average between 5 and 20 birds) and it is estimated that village chicken make up more than 80% of the total domestic chicken population in Africa estimated at 1068 million in 1995. Under this circumstance poultry provide a good source of protein and ready cash for villagers. Moreover, poultry helps to sustain the village economy and contributes to the provision of urban migration. The benefit from family poultry production goes directly to the rural poor, in most cases to the women being most active as caretakers (Gueye, 1998). In addition, chickens are also important for diversifying agricultural production and increasing household food security directly to the rural poor community, including increased distribution of resources through involvement of women (Gueye, 1998; Kitalyi, 1998).

Chickens are kept in most areas of the Africa in different production systems. In Ethiopia, there are different breed of chicken that fit or adapt to different agro-ecological regions in the country. The total poultry population of Ethiopia is estimated at 56.5 million, which represent 60% of the total chicken population in East Africa. From the total population of chicken in Ethiopia, 99% are raised under the traditional backyard system of management, while 1% is under intensive management system (Tadelle *et al.*, 2003a; Ashenafi and Eshetu, 2004). The traditional poultry system is characterized by minimal human involvement, with birds scavenging in the backyard for food and no investments beyond the cost of local grain and possibly simple nightshades. This system is also characterized by high mortality caused by factors such as disease, predators, and poor management and nutrition.

In Ethiopia, the contribution of village chickens to farm household and rural economies is not proportional to their high numbers. This is mainly due to low productivity levels and poor management systems. More than 98% of total meat and egg production comes from village poultry in Ethiopia (Tadelle, 1996; Udo *et al.*, 2006). There are different constraints in village chicken production system. These include diseases, poor management, poor growth rates, predation and lack of organized markets from which the most important in the village chicken are diseases and poor housing conditions which expose birds for

predation. Parasitic and other infectious diseases are common in the tropics where the standard of husbandry is poor and yet climatic conditions are favorable for the development of diseases. In addition, predation is also involved in the mortality of chickens in the tropics (Tadesse, 2005).

Although a village chicken production is important in Ethiopia, few studies have been done on causes of chicken mortality specially under village conditions which is required for the development of successful production strategies for poultry rearing.

The objectives of this study were:

- To investigate the major causes of chicken mortality under village production system;
- To investigate the intervention measures by farmers against the major causes of chicken mortality under village conditions.

2. LITERATURE REVIEW

2.1. The role of poultry in rural areas

It is said that about 80% of poultry in Africa are found in rural areas under free-range system, thus, providing scarce animal protein in the form of meat and eggs as well as being a reliable source of petty cash. In addition, rural poultry is also an important element in diversifying agricultural production and increasing household food security. Rural poultry also fulfills a number of other functions for which is difficult to assign any monetary value. These include the role of rural poultry in pest control and traditional ceremonies and festivals (Abubakar *et al.*, 2007). There are few cultural or religious taboos that stand against consumption of eggs and poultry meat and eggs.

The importance of rural poultry in national economies of developing countries and its role in improving the nutritional status and incomes of many small farmers and landless communities has been recognized by various scholars and rural development agencies in the last two decades (Tadelle, 1996; Kitalyi, 1998; Tadelle *et al.*, 2003b).

2.2. Village chicken production systems and productivity

The traditional poultry system is characterized by minimal human involvement with birds scavenging in the backyard for food, and no investment beyond the cost of the foundation stock, a few handfuls of local grain, and possible simple night sheds (Tadesse, 2005). Village poultry production has over the years attracted some attention due to the enormous potential for increasing the output vis-à-vis the relatively low output at present. However, the view has been that traditional village poultry production could only be improved by just preventing few diseases in the flocks. This point of view has, however, not lead to an increased production (Riise *et al.*, 2005).

In Ethiopia, rural poultry production represents a significant portion of the rural economy; it is a source of income for smallholder farmers. In addition, both poultry meat and eggs are affordable sources of protein and hence chickens play an important role in the provision of animal protein for the rural population (Eshetu *et al.*, 2001). The rural poultry

production based on low input-output levels represents a part of a balanced farming system, has a unique position in the rural household economy as supplier of high quality protein to the family food supply system provides small cash income and plays a significant role in the religious and cultural life of the society in Ethiopia (Tadelle and Ogle, 2001).

Birds on free-range are usually left to wander around the homestead and feed for themselves with little supplementation from household leftovers. The size of the flocks varies from one household to another, depending on the land size, and ranges between 6-22 birds. Chicken are viewed as “bank accounts” for rural households as they are conveniently converted to cash required to meet household requirements such as school fees, school books and planting seeds (Romona, 2005). Housing is simple or often no special housing is provided. In the poorest countries the chickens depend entirely on the scavenging resource base of their environment. In many countries women and children tend the poultry and receive any benefits that result (Spradbrow, 1998). There are different constraints to free ranging village chicken production such as mortalities due to disease, low genetic potential, poor management, poor technical support, predation, limited research service and lack of organized marketing and processing (Boki, 2000; Thekiso *et al.*, 2004). Due to these constraints, chickens in the village system have low performance level (Table 1).

Table 1. Comparison of performances of scavenging and commercial chickens

Parameter	Scavenging chicken	Commercial chickens
Age at mature weight (weeks)	>24	<8 for broilers <20 for layers
Egg production (eggs/hen/year)	40-60	>250
Egg weight (g)	30-49	>60
Mature weight (kg)	1-1.7	>2
Mortality rate (%)	Chicks >60 Adults 45-100	<20

Source: Kitalyi (1997)

2.3. Causes of chicken mortality

Mortality is the main source of variation in flock dynamics in village poultry systems. Diseases and predation are the main causes of mortality (Sonaiya, 1990; Spradbrow, 1994; Kitalyi, 1997; Udo *et al.*, 2006). Other causes of mortality are accidents, suffocation, drowning and theft. Mortalities differ between different bird categories. Mortalities also vary between seasons (Tadelle, 1996; Udo *et al.*, 2006). Predation losses are higher in wet seasons than in dry seasons: lack of feed weakens birds and makes them more vulnerable for predators and the relatively denser vegetation in villages during wet seasons harbors predators (Asgedom, 2000; Udo *et al.*, 2006). Village chicken production system is characterized by high mortality caused by diseases, predators, and poor management and nutrition.

2.3.1. Management problem

Inadequate management is a factor seen to constraint poultry production and some of the factors include poor feed supplementation, inbreeding, poor hygiene of shades and lack of outlets for poultry products (Romona, 2005). Feeds should provide the nutrients to allow poultry to produce to their genetic potential and maintain their health (Sonaiya and Swan, 2004). Nutritional deficiencies in the first week after hatching reflect on food reserves in the yolk sac, derived from maternal diets. These usually present as avitaminoses early in the chick's life. Inadequate nutrition is also important in causing low resistance to diseases (Romona, 2005). However, the emphasis on providing least-cost rations, way of ingredient processing, and the recycling of human and animal waste food and other materials has resulted in the appearance of new and different metabolic disease. Deficiency diseases may occur because of lack or imbalance of nutrients, poor quality ingredients and/or inadequate mixing. A high mortality rate among chicks during the first days or weeks after hatching may be caused by insufficient feed and water. A high mortality in adult birds may be due to nutritional problems such as salt deficiency (Sonaiya and Swan, 2004). Accidental trampling on chicks, drowning, poisoning and contact with charcoal stoves used for heating can also cause mortality (Romona, 2005).

2.3.2. Predation

Predators account for high percentage of mortalities especially in chicks. Farmers have employed provision of proper housing, shelter and clearing as a prevention measures. In addition, trapping, hunting and repelling of predators are also measures to prevent predation. Predators such as snakes, rats, dogs, cats, foxes, raccoons and birds of prey represent the main causes of predator losses, especially in young birds. Human beings can also represent another important predator for adult birds (Sonaiya and Swan, 2004; Romona, 2005).

2.3.3. Diseases

Diseases are the most important constraint to village chicken production in Africa. Studies on scavenging poultry have shown that a variety of viral, bacterial and parasitic diseases are present in scavenging poultry (Romona, 2005). In Ethiopia, poultry diseases are considered to be most important factor responsible for reducing both the number and productivity of chickens (Tadesse, 2005). Infectious diseases contribute markedly to high flock mortalities during the rainy season. These conditions promote vectors survival and multiplication and lowers bird's resistance to infection and infestation. High disease levels can arise from exposure of chickens to the harsh environmental conditions, interaction of different entities, within and among flock contacts during scavenging, uncontrolled introduction of new stock, contact through exchange or sale of live chickens or movement between households and villages (Jull, 2003).

