ASSESSMENTS OF INDIGENOUS CHICKENS PRODUCTION SYSTEMS AND SOME EGG QUALITY PARAMETERS IN SHEBEDINO DISTRICT, SIDAMA REGION ETHIOPIA

BY

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ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
CSA	Central Statistical Agency
DA	Development Agent
EARO	Ethiopian Agricultural Research Organization
ESAP	Ethiopian Society of Animal Production
FAO	Food and Agricultural Organization
HH	Household
ILRI	International Livestock Research Institute
IFAD	International Fund for Agricultural Development
Masl	Meters above sea level
NCD	Newcastle Disease
RK	Rural Kebele
SAS	Statistical Analysis System
SFRB	Scavenging Feed Resource Base
SNNPRS	Southern Nations, Nationalities and Peoples' Regional State
SPSS	Statistical Package for Social Sciences
USAID	United States Agency for International Development

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ABSTRACT

This study was conducted in two agro-ecologies of Shebedino district to generate information on the existing production system, marketing and egg quality traits of indigenous village chicken. A total of 140 indigenous chicken owners from Highland and Midland and 30 market participants from the two selected market places (Lekuand Telamo) were included in the study.

For marketing survey, a randomly selected sellers, buyers and intermediaries were interviewed from each of the two selected market places and market chain of village chicken and eggs in the district was mapped accordingly. A total of 120 eggs from the interviewed chicken owners in the district were collected to evaluate egg quality traits of indigenous village chickens. All the data collected were analyzed using SPSS and SAS.

The result of the study showed that the average chicken holding in the area was 9.16 birds per HH. Majority of the respondents (93.6%) in the study area practiced scavenging with supplementation. The vast majority of the respondents (90%) also provided water for their chicken. The 95% interviewed HH'S not had separate poultry house. The result of the study also revealed that Newcastle disease (85%) was the most dominant chicken disease followed by Coccidiosis (14%). Mean age at first egg, clutches per year and clutch length were 7.6 months, 3.85and 15.95 days, respectively. Average eggs per hen per clutch were 14.85 with annual egg production of 59.4 eggs per bird.

The overall mean hatchability was 75%. Village chicken were predominantly possessed and managed (65%) by women. Majority of the respondents (88.6%) kept chicken for sale as an immediate source of cash for basic HH necessities of the owners. 44.7% and 76.4% of the respondents also highlighted that they kept chicken for home consumption and stock replacement, respectively. The overall mean egg weight 41.5gm , shell thickness 0.3mm, albumin height 21.2gm, Yolk weight(15.29g) ,Yolk colour 9.38, Yolk height(15.58mm)

Key words*: Egg quality, Shebedino district, Marketing system, Production performance and Indigenous chicken*

1. INTRODUCTION

Animal production in general and chickens in particular play important socio-economic roles in developing countries (Alders, 2004; Salam, 2005). Population growth, urbanization and rising income in many parts of the developing world have caused a growing demand for food of animal origin. According to the World Watch Institute (2011), 74% of the world's poultry meat, and 68% of eggs are produced in ways that are described as 'intensive' in the year 2011. In many parts of the world, poultry are kept as scavengers in and around the residence areas of the human beings. Almost all rural and urban families in developing countries keep a small flock of free range chickens (Jens et al., 2004). Village chickens are also an integrated component of nearly all-rural, many peri-urban and some urban households and accounts for more than 60% of the total national chicken population in most African countries (Sonaiya, 2004). The local chicken ecotypes remain predominant in African villages. Poultry farming is widely practiced in Africa almost every farmstead keeps some poultry mainly for consumption and cash sales. Religions and cultural considerations are also amongst the reasons for keeping chickens by resource poor farmers in Africa (Dwinger et al., 2003). Similarly, households in Ethiopia keep birds for household consumption, sale and reproduction purposes including other social and cultural roles (Tadelle and Peter, 2003). Estimating the economic value of rural poultry is more difficult than for other livestock because of the lack of reliable production data. However, the rural poultry in Africa believed to be a viable and promising alternative source of cash income for the rural resource poor women. In most of the cases, the earnings from the sale of eggs and chickens had spent in direct relation to nutrition, health and education of the family (Pederson et al., 2001).