In Ethiopia, there are different major poultry health problems causing mortality. NCD is the most important cause of loss in village-dwelling as well as commercially raised chickens in the country. Newcastle disease is rated as the most devastating disease of village chickens in the study regions in Ethiopia, which is similar to other areas of Africa (Sonaiya, 1990). The disease occurs almost any time of year and velogenic strains of NCD virus are widely distributed throughout the country with mortality rates reaching 100% (Tadesse *et al.*, 2005). NCD is locally known as 'fengel' and the first documented evidence of the disease in Ethiopia dates to 1978. From the viral disease reported to be prevalent at

large scale in the central part of Ethiopia in intensive and high-density juvenile farms is IBD (Aschalew *et al.*, 2005).

Other important constraints to the development of backyard chickens production in rural Ethiopia include endoparasites and coccidiosis. The highest prevalence of cestodes and nematods was observed in the mid-land and lowland areas of the country than in highland areas. Parasitic cestodes in poultry are known to cause retarded growth, enteritis, diarrhea and hemorrhage. Heavy infestations may cause death of young birds (Ashenafi and Eshetu, 2004). In Ethiopia, poultry coccidiosis, caused by for example *Eimeria acervulina*, *Eimeria necatrix*, *Eimeria maxima* and *Eimeria tenella*, is endemic in all parts of the country and affects mainly young growing birds. During the past years, coccidiosis used to be the most important cause of mortalities in all farms. Incidences of the disease were as higher as 80% usually occurring in the form of outbreaks (Kinung'hi *et al.*, 2004).

2.4. Solution for loss of chicken

2.4.1. Disease prevention and control

Disease control is one means of minimizing chicken mortality. Most avian diseases caused by infectious agents can be controlled through management practices. These include production of chicks from grand parent breeders and commercial hatchery stock that are free from the egg transmitted diseases, effective vaccinations, and adoption of management practices that prevent the spread of disease throughout the brooding, growing, adult and marketing periods. To maintain a flock in an ideal state of health and avoid loss through diseases, it is essential to have an adequate knowledge of important disease conditions and predisposing factors influencing the resistance of birds to diseases. The most important predisposing factors are nutritional deficiencies in ration, faulty feeding practices, poor ventilation, lack of cleanliness, over crowding, environmental stresses and others (Jull, 2003; Sonaiya and Swan, 2004).

Poultry should be provided with balanced ration according to their age and function (Sonaiya and Swan, 2004). The nutrient intake of scavenging birds varies from place to

place according to the seasons, the crops grown and the natural vegetation available (Sonaiya and Swan, 2004).

Better hygiene measures, like maintenance of healthy environment inside and outside the poultry shed, restriction of the entry of visitors and wild animals, proper cleaning and disinfections of houses, equipments and workers and appropriate floor and house construction will help in reducing losses due to disease. Droppings, feathers, and dead birds are sources of pathogens and should be removed from overnight housing and the free-range compound, and then properly disposed of. This will also reduce the incidence of external parasites. All new arrivals should be treated for ectoparasites and endoparasites as well as vaccinated on arrival, if possible. Sick birds should be isolated or slaughtered promptly, and dead birds buried. The litter in the poultry house should be turned frequently and changed, if wet. Feeders and drinkers should be cleaned frequently. The poultry house or basket should be regularly disinfected every two months. Water must be free of harmful chemicals and disease agents (Sonaiya and Swan, 2004).

Simple medical control measures appropriate for free-range village flocks include vaccination against NCD, fowl pox and fowl cholera. De-worming for internal parasites in a mixed flock and chemical treatment for external parasites is one way to control parasites (Sonaiya and Swan, 2004). NCD is highly contagious and attempts to control it by veterinary sanitary measures alone are often unsatisfactory. Where the disease has become endemic, systematic vaccination of the total poultry population is a successful method of control. However, in developing countries, it may be difficult to institute and sustain vaccination programs and hence it is essential to give appropriate attention to traditional disease treatment and control methods (Sonaiya and Swan, 2004).

2.4.2. Predation control

Predation can be reduced by closely monitoring village chickens during scavenging periods and keeping in proper houses during the night. Hunting, trapping or poisoning of predators such as cats, snakes and others can also lessen predation levels. Given the importance of predation-induced mortality, predation prevention measures deserve more attention from poultry research and development professionals. 'Improved housing' is the

solution usually proposed by livestock scientists. However, since most predation takes place during daylight hours, when the birds are scavenging, for it to be effective scavenging would have to cease. This would require the owners to bring feed to the birds, thereby incurring labor and/or cash costs, which poor poultry-keepers might consider to be undesirable or not feasible (Conroy *et al.*, 2005).

3. MATERIAL AND METHODS

3.1. Study area

This study was carried out in Ada'a District. Ada'a district is one of the districts in East Shoa Oromiya region (Figure 1). The district covers an area of 92, 751.33 ha. Debre Zeit is the town of the study district, located at 47 km South East of Addis Ababa with a human population of about 95,000. The altitude is about 1880m above sea level. It is an important small town where many governmental institutions, national and international research centers are found. The soil and climate are similar to many highlands in Ethiopia (NMCA, 1999).

Based on figures published by the Central Statistical Agency in 2005, this district has an estimated total population of 355,343, of whom 175,788 were males and 179,555 were females; 142,866 or 40.21% of its population are urban dwellers, which is greater than the Zone average of 32.1%. With an estimated area of 1,635.16 square kilometers, Ada'a has an estimated population density of 217.3 people per square kilometer, which is greater than the Zone average of 181.7 (CSA, 2005).

A survey of the land in this district shows that 51% is arable or cultivable, 6.4% pasture, 7.4% in community, regional and natural forests, and the remaining 34.8% is considered degraded or otherwise unusable. Ada'a district produces the most teff, wheat and legumes in Eastern Shewa (Figure 1). The district has an altitude ranging from 1500-2250 meters above sea level. The minimum and maximum temperature is 13 °C and 25 °C, respectively (CSA, 2005).

Some of the problems prevailing in the area include soil erosion and poor drainage system of vertisols, deforestation, shortage of farm and grazing lands, inadequate education and health services, prevalence of tropical human and livestock diseases.

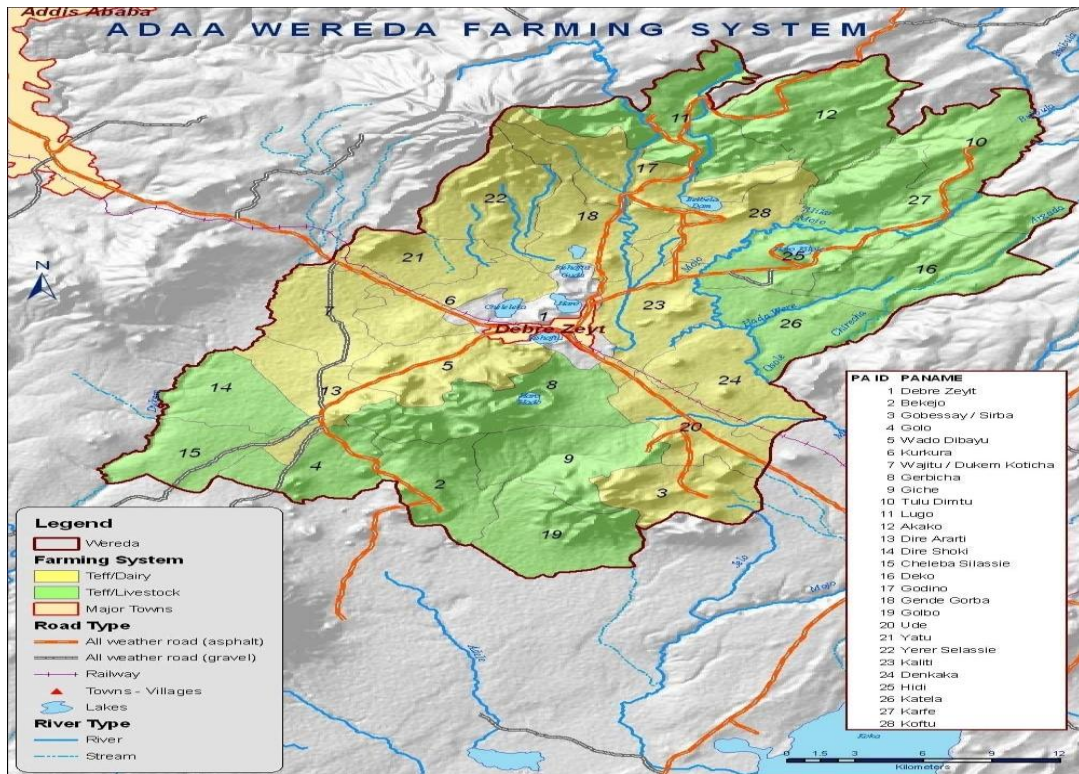


Figure 1. Map of the study area (CSA, 2005)

3.2. Study population

The chicken population in the District managed under village chicken production system and farmers keeping the chicken were the study population.