In Ethiopia chickens are the most widespread and almost every rural family owns chickens, which provide a valuable source of family protein and income (Tadelle *et al.*, 2003).The total

chicken population in the country is estimated to be 56.5 million with native chicken representing 96.9%, hybrid chicken 0.54% and exotic breeds 2.56% (CSA, 2014). The most dominant chicken types reared in Ethiopia are local ecotypes, which show a large variation in body position, plumage color, comb type and productivity (Halima, 2007). However, the economic contribution of the sector is not still proportional to the huge chicken numbers, attributed to the presence of many productions, reproduction and infrastructural constraints (Aberra, 2000; Halima, 2007).

The chicken production system in Ethiopia can be characterized by not market oriented, low input, scavenging and traditional management system consisting of local breeds (Alemu and Tadelle, 1997). The most dominant chicken production system in south region is free range /scavenging type/ using a majority (95.8%) of local chicken ecotypes, with only seasonal feed supplementation, Scavenging only (2.5%), scavenging with regular feed supplementation (21.9%) and intensive production system (0.63%) (Fisseha *et al*., 2010). Rural household poultry is affordable source of animal protein and sources of family income. Poultry is a source of self-reliance for women since, poultry and egg sales are decided by women (Aklilu et al., 2007) both of which provide women with an immediate income to meet household expenses and sources of food. 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. Thus household poultry of the Ethiopian indigenous chicken has a unique position in the rural household economy and plays a significant role in the religious and cultural life of the society (Tadelle and Ogle, 1996a). However, the contribution of the indigenous chicken resource to human nutrition and export earnings is disproportionately small. All the available literature tends to indicate that the per capita poultry and poultry product

consumption in Ethiopia is one of the lowest in the world: 57 eggs and 2.85 kg of chicken meat per annum (Alemu, 1995).

The indigenous flocks are considered to be very poor in egg production performance, attributed to the low genetic potential (slow growth rate, late sexual maturity and broodiness for an extended period). The low productivity of local scavenging chickens is not only because of their low egg production potential, but also due to high chick mortality and longer reproductive cycle. About 40-60% of the chicks hatched die during the first 8 weeks of age (Hoyle, 1992, Tadelle and Ogle, 1996a) mainly due to disease and predators attack. About half of the eggs produced have to be hatched to replace chicken that have died (Tadelle and Ogle, 1996a), and the brooding time of the laying hens is longer, with many brooding cycles required to compensate for its unsuccessful brooding. It is estimated that, under scavenging conditions, the reproductive cycle of indigenous hens consists of 20-days of laying phase, 21-days of incubation phase and 56-days of brooding phase (Alemu and Tadelle, 1997). One and the major suggested solution to increase the production and productivity of chicken is utilization of chicken production system which is modern, market oriented and compatible with the existing situation of the farming system. Therefore, by minimizing the production constraints through use of selected and productive poultry breed as well as improvement of the production system (feeds and feeding, housing, health, etc), it is possible to supply chicken products for the market demand over the household consumptions with the following objectives:-

1.1 Objectives

1.1.1 General objective:-

- To assess the existing indigeneous chicken production systems and evaluate egg quality parameters in Shebedino District of Sidama region

1.1.2 Specific objectives:-

- To assess management practices and socio-economic functions of village chicken in the study area
- To investigate marketing channels and key actors in the poultry marketing system
- To identify major constraints and opportunities for improvement of village chicken production system in the study area
- To determine egg quality traits of indigenous chicken in the study area

2. LITERATUR REVIEW

2.1 Characterization of smallholder poultry production systems

Poultry is a name given to domesticated birds kept by humans for the eggs they produce, their meat or feathers. It includes chickens, ducks, pigeons, turkeys, guinea fowls, geese, quails, ostriches and doves kept by humans. Poultry is very often used as synonymous to chicken as they are more commonly found and are of great importance for meat and egg (Augustine and Shukla, 2015). Poultry species are originated from south East Asia and domesticated from red jungle fowl. Four wild species of the jungle fowl is existed such as the red jungle fowl (Gallus gallus), the grey jungle fowl (G. sonnerrati), the ceylon jungle fowl (G. lafayettei) and the green jungle fowl (G. varius) (Addis, 2014). Domestication of poultry is said to have started in Asia and there is evidence of domesticated chickens in China that goes back to 3000 BC. It is believed that today's breeds originated in India, since the earliest record of poultry dates back to about 3200 BC in that country (Daghir, 2008).Nowadays, indigenous village chickens are the result of centuries cross-breeding with exotic breeds and random breeding within the flock. As a result, it is not possible to standardize the characteristics and productive performance of indigenous chickens (Sonaiya and Swan, 2004). In Ethiopia ostriches, ducks, guinea fowls, doves and pigeons are found in their natural habitat (wild) whereas, geese and turkey are exceptionally not common in the country. Thus, the word poultry production is synonymous with chicken production under present Ethiopian conditions (Meseret, 2010 citing EARO, 1999). Indigenous chicken don't have phenotypic standards and their classification is given based on colours and name of place where they are identified. Extensive production system is the dominant management practice of chicken with small feed supplementation (Addis, 2014).

The modern poultry sector in Ethiopia comprises a few small to medium scale semi-commercial producers and even fewer large-scale commercial farms. These producers, especially large-scale farms, have strong backward and forward linkages in the economy. Large-scale commercial poultry farms involve a highly intensive production system with 10,000 or more birds kept under indoor conditions with a medium to high bio-security level. This system depends heavily on imported exotic breeds that require inputs such as feed, housing, healthcare, and a modern management system (Alemu et al., 2008).

2.2. Production and productivity of village chicken

Up to present, the domestic chicken sector has been dominated by traditional production practices, and local breeds represent almost 98% of the national poultry flock (FAO, 2008a). Indigenous chickens are widely distributed in the rural areas of tropical and subtropical countries where they are kept by the majority of rural poor. Indigenous chickens in Africa are in general hardy, adaptive to rural environments, survive on little or no inputs and adjust to fluctuations in feed availability (Halima, 2007).

Ethiopian chickens have a variety of morphological appearance. They vary in colour, comb type, body conformation and weight, and may or may not possess shank feather. Eggs have thick shells and deep yellow coloured yolk. Indigenous chickens, however, have low productivity, annual egg production is estimated at 60 eggs (average 38g); while the carcass at 6 months of age is about 0.5kg from a live bird of about 1.5kg. Low productivity is also due to low or medium hatchability at about 70% and high mortality. Estimated 4060% of chicks die during their first eight weeks mainly due to disease and predators (FAO, 2008a citing Demeke, 2007). Indigenous village birds in Ethiopia attain sexual maturity at an average age of seven months

(214 days). The hen lays about 36 eggs per year in three clutches of 12 to 13 eggs in about 16 days. If the hen incubates her eggs for three weeks and then rears the chicks for twelve weeks, then each reproductive cycle lasts for 17 weeks. Three cycles then make one year. These are very efficient, productive and essential traits for survival (Sonaiya and Swan, 2004).

The native hens exhibited signs of broodiness and sit on their eggs for hatching. Egg production ceases during that period. They were sold from 6-8 months of age for meat purpose when they weigh around 700 - 1400 g. The average age at start of lay was 195 $\pm$ 28 days, with a range of 183 - 245 days. Mean body weigh ranging from 985 to 1113 g. Average egg production per clutch was 15 - 20 with 3 - 4 clutches per year (Tadelle, 1996).Sonaiya (1999) reported that, there were three production systems for family poultry-free range, backyard and small scale intensive with productivity of 20 - 60, 30 - 100 and 80 - 150 eggs/hen/year respectively. Body weights of 1.2 kg and 800 g were obtained at 32 weeks for normal size and dwarf breeds of local chicken in free-range system.