3.3. Study design

A retrospective and cross sectional types of studies were carried out to investigate the major causes of chicken mortality and their management under village chicken production system.

3.3.1. Sample size determination and sampling procedure

Sample size was determined using the formula recommended by Arsham (2005) for survey studies:

$$N= 0.25/SE^2$$

With the assumption of 5% standard error, a total of 100 households were required for the study. However, a total of 180 households were included in the study to increase the level of precision.

Six farmers associations (FA) were selected randomly from the District. The selected FA's were Kurkura, Ude, Gende Gorba, Denkaka, Yatu and Godeno. Then, a fresh list of farm households were prepared jointly with the community representatives, village leaders, village elders and the development agents working in the selected FA's. Finally, simple random sampling techniques were employed to select 30 households from each FA, which made a total of 180 households. All poultry in a farm household were sampled as a cluster. With the national average flock size of 6 (AACMC, 1984), approximately a total of 1080 chickens were included in the study.

3.3.2. Data collection

A single-visit formal survey method (ILCA, 1990) was followed to gather the necessary information. Prior to the actual survey, visits were made to the district and secondary information relevant to the study was gathered from all possible sources. The study regarding causes of village chicken mortality and intervention by farmers was undertaken using structured questionnaire.

The questionnaire format involving both close ended and open-ended questions was prepared, pre-tested and administered by the researcher. The open-ended questions gave the respondents an opportunity for self-expression to share their views, experiences and opinions.

A structured questionnaire were prepared and interview was carried out to collect data on socio-economic characteristics of farm households, chicken flock size and composition, chicken management practices (housing, feeding and breeding), chicken flock dynamics, annual chicken mortality pattern (distribution among the different groups of chicken and seasons), major causes of chicken mortality and intervention measures by farmers (strategies used to avoid mortalities and control measures employed to control mortalities) (Annex I).

3.4. Data analysis

The collected household data were summarized and analyzed using SPSS (SPSS-release 11.05, 2002). Descriptive statistics such as mean, percentage and standard deviations were used to present the household survey results.

4. RESULTS

4.1. Socio economic characteristic

Of the 180 respondents, 30.6% were male and 69.4% were female. The average ages of respondents were 40 ± 11.5 years (SD). Very few respondents (7.2%) had acquired secondary education while majority respondents (56.6%) had no formal education and the rest acquire primary and junior education (Table 2). Majority of the respondents claimed that agriculture was their main occupation. Five percent of the respondents claimed daily laborer as their main occupation. Very few respondents described their main occupation as trade, government employer and animal production (Table 2).

Table 2. Demographic profile of respondents in the study areas (n =180)

Variable	Category	Frequency	Percent
Sex	Male	55	30.6
	Female	125	69.4
Education	Illiterate	78	43.3
	Elementary	48	26.7
	Junior secondary	17	9.4
	Secondary	13	7.2
	Informal education	24	13.3
Main occupation	Agriculture	160	88.9
	Daily laborer	9	5.0
	Government employer	3	1.7
	Trade	7	3.9
	Animal Production	1	0.6

The overall farming system in Ada'a district in general and in the PAs in particular is characterized by mixed crop-livestock production system, and the system integrated the livestock sector as well as the crop production. At the study district the farm size of 26.1% (n=47) and 35% (n=63) of the farmers ranged from 0.25 - 1.0 ha and 1.0 - 2 ha, respectively. Moreover, 13.9% (n=27) of the farmers had farm sizes ≥ 2 ha. The rest had no farm land and above half of land less respondents rent crop land from other farmers (Figure 2). The average land holding size per household was 1.38 ± 1.18 (SD) hectare.

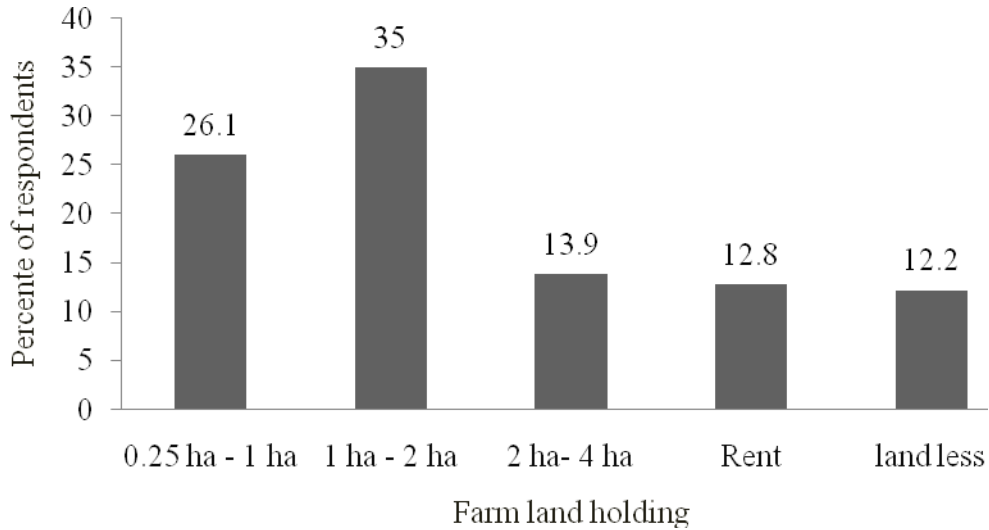


Figure 2. Farm land size distribution between households headed in the district

Out of a total 180 farmers, about 84.4% (n=152) of the farmers cultivate teff as the first priority crop. Wheat was found to be the next important crop in the study area and was cultivated by 82.2% (n=148) of the farmers as the second priority crop. Chickpea was also found to be an important crop and cultivated as the third priority crop by about 13.3% (n=24) of the farmers in the study district. There were also very few households involved in growing pea, barley, horticultural crops and others.

4.2. Livestock ownership

The livestock herd of the sampled households included cattle, sheep, goat, donkey, horse and poultry. The highest proportion in terms of heads of animals per smallholder household was made of poultry (9.17±7.72). The livestock herd other than poultry was dominated by cattle (5.05 ± 4.16) and followed by sheep (2.37±3.95). The least proportion from the livestock herd was made by goats (0.21±0.82) and horses (0.12±0.38). Goat and horse owned less than one in average (Figure 3). In addition to smallholder farmers there are another 5% (n=4) respondents kept more than 100 chickens per household.

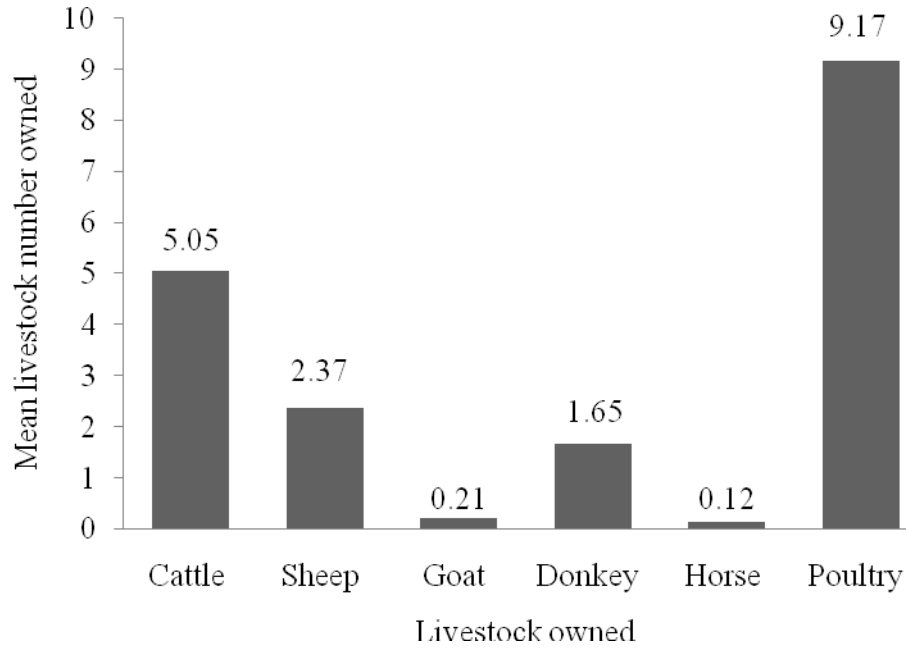


Figure 3. Mean number of livestock by species owned per smallholder household in the study district

4.3. Poultry production system

In the study area there are two production systems; village chicken production systems and semi-intensive production systems. From the total respondents, only 2.4% (n=4) kept their chicken in semi-intensive production systems. The rest of the respondents practiced village chicken production systems.