2.3. Chicken production systems in Ethiopia

Poultry sector in Ethiopia can be characterized into three major production systems based on some selected parameters such as breed, flock size, housing, feed, health, technology and bio-security (Alemu et al., 2008). These are village or backyard poultry production system, small scale poultry production system and commercial poultry production system. Backyard poultry production system is characterized by a low input (scavenging is almost the only source of diet), low input of veterinary services, minimal level of bio-security, high off-take rates and high levels of mortality (Alemu et al., 2008). In terms of bio-security, the backyard poultry producers use inputs with little or minimum external inputs, which include poor quality feed; mixed cereals;

local breeds sometimes combined with improved breeds obtained from extension services or neighboring farmers; minimal veterinary services from Bureau of Agriculture; local labour and traditional housing systems (Aila et al., 2012). Indigenous poultry are local birds whose rearing system is characterized by extensive scavenging management, no immunization programs, increased risk of exposure of birds to disease and predators, and reproduction entirely based on uncontrolled natural mating and hatching of eggs using broody hens, where there is no or minimum intervention to maximize their production and reproductive performance (Bushra, 2012; Wanjugu, 2015). Family poultry are kept under a wide range of conditions, known as production systems (INFPD/FAO/IFAD, 2012).

Village poultry is kept with minimal input of resources and is considered by most smallholders as supplementary to the main livelihood activities. The birds scavenge to find feed and are rarely provided more than kitchen leftovers, although supplementation with cheap grains or leftovers from the keepers' own grain production does occur. Sheds, if provided, are made of local materials. Poultry keepers lose many birds as a result of diseases and exposure to predators, but little attention is paid to the health and protection of birds. The birds are mainly indigenous, sometimes mixed with foreign birds. The productivity of village poultry is low as a result of the above characteristics but the little output obtained from keeping poultry contributes to household income and provides access to high-quality protein, which is generally in short supply (FAO, 2010). In small scale commercial poultry production system, modest flock sizes usually ranging from 50 to 500 exotic breeds are kept for operating on a more commercial basis. Most small scale poultry farms are located around Debre Zeit town in Oromia region and Addis Ababa. This production system is characterized by medium level of feed, water and veterinary service inputs and minimal to low bio-security (Alemu et al., 2008). Large-scale commercial poultry

production system is a highly intensive production system that involves, on average, greater or equal to 10,000 birds kept under indoor conditions with a medium to high bio-security level. This system heavily depends on imported exotic breeds that require intensive inputs such as feed, housing, health, and modern management system. This system is characterized by higher level of productivity where poultry production is entirely market-oriented to meet the large poultry demand in major cities. The existence of somehow better bio-security practices has reduced chick mortality rates to merely 5% (Bush, 2006 cited in Alemu et al., 2008)

2.4. Importance of the village chicken production

Smallholder chicken production plays a major role in poverty alleviation and food security at household level. It provides off-farm employment and income generating opportunity and source of gifts and religious sacrifices (Wethli, 1995; Sonya, 1990a; Gueye, 2003; Tadelle and Ogle, 2001; Sonaiya, 2000). Scavenging chicken also serve in waste disposal system by converting leftover of grains and human foods and insects in to valuable protein foods-egg and meat (Doviet, 2005). The smallholder poultry production considered as an income-yielding activity that fits well with the concept of small-scale agricultural development. Moreover, land, which is a critical production resource in rural Ethiopia, is not a limiting factor in the smallholder chicken production systems.

Village chicken products are often the only source of animal protein for resource-poor households. Eggs are a source of high-quality protein for sick and malnourished children under the age of five. Due to their small size and fast reproduction compared to most other livestock, chicken are more often slaughtered and eaten in the household (Delgado et al., 1998). However, according to Tadelle et al. (2003) only 32% of the animal protein needs of the household are

supplied from poultry. Although the smallholder rural poultry production plays a significant role in the national as well as in the rural and pier-urban economy, their contributions to farm household as well as national income are not as high as their number.

The per capita chicken meat and egg consumption in the country reported to be 2.85 kg and 57 eggs per annum (Alemu and Tadelle, 1997) with the higher meat consumption in urban areas than in rural areas (Kena et al., 2002). 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). Future prospects for rearing village chickens believed to be promising as there is traditionally high demand for their meat and eggs that perceived to be flavorsome and of higher quality than that of exotic breeds (Crawford, 1992). By its numerical importance, rural poultry contributes to the protein supply of the human population. Thus, for its role in the supply of chicken and eggs and source of income for resource poor women, the smallholder rural poultry production in the country cannot be neglect.

2.5. Socio-economic and Cultural Significance of Chicken Production

If village poultry are significant for their nutritional or economic value, they also play a significant role in human society through their contribution to the cultural and social life of rural people. The gift of a chicken is often, in many parts of Africa, a way of welcoming high status visitors or honouring affines and kin. Birds are also frequently sacrificed, in some cultures the entrails of dead birds are consulted as oracles (Aklilu, 2007). Birds are given away as gifts, they are sacrificed to ancestors and divinities, or they are consumed as part of ritual and secular celebrations, thereby strengthening important social bonds. In some societies, chickens may be used to foretell the future through divination rites. As such, poultry play an important cultural

and social roles as well as being used to meet individual economic goals (FAO, 2010). Poultry are used for strengthening marriage partnerships and social relationships. In the local culture, particularly in the remote areas of Tigray and Amhara regions, women who can provide men with food like a chicken dish (Doro wot) are considered to be contributing to a stable marriage. Serving Dorowot is also a demonstration of respect to guests, thus strengthening a social relationship which is especially important for poor households. For the poor, poultry meat is the only special meal they can afford during religious festivities like New Year, Christmas and Ester. Church leaders and attendants are also served with chicken dishes (Aklilu et al., 2007).

2.6. Decision Making and Ownership

Women play important roles in the livestock value chains. When women own livestock, it constitutes an important component of their asset portfolio, being an asset that they can easily own and that is not bound by most of the legal and property rights issues such as land (USAID, 2013). Chicken production in the home is mainly the business of the women, who manage them freely and without any traditional feedback required of the husband. This provides for a measure of economic security to the women in the house (FAO, 2008a). According to a study conducted in Machako, Kenya, 57% of the local indigenous poultry are owned by women, indicating the responsibility of taking care of the indigenous local poultry likely to be done by women is 67% (Wanjugu, 2015). The same author reported that women are the main decision makers (60%) regarding slaughter and sale of the indigenous local poultry.

The finding is consistent with Justus et al. (2013) who reported that women were the majority (76%) with men representing only 24% of the sampled farmers keeping indigenous chickens in Western Kenya. A study carried out by Samson and Endalew (2010) in Mid Rift Valley, Oromia,

Ethiopia also revealed that majority of village chicken production (92.4%) was owned by women and children.

Though women are central in poultry keeping, they may be expected to consult men before making decisions about the birds. Surveys carried out in some African countries revealed that women are more involved in activities related to the poultry farming. However, the management of poultry is generally not left to women alone. All household members participate in the management of poultry. Thus, women are not usually the marketers of chickens, especially when the place of sale is far from the house, men and children (boys) being usually more involved in the marketing of live birds and their products. Men and children are also responsible, to a large extent, for the construction of shelters (Gueye, 2007).

Division of labour among household members is another gender aspect that has to be addressed. It was found that all gender groups are involved in poultry management. Construction of shelters was mainly done by men, or by men and children. Results also showed that, in Ethiopia, management of chickens was fully in the domain of women and children. Women manage and prepare nests for laying and brooding, especially where fostering of eggs or chicks was practiced (Alemu et al., 2008).

2.7. Smallholder Chicken Production and Management Practices

2.7.1. Feeding and watering

Egg production and the birds' growth are limited by access to feed and their genetic potential. Local birds living in the villages are normally the best converters of feed to eggs under fluctuating environmental conditions, although their production potential is much lower than genetically improved breeds (Riise et al., 2004). In Ethiopia, in village poultry production

systems birds are usually kept under free range system and the major proportion of the feed is obtained through scavenging. The major components of Scavenging Feed Resource Base (SFRB) are believed to be insects, worms, seeds and plant materials, with very small amount of grain and table leftover supplements from the household (Tadelle and Ogle, 2000). The assessment result of poultry feeding and watering by Desalew et al. (2013b) in Ada'a and Lume districts of East Shewa, Ethiopia indicated that the dominant system of poultry feeding practiced in the study area is free scavenging with supplementary feeding and very small proportion of commercial ration supplementation. This is in agreement with that of Bosenu and Takele (2014) who reported the absence of purposeful feeding of rural chickens in Ethiopia. According to Desalew et al. (2013b) information recorded for frequency of watering revealed that about 96% of the respondents provided water with free access in Ada'a and Lume districts. Getu and Birhan (2014) also reported that nearly all the respondents in the study area (North Gondar Zone) provide water ad libitum for their chickens.