4.3.1. Establishment and objectives of poultry keeping

The majority of the respondents kept (81.1%) (n=146) poultry before 15 years ago, 7.8% (n=14) before 7-8 years and 11.1% (n=20) of them kept with the range of 1-5 years. Above half of the respondents bought starting flock from their village, 27.2% (n=27) from market which is found around their vicinity, 3.9% (n=7) got gift from their relatives, only 1.7% (n=2) bought from rural development offices and Genesis farm for foundation flock. From the total respondents, 92.2% (n=166) started by local breed, 2.2% (n=4) exotic and 5.6% (n=10) hybrid chicken as foundation flock.

Purpose of keeping poultry in different study areas of the households is shown in Figure 4. The purpose of keeping poultry by the households was highest priority for home consumption as well as selling (95%) (n=171), but they also gave minimum priority for only home consumption (4.4%) (n=8) and selling (0.6%) (n=1).

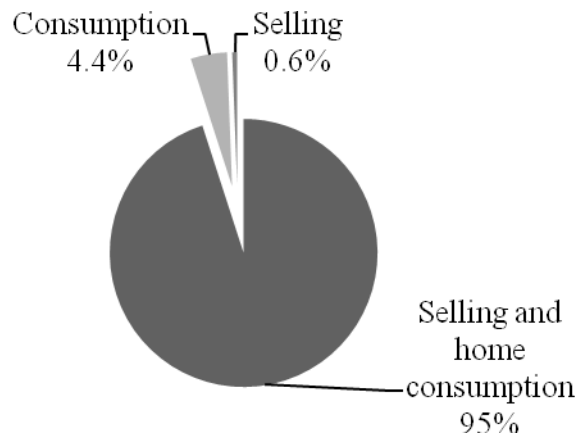


Figure 4. Main purpose of poultry keeping in the study areas

4.3.2. Chicken flock composition and dynamics

The overall flock size per smallholder household was 9.17 (± 7.72). Most of the respondents owned local breed and while few households kept exotic and hybrid type of chickens. Exotic breeds have been distributed to voluntary farmers from research centers, intensive farms like Genesis farms and local agricultural office. In the overall chicken flock, hens (39.91%) and pullets (35.66%) comprised significant proportion. The same was true in the hybrid and local chicken flock (Table 3).

Table 3. Mean and standard deviation of different group of chicken and breed type among smallholder farmers

Chicken type	Mean	SD	Proportion from the flock
Exotic			
Hens	0.17	1.08	1.85
Chicks	-	-	-
Pullets	0.03	0.45	0.33
Cockerels	0.01	0.08	0.12
Cock	0.01	0.08	0.12
Hybrid			
Hens	0.89	1.87	9.71
Chicks	0.40	2.46	4.36
Pullets	0.69	3.01	7.52
Cockerels	0.02	0.30	0.22
Cock	0.28	0.79	3.05
Local			
Hens	2.60	2.48	28.35
Chicks	0.60	1.57	6.54
Pullets	2.55	4.47	27.81
Cockerels	0.06	0.38	0.65
Cock	0.86	1.39	9.38
Overall			
Hens	3.66	2.86	39.91
Chicks	1.00	2.83	10.91
Pullets	3.27	5.31	35.66
Cockerels	0.09	0.40	0.98
Cock	1.15	1.46	12.54
Total	9.17	7.72	100

The respondents indicated that the number of chicken added to the farm during the past year (1999 E.C.) was low (10.83 ± 80.38) compared to the disposal rate (32.97 ± 217.56) in one year. The higher disposal of chicken was in relation to mismanagement (29.4%) (n=53), disease (86.4%) (n=155), predation (91.9%) (n=165), bad weather (6.1%) (n=11) and sell and slaughter (56.67%) (n=102) according to the respondents. Disease and predation contribute the higher proportion for the higher rate of disposal of chickens (Figure 5).

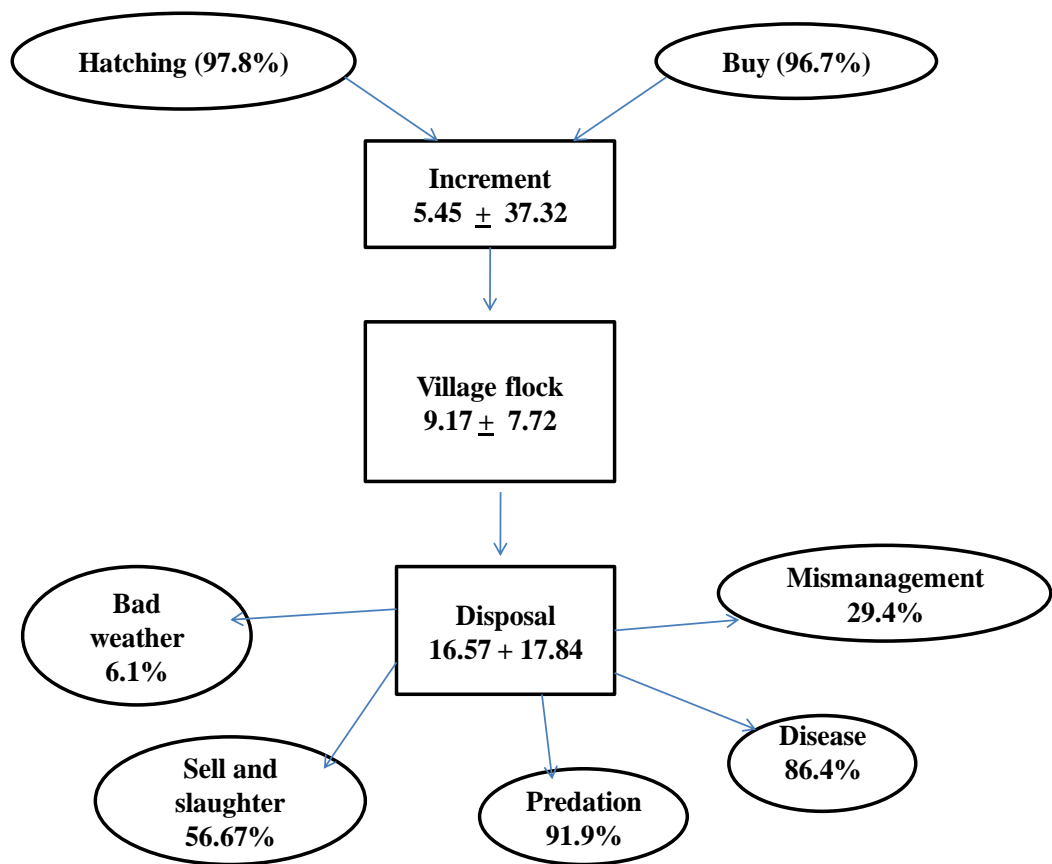


Figure 5. Chicken flock dynamics and major causes of additions and disposals of chicken from the flock

4.4. Management of chicken

4.4.1. Decision making

The persons responsible to manage the birds and decision makers to sell live birds and egg were mostly house wife (78.9%) (n=142) followed by house wife and children together (9.4%) (n=17), the family members altogether (6.7%) (n=12), husband (2.8%) (n=5) and children (2.2%) (n=4).

4.4.2. Housing system

More than half of the sampled households they roosted inside the family dwelling at night, 62.2% (n=112), the roost being made of two or three raised parallel planks of wood and 21.7% had a poultry house made of mud and wood out side home. Some households constructed house which is a combination of traditional and modern poultry house 7.2% (n=13). In 5.6% (n=10) of the households scavenging chicken spend the night in kitchens, while in 3.4% (n=6) of the farms, chicken do not have a defined place to spent the night period.

The house cleaning frequency was daily for 73.3% (n=132) of the respondents, 2-3 times per week for 7.8% (n=14) and 1 per week for 7.8% (n=14). About 11.1% (n=20) of the respondents did not clean the poultry shelter. During cleaning most of the respondents (79.4%) (n=143) simply remove the chicken droppings, 10.6% (n=19) cleaning and smoke the house with leaves of plants (*Otostegia integrifolia*) and 7.8% (n=14) no cleaning at all. Very few farmers clean the farms using chemicals (1.1%) (n=2) and change the litter regularly (1.1%) (n=2).

4.4.3. Feeding system and feed resources

From the total respondents, 92.8% (n=167) depended only on scavenging feed resource base. Others (4.4%) (n=8) confine the chicken and supplement them with purchased feed. The remaining 2.8% (n=5) confine the chicken during the day time and house the chicken at night and supplemented them with purchased feed and household leftovers completely (Figure 6).

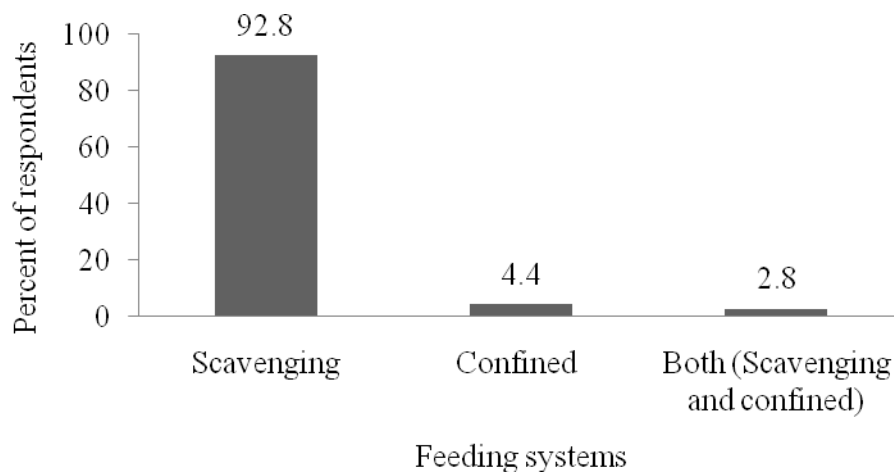


Figure 6. The proportion of households practicing different types of feeding system

The most important chicken feed resources in the study areas were scavenging feed resources, food waste, farm crops, off farm feed and crop waste. All respondents provide household food leftovers for chickens. Of the total respondents, 86.1% (n=155) supply their chicken with farm resources such as wheat, maize, barely, teff and sunflower. In addition, 75.4% (n=136) utilized off farm feeds. The off farm feeds were bought from the mill houses found in the vicinity, from research center and intensive poultry farm in the area.

Most of the farmers (82.8%) (n=149) experienced chicken feed shortage mainly in the rainy seasons. All year round feed shortage was experienced by few farms (3.3%) (n=6). During feed shortage, most of the farmers (78.3%) (n=141) bought feed from other sources, 15% (n=27) used stored feed, 2.2% (n=4) used household food wastes and the rest of the respondents did not take any measure for shortage of feed. Most of the respondents supply feed to chickens on the ground (76.1%) (n=137), 2.8% used modern feeder and the rest use different old household utensils.

The majority of the sampled households (72.2%) (n=130) used pump water, 16.1% (n=29) river and 11.7% (n=21) bore hole for their chicken. More than half of the respondents (56.7%) (n=102) have water source near to their homestead, while 16.1% (n=29) of them pump water in their home, 14.4% (n=26) traveled for about 15-30 minute to fetch water from their home and the rest traveled for more than 30 minutes to get water. Most of the

respondents used plastic drinkers (75.0%) (n=135) and the remaining used sand drinker (7.2%) (n=13), modern drinker (6.1%) (n=11), woody drinker (5%) (n=9) and different old household utensils (4.4%) (n=8). There were also few cases, where chicken got water from river (2.2%) (n=4).

4.5. Breeding and reproduction

About half of the sampled households (52.8%) (n=95) buy replacement flock from village, 22.2% (n=40) rear on farm, 12.8% (n=23) buy from Debre Zeit market, 12.2% (n=22) get from rural development offices, intensive farm (Gensis and Kelehiwot) and research centers. The profile of replacement chicken breed was 91.1% (n=164) local, 1.7% (n=3) hybrid and local and 3.9% hybrid. The remaining 3.3% (n=6) do not practice replacement.

From the respondents, 56.1% (n=101) indicated that they did not face hatchability problem and 43.9% (n=79) indicted there were low hatchability in their flock. The respondents indicated different reasons for low hatchability: absence of cock (infertile egg), bad mothering ability (low brooding ability), cold weather, unwillingness of hens to brood egg from other birds, large number of eggs per brooding, low egg quality, hybrid egg, egg positioning, and frequent change of incubation places.

4.6. Performance of chicken

Most of the respondents (97.8%) (n=176) incubate eggs while the remaining 2.2% (n=4) do not practice incubation. The number of incubated eggs varied from 5-10 eggs (18.3% (n=33)), 11-15 eggs (71.7%) (n=129) and above 16 eggs (7.8%) (n=14). Broody hens were used to incubate the eggs. In general, the local breeds had good broodiness behavior as compared to the hybrids and the exotics. From the respondents, the majority (60.6%) (n=109) collected less than 10 eggs per clutch from one hen. A significant proportion of the respondents (35%) collected from 11 to 15 eggs per clutch (Figure 7).

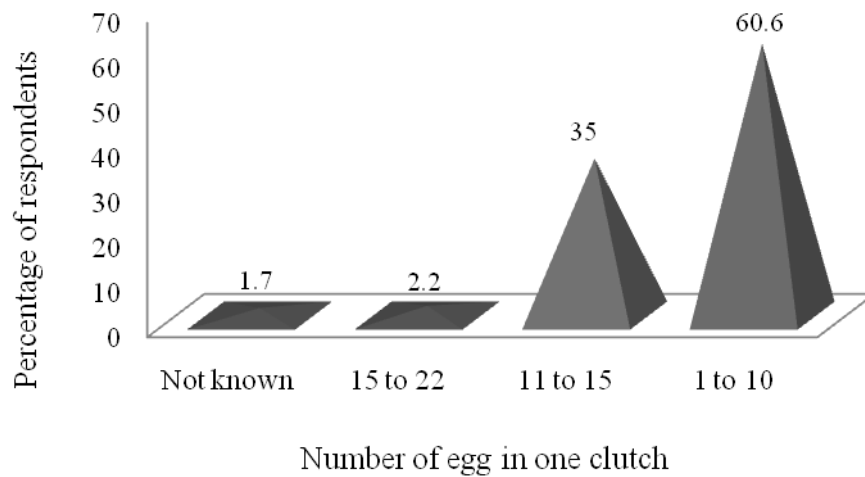


Figure 7. Average number of egg in one clutch per hen in the study areas

4.7. Mortality of chicken

The majority of the respondents put predation (91.9%) and disease (86.4%) as major causes of mortality in chicken older than 7 days. In addition, mismanagement (0.6%) and bad weather (0.6%) was also mentioned by some people as causes of chicken mortality (Table 4).

Table 4. Major causes of chicken mortality above the age of 7 days

Causes of mortality	Frequency	Percentage
Disease	156	86.4
Predation	165	91.9
Bad weather	1	0.6
Mismanagement	1	0.6

About 50.6% (n=91) of the respondents indicated that more than half of hatched chicks are lost. There were different causes for loss of new hatched chicks indicated by the respondents. More than one fourth of the respondents (29.4%) indicated that mismanagement lead to loss of young chicks. These include water shortage and tramping by adult chicken, children and cattle. More than half of the sampled households mentioned

predation as the major causes of chick mortality (67.8%). Other causes were also mentioned by less than 10% of the respondents (Table 5).

Table 5. Causes for chick mortality in the selected households in the study areas

Causes	Frequency	Percentage
Miss management	53	29.4
Predation	122	67.8
Disease	10	5.6
Bad weather	11	6.1
Cold	10	5.6
Hot	1	0.6
Cannibalism	1	0.6
Low mothering ability	6	3.3
Not known	6	3.3

There were also different symptoms and specific diseases mentioned by the respondents that lead to death (Table 6). Most of the respondents were not familiar with the names of diseases but Newcastle disease (NCD) locally known as “*Fengel*” was commonly known in the study area (72.2%). Mites were mentioned by name by some of the respondents (11.1%) as causes of mortality in the study areas. The most important signs of diseases mentioned by the respondents were diarrhea (65.6%), depression and death within few days (48.6%) and lowering of the head down (28.9%). Other signs mentioned include blackening of comb, swelling and blinding of eye, coughing and sneezing, loss of appetite and staggering movement. According to most of the respondents, disease occurrence was higher at short and long rainy season (77.8%) (n=140). However, there were also respondents who experienced high rate of disease occurrence any time in a year (16.7%) (n=30) and in the dry season (5.6%) (n=10).

Table 6. Different signs and diseases noticed by respondents as causes of mortality in chicken in the study areas

Sign of disease or names of known disease	Frequency	Percentage
Depression and death within 3 days	87	48.4
Diarrhea (yellow, green and white diarrhea and bloody type)	118	65.6
Blackening of comb	21	11.7
Loss of appetite	15	8.3
Eye swelling and blinding	21	11.7
Coughing and sneezing	17	9.4
Paralyzed	6	3.3
Staggering movement	9	5
Lowering of the head down	52	28.9
Twisting of the neck	1	0.6
Newcastle disease (<i>Fengel</i>)	130	72.2
Fowl Pox (<i>Fentata</i>)	1	0.6
Gumboro Disease	1	0.6
Mites	20	11.1

Among the predators mentioned by the respondents, domestic cats (71.1%), vultures (65%) and mongoose (42.8%) were the most important ones. In addition, dogs, wild cat, rats and birds other than vultures were also incriminated in predation of chicken. Vultures, cat, rats and other birds prey mainly chicks, while mongoose and wild cat prey all age groups (Table 7). Loss of chickens due to theft was also mentioned by one respondent. The majority of the respondents agreed that there is no seasonal variation on the predators (93.3%) (n=168). Those who believe in the seasonal variation in predation indicated that vultures are more common during the dry season while the predation by mongoose increased at the end of the rainy season.