2.7.2. Housing

Poultry house protects chickens from predators, theft, rough weather (rain, sun, wind and temperature) and provide shelter for egg layers and broody hens (Getu and Berhan, 2014). Although no data are available about housing at national level, the local birds are set free on free range whereby they move freely during the day and spend the night in the main house. Overnight housing, perched in trees or on the roofs and overnight housing within the main house are the common patterns of housing prevailing in the country (Mekonnen, 2007).

2.7.3. Chicken health management

Unlike in commercial set-ups many factors influence the health of smallholder chicken populations. Such complex phenomena make it even more difficult to design improvement strategies to overcome health constraints (Mapiye et al., 2008). Backyard poultry move freely between families in the village. Movement can also be from household to local market for sale, from market to household in case of unsold chicken or in form of gift from household to household. This free movement of backyard poultry could contribute to the transmission of many infectious diseases in the backyard system (Alemu et al., 2008). A study carried out by Hunduma et al. (2010) indicates that 44% of farmers in Rift valley, Oromia usually treat sick chickens using traditional medicine whereas others (41%) do nothing. Only 11% of the respondents consult veterinarians when their chickens get sick. According to Mekonnen (2007) most of the farmers (87.6%) use traditional remedies, which usually administered through drinking water, whereas few (12.4%) use modern

2.7.4 Marketing systems of Chicken

Village poultry owners produce birds for consumption, for gifts, sacrifice and other purposes, and not least for sale to earn cash during critical cash shortage time particularly by poorer household. Market demand, structure, prices, trends and seasonality influence income opportunities from poultry production (FAO, 2010). The informal marketing of poultry and poultry products at open markets is common throughout the country and both live birds and eggs are sold on road sides. Almost every little shop or kiosk sells 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 can be transported over long distances to supply urban markets live birds are transported either on foot or using public transportation along with other bags, sacks of grains and bundles of fire wood. The farmers directly sell their chickens to consumers and/or to small retail traders who take them to large urban centers. At all the market areas, chicken buyers are made up of traders, direct consumers, restaurants, farmers and small scale urban chicken keepers. In the primary markets, producers are the predominant sellers, while in the secondary markets both producers and traders sell chickens. In the terminal markets, small traders are predominant sellers. Small traders operate on a very small scale and the volume of trade ranges from 10 – 50 chicks (FAO, 2008b). A study conducted in Ethiopia by Aklilu et al. (2007) indicated fluctuations across the months of the year in sales as well as in consumption of both birds and eggs. The highest bird sales and consumption overlapped with the major social and religious festivals of the year. These are Ethiopian New year (September 11), Ethiopian Christmas (January 5), Ethiopian Epiphany (January 19), Ethiopian Ester (April), and St. Mary's day (August) (Aklilu et al., 2007).

The major channels through which producers/farmers sell their chicken in the markets are direct sold to consumers and/or to small retails that take the chicken to large urban centers (Kena et al., 2002). However, the smallholder farmers do have little knowledge on how the market works and why price fluctuates and have virtually no information on market conditions (Sonaiya, 2000). Thus, most farmers sell chickens within their vicinity. This can attribute to the small number of chickens offered for sale, long distance to the high demanding urban and pier urban markets and that selling of chickens is occasional and based on prevalent pressing needs of the family (Kena

et al., 2002). Although local consumer generally prefers the indigenous birds the high consumption associated only with holy days resulted in the largest off take rates from the flock to occur particularly during holidays and festivals and during the onset of disease outbreaks (Tadelle and peter, 2003). In such circumstances, prices fall dramatically due to the high supply compare to demand. Ultimately, affect the smallholder producers. In most cases, traders use public transportation (buses and minibuses) or hire space in private trucks to transport chicken to terminal markets. During transportation, the chickens may be kept along with other bags sacks of grain bundles of firewood etc by binding their legs together that can result in considerable lose due to stressful conditions (Kena, 2002). The marketing aspects of the smallholder poultry production often marginalized by policy-makers and development workers. Traditional chicken and egg collectors, who collect eggs and birds from the villages, can facilitate the marketing of small holders however, such marketing structure are over looked, or criticized, as it is not sustainable. These indicate that there is a need to do something on this regards.