Table 7. Type of predators causing loss of chicken in the selected households in the study areas

Type of predators	Frequency	Percent	Group of chicken susceptible
Vultures	117	65	Chicks
Mongoose	77	42.8	All age groups
Wild cat	16	8.9	All age groups
Cat	128	71.1	Chicks
Dog	25	13.9	Mostly chicks
Mouse	6	3.3	Chicks
Other birds	5	2.8	Chicks

4.8. Interventions measures to reduce chicken mortality

4.8.1. Disease control

Of the total respondents, 48.3% (n=87) did not provide modern medicine and those using utilize mainly broad spectrum medicines without consulting veterinarians. On the other hand about 80% of the households used traditional medicine to treat chicken affected by diseases. Different materials were mentioned as traditionally used medicines for diseases of chicken (Table 8). The traditional medicaments are usually mixed with feed specially *Injera* and fed to sick birds. Except for gas oil and *Otostegia interifolia* smoking, which are used against external parasites, all the others are used to all health problems of chicken.

When farmers get replacement flock (new) from other source, 64.5% (n=116) respondents check the health status of chicken by visual observation. The criteria used to determine the health status of chicken while acquired were alertness and the nature of feces at the vent area. There were also some respondents restricting movement of chicken during disease outbreaks (13.9%) (n=25).

The ways of disposal of the bodies of dead chicken by sampled households include throwing away in the field (62.2%) (n=112), burying (18.9%) (n=34), throwing in the toilet (1.1%) (n=2) and burning (1.1%) (n=2). Most of the farmers (87.2%) (n=157) were

not aware of means of disease transmission. Dog was incriminated as a means of disease transmitter by 6.7% (n=12) of the respondents. The remaining 6.1% (n=11) of the sampled households considered bodies of dead chicken as potential sources of diseases.

Table 8. Different material used as traditional medicines by farmers in the study area

Category	Traditional medicaments
Liquid	Local alcoholic drink (Areke) Food oil Gas oil
Spices	Senafech (<i>Brassica japonica</i>) Hot pepper (<i>Capsicum frutescens</i>) Hyena onion (<i>Dipcadi lanceolatum</i>) Garlic Feto (<i>Lepidium sativum</i>) Salt
Plants	<i>Sensel (Adathoda schimpriana)</i> <i>Rete (Aloe trichocantha)</i> <i>Lemon (Citrus aurantifolia)</i> <i>Citrus aurantium</i> <i>Eucalyptus globulus</i> <i>Kil (Lagenaria siceraria)</i> <i>Melya (Melia azedarach)</i> <i>Tenejute (Otostegia interifolia)</i> <i>Gerwa (Vernonia amygdalina)</i> <i>Kurkura (Zizyphus spina-christ)</i>
Others	Holy powder (<i>Emenete</i>) Cutting of black combs

4.8.2. Predation control

About 50.6% (n=91) of the respondents did not have any measure to control predation, 1.7% (n=3) plant tree to control predators specially vultures, 5.6% (n=10) of them predate predators by themselves and 19.4% (n=35) used dogs to predate predators. Confining chickens specially during night time was also one option to cope with the problem of predators for 19.4% (n=35) of the respondents. Some of the respondents (3.3%) (n=6) used toxic chemical to kill the predators.

4.8.3. Controlling bad weather

Of the total respondents, 65.6% (n=118) did not take any measure to reduce the impact of the bad weather and 17.2% (n=31) confined chicks until the weather gets better (warm). About 4.4% (n=8) of the respondents adjust hatching time at dry season to reduce the negative effect of cold weather while 12.2% (n=22) supply heat for chicks by using straw and reduce heat loss by putting chicks in an enclosure locally called *Debegnete* (locally material which is made from soil and teff straw to supply heat for chicks).

5. DISCUSSION

The mean size of total tenured land per household in the present study was 1.38 ha, which is a little bit lower than the report of Samuel (2005) (1.47ha). This result is also much lower than a report from Zimbabwe (Muchadeyi, *et al.*, 2005) (2.6 ha). The study area is a mixed crop-livestock area where the dominant crops are teff and wheat. This is in agreement with the report of Samuel (2005) in Debre Zeit area.

Majority of the respondents indicated that the main objectives of keeping poultry were for sale and home consumption. Similar result was reported by Tadelles and Ogle (2001). Chickens in this study were managed by traditional management system and the major feed sources in this study were scavenging feed resources with little supplementation with household leftovers and off farm feed resources. This result is also similar with different reports (Gunaratne *et al.*, 1993; Tadelles, 1996; Tadelles and Ogle, 2001; Aboe *et al.*, 2006). This may be due to the fact that farmers keeping chicken in the study area were smallholders and have not access for improved feed resources mainly due to economic reasons.

The overall mean of chicken flock for smallholder farmers was 9.17. The mean disposal number is higher than the increment number. The higher disposal of chicken was in relation to mismanagement, disease, predation, bad weather and sell and slaughter; from these disease and predation contribute the higher proportion for the higher rate of disposal of chickens. Different authors also confirmed this result (Tadelles, 1996; Tadelles and Ogle, 2001).

From the total household interviewed 78.9% indicated that house wife are responsible to manage the birds and they are also decision makers to sell live birds and eggs and this result is in line with different studies conducted in rural parts of Africa (Tadelles and Ogle, 2001; Prabakaran, 2003; Sonaiya and Swan, 2004). This could be due to the fact that scavenging chicken are kept near homesteads where they are very close to women while males tend to be involved in other farming activities and males consider poultry production is less profitable while women considered the reverse.

Although good housing is a prerequisite for any viable and sustainable poultry project, the majority of the households in this study were not providing proper housing for their chicken. Many authors reported the same housing conditions for village chickens (Gueye, 1998; Kitalyi, 1998; Tadelle and Ogle, 2001, Kondombo, 2005; Aboe *et al.*, 2006).

This result showed that mortality of chicks less than 7 days was mainly due to mismanagement and predation problems. This result disagrees with the findings of Tadelle and Ogle (2001) who reported disease as the most important factor in the death of chicks in the first two months of their life. This difference could be due to the long age range considered by the authors. On the other hand, Kitalyi (1998), Tadelle and Ogle (2001) and Udo *et al.*, (2006) emphasized that mortality during brooding stage was high for village chickens. Mismanagement in the form of poor housing, poor hygiene and inadequate feeding predisposes bird to diseases, predators and other miscellaneous consequences including accidents and poisoning.

In the group of chicken which were above 7 days old, the causes of mortality were the same as those chickens which were less than 7 days old. However, the most important causes were predation and disease. Predation and diseases were identified as major constraints by different authors (Sonaiya, 1990; Spradbrow, 1994; Kitalyi, 1997; Mapiye and Sibanda, 2005; Udo *et al.*, 2006). The fact that predation and disease were the most important causes of chicken mortality in this study is an indication that village chickens are not protected from diseases and predation due to reasons like lack of awareness, lack or improper housing and economic incapability.

Mostly the farmers indicated that they simply through away the dead body of the birds in the field and this might also create a good ground for disease transmission. Different report also confirmed that if dead birds not properly disposed, pose a danger to other flocks and farms and cause soil, air and water pollution (Prabakaran, 2003; Mammo, 2006).

Among the diseases mentioned as important by respondents in the current study, NCD was cited as the most serious. This finding agrees with the reports of Gueye (1998) and Aboe *et al.* (2006). The majority of the household indicated that disease occurrence is higher at long and short rainy seasons. This is supported by the report of Mapiye and Sibanda (2005) who indicated that diseases and parasites contributed markedly to high flock

mortalities recorded during the rainy season. This is because the conditions promote vector survival and multiplication and lowers bird's resistance to infection and infestation.

Traditional medicine made from different plants, spices and others materials, were used in the study area to control disease problems. In addition, some respondents try to control the disease occurrence by buying replacement flock from known person mostly in the village. These practices were also reported by Tadelles and Ogle (2001) and Tadelles (1996). It would appear that simple changes in management practices (e.g. preferential provision of feed to newly hatched chicks), home remedies (e.g. indoor management of chicks) and including attention to small details (e.g. control of predators) are believed to be capable of significantly reducing losses and in turn improve the off take rate from traditional chicken farming (Tadelles *et al.*, 2003b).

Flying predators like vulture and other birds were among the predators most frequently mentioned by the respondents in this study. This was also indicated by Biswas *et al.* (2008). Even if the problem of predation is serious, about half of the respondents indicated that they did not take any measure to control this problem. The remaining group practiced confinement of birds during night period, kept dogs around rearing areas to predate predators and kill predators by toxic substance. The predators might also be prevented by putting simple fencing made from materials like sticks around the rearing places. To prevent chicken from nocturnal predators, a smallholder should keep chickens in a well-constructed night-shelter made from stronger wood (Biswas *et al.*, 2008).

Although bad weather was not a common problem in this study, whenever, the problem comes, farmers in this study tended to control effects of cold weather by confining chicks in a locally made pot (*debegnet*) until the weather improves. This practice is in line with the report of Tadelles and Ogle (2001).

6. CONCLUSIONS AND RECOMMENDATIONS

The results of this study showed that farmers in the study area are practicing a typical village chicken production where chicken flocks dominated by indigenous breeds are kept under traditional type of management. Chicken are kept mainly to produce egg and chickens for household consumption and sale. The production depended more on scavenging feed resources and chicken were provided with no or improper housings. The chicken flock dynamics is mainly a function of hatching and purchasing for flock increment and mortality and sales for disposals. The most important causes of chicken mortality were predation, disease and mismanagement. Farmers used different strategies to control the effects of disease and predation including the use of traditional medicine against diseases and planting of tree, predation of predators, use of toxic chemical to kill the predators and confinement of chickens specially during night time were used to some extent against predation.

Based on the conclusions the following are recommended:

- Creation of awareness and training of farmers as to the importance of proper housing and good management should be carried out
- Since traditional medicine was widely used by farmers, studies are needed to determine the efficacy and the exact medical value for specific poultry disease;
- More detailed studies should be carried out to investigate the disease problems prevailing in the study area that would help develop a sustainable strategy of disease prevention and control

7. REFERENCES

- Aboe P.A.T., K. Boa-Amponsem, S.A. Okantah, E.A. Butler, P.T. Dorward and M.J. Bryant, (2006): Free-range village chickens on the Accra Plains, Ghana: Their husbandry and productivity. *Trop Anim Health Prod* **38**: 235–248.
- Abubakar M.B., A.G. Ambali and T. Tamjdo, (2007): Rural Chicken Production: Effects of Gender on Ownership, and Management Responsibilities in Some Parts of Nigeria and Cameroon. *International Journal of Poultry Science* **6** (6): 413-416.
- AACMC, (1984): Project preparation report draft final. Poultry production project, Australian Agricultural Consulting and Management Company. Annex-5 and Main report. Addis Ababa, Ethiopia.
- Aschalew, Z., Esayas, G., Teshale, S., Gelagay A., Asegedech S. and Bereket, Z. (2005): Investigation on Infectious Bursal Disease outbreak in Debre Zeit, Ethiopia. *International Journal of Poultry Science* **4**(7): 504-506.
- Asgedom, A.H., (2000): Modeling impact analysis in village poultry production systems. M.Sc. Thesis, Wageningen University, Wageningen.
- Ashenafi, H. and Eshetu, Y. (2004): Study on gastrointestinal helminthes of local chickens in central Ethiopia. *Revue de Medecine Veterinaire*, **155** (10): 504-507.
- Arsham, H., (2005): Questionnaire design and surveys sampling, 9th Edition. <http://home.ubalt.edu/ntsbarsh/stat-data/Surveys.htm>.
- Biswas P.K., G.M.N. Uddin , H. Barua, K. Roy , D. Biswas, A. Ahad, N.C. Debnath, (2008): Survivability and causes of loss of broody-hen chicks on smallholder households in Bangladesh. *Preventive Veterinary Medicine* **83**: 260–271

- Boki J. Kibari, (2000): Poultry Industry in Tanzania with emphasis on Small-scale Rural Poultry. Proceedings of the workshop on the Possibilities for smallholder Poultry projects in eastern and Southern Africa, Morogoro, Tanzania, 22-25 may, 2000.
- Conroy, C., Sparks, N., Chandrasekaran, D., Sharma, A., Shindey, D., Singh, L. R, Natarajan, A. and Anitha, K. (2005): The Significance of Predation as a Constraint in Scavenging Poultry Systems: Some Findings from India. Natural Resources Institute, University of Greenwich, Central Avenue, Chatham Maritime.
- CSA (Central Statistical Agency), (2005): Ethiopian Statistical Abstract, Central Statistical Authority, Addis Ababa Ethiopia.
- Eshetu Y., E. Mulualem H. Ibrahim, A. Berhanu and K. Aberra, (2001): Study of Gastro-intestinal Helminths of Scavenging Chickens in Four Rural Districts of Amhara Region, Ethiopia. *Rev. sci. tech. Off. int. Epiz.*, **20** (3), 791-796.
- Gueye, E.F., (1998): Village egg and Fowl Meat Production in Africa, *World's Poultry Science Journal* **54**:73-86.
- Gunaratne, S.P., Chandrasiri, A.D.N., Margaliki, W.A.P. and Roberts, J.A., (1993): Feed resource base for scavenging village chickens in Sri Lanka. *Tropical Animal Health and Production*, **25**, 249–257.
- International Livestock Center for Africa (ILCA), (1990): Livestock systems research manual. Vol.1. ILCA working Paper 1. ILCA, Addis Ababa, Ethiopia.
- Jull, A., M. (2003): Successful Poultry Management. 2nd ed., Bio-Tech Books, New Delhi, India, Pp 267- 308.
- Kitalyi, A. J. (1996): Socio-economic aspects of village chicken production in Africa: the role of women, children and non-governmental organizations. Paper Presented at the XX World Poultry Congress, 2-5 September 1996, New Delhi.

- Kitalyi, A.J., (1997): Village chicken production systems in developing countries. What does the future hold? *World Anim. Rev.* **89**, 48–53.
- Kitalyi Aichij, (1998): Village chicken production systems in rural Africa. House holds food and gender issues. Food and Agriculture Organization of the United Nations: Rome Italy. Pp 81.
- Kinung'hi Safari M., Getachew Tilahun, Hafez M. Hafez, Moges Woldemeskel and Moses Kyule, (2004): Assessment of Economic Impact Caused by Poultry Coccidiosis in Small and Large Scale Poultry Farms in Debre Zeit, Ethiopia. *International Journal of Poultry Science* **3** (11): 715-718.
- Kondombo, S.R. (2005): Improvement of village chicken production in a mixed (chicken-ram) farming system in Burkina Faso. PhD Thesis, Wageningen University, Netherland.
- Mammo Mengesha, (2006): Survey on village chicken Production under Traditional Management Systems in Jamma Woreda, South Wollo, Ethiopia. M.Sc. Alemaya University.
- Mapiye, C., and Sibanda, S. (2005): Constraints and opportunities of village chicken production systems in the smallholder sector of Rushinga District of Zimbabwe. Livestock Research for Rural Development, (<http://www.cipav.org.co/lrrd/lrrd17/10/mapi17115.htm>).
- Muchadeyi F.C., S.Sibanda, N.T. Kusina, J.F.Kusina and S.M. Makuza., (2005): Village Chicken Flock Dynamics and the Contribution of Chickens to Household Livelihoods in a Smallholder Farming Area in Zimbabwe. *Tropical Animal Health and Production*, **37**: 333-344.

- NMCA (National Metrological Center Agency), (1999): Rain fall, humidity and temperature data. Addis Ababa, Ethiopia.
- Prabakaran, R., (2003): Good practices in planning and management of integrated commercial poultry production in South Asia. Food and Agricultural Organization of the United Nations: Rome Italy. Pp 97.
- Riise J.C., Permin A. and Kryger K.N., (2005): Strategies for Developing Family Poultry Production at Village Level – Experiences from West Africa and Asia. *World's Poultry Science Journal*, Vol. 61, March 2005.
- Romona Mary, (2005): A Study to Determine causes of Mortality and the Effect of Infectious Bursal disease (IBD) Vaccination in village Chickens in Taita Taveta District of Kenya. M.Sc. Thesis, The Royal Veterinary and Agricultural University, Denmark.
- Samuel Menbere, (2005): Characterization of livestock Production on System: A case study of Yerer Watershed, Adaa Liben District of East Showa, Ethiopia. M.Sc. Thesis, Alemaya University, Alemaya, Ethiopia.
- Sonaiya, E.B., (1990): The context and prospects for development of smallholder rural poultry in Africa. Proceedings CTA International Seminar on Smallholder Rural Poultry Production, Thessaloniki, pp. 35–52.
- Sonaiya, E. B. and Swan, S. E. J (2004): Small-scale Poultry Production. Animal Production and Health Paper 1. FAO, Rome, Italy.
- Spradbrow, P.B., (1994): Newcastle disease in village chickens. *Poultry Sci. Rev.* **5**, 57–96.