2.8 Egg Quality Traits

Egg is one of the most nutritious foods available to man. It provides a balanced protein which contains all the amino acids considered essential in sufficient amounts and proportion to maintain life and support growth when used as a sole source of protein food (Raji et al., 2009 citing Ricketts, 1981). Egg quality comprises a number of aspects related to the shell, albumin and yolk and may be divided into external and internal quality (Kul and Seker, 2004 cited by Raji et al., 2009). Both external and internal qualities of eggs are of major importance to the egg industry worldwide. However, they are not being given due attention in the developing world where the majority of the eggs are coming from free scavenging village chickens as compared to that of the developed world (Aberra et al., 2012).

Haugh Unit, a measure of albumin quality and therefore freshness of the egg, is determined using the formula below (Raji et al., 2009): HU = 100 log (H + 7.6 – 1.7W0.37), where: HU = Haugh Unit; H = Height of albumin; W = egg weight (grams) Study has shown in UK that there is a consumer resistance to purchase eggs which have HU's below 60 (Niraj et al., 2014). Yolk colour is a key factor in any consumer survey relating to egg quality (Okeudo et al., 2003 cited by Niraj et al., 2014). Halima (2007) reported that the eggs collected from scavenging birds had a higher yolk color count because scavenging birds have free access to green plants and other feed sources rich in xanthophylls (plant pigment). According to Khan et al. (2004) cited by Niraj (2014) egg shell thickness is an important trait for hatchability. For best result of hatchability egg shell thickness should be between 0.33 and 0.35 mm and only few eggs with a shell thickness less than 0.27 mm will hatch. Eggs are available in different shapes. These shapes can be differentiated using shape index (SI). The shapes most often encountered are sharp, normal (standard) and round eggs which are enumerated on the SI as <72, 72-76 and >76, respectively (Niraj et al., 2014).

2.9 Major Constraints of Chicken Production

Poultry makes a substantial contribution to household food security throughout the developing world. It helps diversify incomes and provides quality food, energy, fertilizer and a renewable asset in over 80 percent of rural households. Small scale producers are however constrained by poor access to markets, goods and services; they have weak institutions and lack skills, knowledge and appropriate technologies. The result is that both production and productivity remain well below potential and losses and wastage can be high (Sonaiya and Swan, 2004). Lack of market, shortage of labor and feed, disease, predation, low production by local birds, neighborhood conflict, damage of garden and crops, theft, lack of knowledge (reproduction management), shortage of space and housing, lack of financial and capital and

effect on family members' health were the constraints mentioned by farmers' village poultry production (Aklilu, 2007).

2.9.1 Nutritional challenges

No planned feeding of chickens under traditional village production in Ethiopia and scavenging is almost the only source of diet. The scavenging feed resource base for local birds is inadequate and variable depending on season (FAO, 2008b). According to Fesseha et al. (2010) shortage of feed both in quality and quantity is one of the major constraints in village chicken production. Farmers had no clear idea in terms of the quality and quantity of supplementary feeds (Getu and Berhan, 2014).

2.9.2. Disease and predators

Poultry diseases are seriously affect village poultry production in Africa and therefore constitute one of its major threats (Gueye, 1999). Newcastle disease is identified as the major killer in the traditional system while other diseases including a number of internal and external parasites contribute to the loss. The incidence of Newcastle disease is widespread during the rainy season. It often wipes out the whole flocks when it strikes. In particular, it was found that poultry production drops by 50% during the rainy season (Alemu et al., 2008; Samson and Endalew, 2010; Getu and Birhan, 2014).

Predation is more common in free range chicken due to tendency of farmers to let their chicks scavenge with the mother hen from the first day due to increased feed cost in confined systems. With predators such as snakes, rats, dogs, cats and birds of prey as the main causes of losses especially in young birds, controlling them either by housing, trapping, hunting or using repellents are technologies farmers have adopted (Berg, 2001).

The Ethiopian indigenous flocks are said to be disease resistant and adapted to their environment. However, survival rates of chicks kept under natural brooding conditions is considered to be very low. Disease and predators are known to be the major causes of mortality in the country (Negussie, 1999).