- Spradbrow, P.B., (1998): Protection against Important Diseases Including Newcastle Disease 1996. XX World's Poultry Congress, 2–5 September, 1996, New Delhi, India.
- SPSS, (2002): Statistical Package for Social Science, USA.
- Tadelle, D. (1996): Studies on village poultry production systems in the central highlands of Ethiopia. M.Sc. Thesis. Swedish University of Agriculture Sciences, Uppsala, Sweden.
- Tadelle D and Ogle, B., (2001): Village poultry production systems in the central highlands of Ethiopia. *Tropical Animal Health and Production*, **33**(6), 521-537.
- Tadelle, D., Kijora, C. and Peters, K. J. (2003a): Indigenous chicken ecotypes in Ethiopia: growth and feed utilization potentials. *International Journal of Poultry Science*, **2** (2):144-152.
- Tadelle, D., Million, T., Alemu Y. and Peters, K. J. (2003b): Village chicken production systems in Ethiopia: use patterns and performance valuation and chicken products and socio economic functions of chicken. Debre Zeit Agriculture Research Center, Debrezeit, Ethiopia.
- Tadesse, G. (2005): Investigations into Technical Interventions to Improve Rural Poultry Production Systems in South Wello Zone. M.Sc. Thesis, Alemaya University, Ethiopia, Alemaya, Ethiopia.
- Tadesse, S., Ashenafi, H. and Aschalew, Z. (2005): Seroprevalence study of Newcastle disease in local chickens in central Ethiopia. *Intern. J. Appl. Res. Vet. Med.*, **3**: (1): 25-29.

Thekiso, M.M.O., P.A. Mbatia and S.P.R. Bisschop, (2004): Different approaches to the vaccination of free ranging village chickens against Newcastle disease in Qwa-Qwa, South Africa. *Veterinary Microbiology* **101**: 23-30.

Udo, H. M. J., Asgedom, A. H. and Viets, T. C. (2006): Modelling the impact of interventions in village poultry systems. *Agricultural Systems* **88**: 255-269.

8. ANNEX I

QUESTIONNAIRE ON CAUSES OF VILLAGE CHICKEN MORTALITY AND INTERVENTIONS BY FARMERS IN ADA'A DISTRICT, ETHIOPIA

Socio-Economic characteristics and farming system characteristics

1. General Information

Enumerator

Farmers Name (decision maker regarding poultry)

Peasant association

Village

Household

Date

2. Level of education of the decision maker: -----

3. Age of respondents: -----

4. Sex of the respondents: -----

5. What do you do for living? -----

6. If you cultivate land, what is the size of your farmland? -----

7. What are the most important crops you are currently producing? Please, list in the order of importance.

8. Which species of livestock comprise your livestock herd?

Livestock species	Number
Cattle	
Sheep	
Goat	
Donkey	
Mule	
Horse	
Others	

A. POULTRY PRODUCTION SYSTEM

1. History of the farm and objectives

1.1. When did you start keeping chicken?

1.2. What was your source of foundation stock?

1.3. Which breeds and types (layers, broilers) of chicken comprised your foundation stock?

1.4. What is/are your objectives of keeping chicken in your farm?

2. Chicken flock composition and dynamics

2.1. What breeds and types of chicken do you have currently?

Chicken type	Number of chicken by breed		
	Exotic	Hybrid	Local
Hens			
Pullets			
Chicks			
Cocks			
Cockerels			

2.2. Was there any increment to the chicken flock in your farm last year? If yes, specify the reason.

Chicken type	Number of chicken added to the farm by breed			Reason
	Exotic	Hybrid	Local	
Hens				
Pullets				
Chicks				
Cocks				
Cockerels				

2.3. Was there any disposal from the chicken flock in your farm last year? If yes, specify the reason.

Chicken type	Number of chicken disposed from the farm by breed			Reason
	Exotic	Hybrid	Local	
Hens				
Pullets				
Chicks				
Cocks				
Cockerels				

3. Management of chicken

3.1. Who is responsible for the attendance of the chicken?

3.2. Where do chicken spend the daytime? (housed or scavenging?)

3.3. Do chickens have a night shelter? If yes, specify the type after observation

3.4. Do you clean the chicken house/shelter? If yes, how frequent?

3.5. How do you clean the chicken shelter/house? Do you use chemicals? If yes, please, try to specify.

3.6. If your chicken are confined, what are the feed stuffs you use to feed your chicken?

Please, specify the types for chicks and adult chickens

3.7. Would you please classify the feedstuffs you mentioned above as off-farm and on-farm?

3.8. If you are confining your chicken, do you know the quantity of feed supplied to each chicken per day? If yes, specify the quantity of each type of feed item supplied to each type (age group) of chicken.

3.9. If your chicken are confined, do you provide them with green feed? If yes, which types of green feed do you supply?

3.10. From where do you get the off-farm supplemental chicken feed?

- 3.11. If you let your chicken to scavenge, is there a special area meant for scavenging chicken (specially enriched with vegetation)? If yes, how do you prepare the scavenging area?
- 3.12. What is the source of water for your chicken? How frequent do you supply water to chicken?
- 3.13. How far is the water source from the chicken house?
- 3.14. What type of drinkers (containers) do you use to provide water to chicken?
- 3.15. What type of feeder and how frequent?

4. Breeding and reproduction

- 4.1. What is your source of replacement flock?
- 4.2. Are you hatching chicken on farm? If yes, what type of brooder are you using?
- 4.3. Are you buying replacement stock from other sources? If yes, from which sources?
- 4.4. Have you ever encountered loss of eggs set for hatching/ reduction of hatchability to a level close to zero?
- 4.5. If yes, what do you think is the major reason?

5. Chicken health management

- 5.1. Do you encounter disease and parasitic problem in your farm?
- 5.2. If the answer is yes for the previous question, what are the major health problems affecting your chicken? If you cannot give names, please indicate clinical signs.

Names of major diseases (local name)	Affected age group	Clinical signs
---	---------------------------	-----------------------

- 5.3. Which disease problems are causing high losses (mortalities) in your farm?
- 5.4. Which age groups/types of chicken are lost more by each disease mentioned above?
- 5.5. Do you get veterinary service for your chicken? If yes, from where do you get the service?
- 5.6. Do you vaccinate your chicken for diseases common in your area? If yes, for which diseases?
- 5.7. What are disease transmitter? List
- 5.8. What do you do to chickens affected by diseases? (regarding treatment, isolation and culling)

- 5.9. If you are treating your chicken, which method of treatment do you follow?
(traditional or modern or both)
- 5.10. If you are using traditional treatment, which types of traditional practices are you using for the different health problems affecting your chicken flock?
- 5.11. Do you practice any sort of prevention activity against entry of disease to your farm? (biosecurity measures) If yes, specify the measures?
- 5.12. If you are buying replacement stock from other sources, do you require information from the source about the health status (vaccination for major diseases) of the chicken you are receiving?
- 5.13. What do you do to the body of dead chicken (due to disease problems)?
- 5.14. Is there any specific season, when the disease problem is becoming high? If yes, which season is favoring each health problem you mentioned above?
- 5.15. Do you have any sort of strategy to avoid the effect of the season with high disease prevalence on your chicken flock?

6. Mortality of chicken

- 6.1. What are the most important causes of chicken mortality in your farm? Please, list in the order of importance.
- 6.2. In which type of chickens is the mortality is more serious? Try to associate chicken type with the causes of mortality listed above.
- 6.3. Is there any seasonal variation in chicken mortality in general? If yes, could you please specify the pattern?
- 6.4. If there is a loss due to predators, what are the most common predators preying your chicken flock? Please, list in the order of importance?
- 6.5. Is there any seasonal variation in losses due to predators? If yes, please, specify the pattern.
- 6.6. If there is loss due to bad weather conditions, which weather condition is causing the highest mortality and which groups of chicken are lost?
- 6.7. If there is cannibalism in your chicken flock, which group of chicken are more affected?
- 6.8. Is there any specific condition favoring cannibalism in your chicken flock? If yes, please, specify.

6.9. What are your major interventions to control chicken mortality in your chicken due to predators? Please, rank the intervention measures based on their efficacy.

6.10. What are your major interventions to control chicken mortality in your chicken due to bad weather conditions? Please, rank the intervention measures based on their efficacy.

6.11. Is there a time through the year(s) when you faced shortage of feed to your chicken? If yes, specify the time/season/year.

6.12. Have you ever encountered losses of chicken due to feed shortage? If yes how serious was the loss (low, moderate or high)?

6.13. What did you do during the chicken feed shortage, to alleviate the problem?

7. Performance of chicken

7.1. How many times do your chicken lay egg per year (clutch frequency)?

7.2. What is the number of eggs you get from your chicken per clutch?

7.3. What is the number of eggs you set for incubation?

7.4. How many eggs would hatch from a clutch?

7.5. How many of the chicks would be weaned?

9. DECLARATION SHEET

This thesis is my original work, has not been presented for a degree in any other university and that all sources of material used for the thesis have been duly acknowledged.

Name: Selam Meseret

Signature _____

Date of submission _____

Advisor

Name: Dr. Kelay Belihu

Signature _____

Date _____