2.9.3 Infrastructure and market constraints

Lack of organized marketing system and the seasonal fluctuation of price are the main constraints of poultry market in Ethiopia (Mekonnen, 2007; Hunduma et al., 2010; Matiwos et al., 2013). Bosenu and Takele (2014) reported that there is no formal poultry and poultry product marketing channel in the study area and informal marketing of live birds and eggs involving open markets are common throughout the district (Haramaya district). The farmers directly sell their chicken to consumers and/or to small retail traders who take them to large urban centers. Live chickens and eggs are sold either at the farm gate, small village market (primary market) or at larger district market (secondary market in the town) (Bosenu and Takele, 2014). According to Matiwos et al. (2013) almost all the respondents interviewed in Nole Kabba District, Western Wollega, Ethiopia reported that poultry and poultry product market price fluctuation is attributed to limitation in land holding, disease occurrence and low purchasing power of the consumers.

According to Bosenu and Takele (2014) about 100% of the entire respondents carry their chickens to market places either on foot or using public transportations causing physical injury and other complications on the chickens which in turn reduce the quality of the products. According to Aklilu et al. (2007) access to markets, highly determined by distance to the market, influences poultry markets. With increasing market access, the marketing chain between producers and consumers was shorter, which was associated with higher prices for both live birds

and eggs. It is clear that increased involvement of intermediaries leads to reduced prices for the producer. There was a price reduction of 68% for birds and 25% for eggs in the low-market-access location compared to the high-market access one (Aklilu et al., 2007). A further constraint to the marketing of traditional household poultry and products is the fact that there is no packaging and weight standardization of market eggs and the traditional storage methods can lead to deterioration of the quality of table eggs (FAO, 2008b).

2.9.4 Social and cultural constraints

Religious festival days are associated with increased poultry consumption and sales and fasting periods with decreased consumption. These patterns cause strong fluctuations in prices of poultry products. In addition to the fasting periods, most strict orthodox Christian households, especially in the rural areas, abstain from eating animal products on most Wednesdays and Fridays except for about two months after Ester (Aklilu et al., 2007). The market actors mentioned socio-cultural factors that influence the prices of individual birds in markets. Consumers prefer brown birds, and pay higher prices for them. Black colour is believed to bring bad fortune. White birds are considered agents of transmission of (human) disease between households. Type of comb is also considered: double-combed birds are preferred. Exotic birds such as White Leghorn, apart from being white, are not selected for consumption because they are single-combed (Aklilu et al., 2007). Another constraint is the social norm that determines ownership of livestock. Typically, where crop farming is the men's main activity, keeping livestock is perceived as a peripheral activity neglected to women and children. Practical experience indicates that there were no regular watering and supplementing feed and they do not clean the birds' night shelter and take care of the young chicks. Farmers are also reluctant to expand poultry farm. The

farmers' attitude to the sector makes the rural traditional poultry farming remain unchanged for a long time (Mekonnen, 2007).

3 MATERIALS AND METHODS

3.1 Description of the Study Area

The study was Shebedino District situated in Sidama Region of Ethiopia. The district is located at the Northern-central part of Sidama region at a distance of 27 km from Hawassa city, the capital city of region, and 302km from Addis Ababa, the capital city of Ethiopia. It is situated in the coordinates of 6º46' to 7º 45' North latitude and 39º 34' to 39º 53' East longitudes. The district lies between 1800 to 2950 m.a.s.l, receives between 900 to 1500 mm rain fall with mean annual temperature between 16 and 25ºc.

The climate of the District classified as mainly dega and woinadega. The two-agro-ecologies were stratified based on altitude. The District has total land areas of 27,690 hectares; the major land about 26,990 was occupied by rural house hold farmers while the remaining 700 hectares was hold by urban dwellers. The topography of the District is 8.57% mountain, 90.43% plateau and 1% others (SWADO, 2019). The main economic activity in the study area is, enset plantations, coffee, maize &cereal crop production, cattle fattening, apiculture, vegetables and different fruits (SWADO, 2019).

There are two rainy seasons of Belg (February to April) and Meher (June to September). The livestock population of the district is 197,369 chickens, 228,905 cattle, 46,684 sheep, 42,818 goats, 1,450 donkey, 25, horse and 29,071 honey bee colonies (SWADO, 2019).

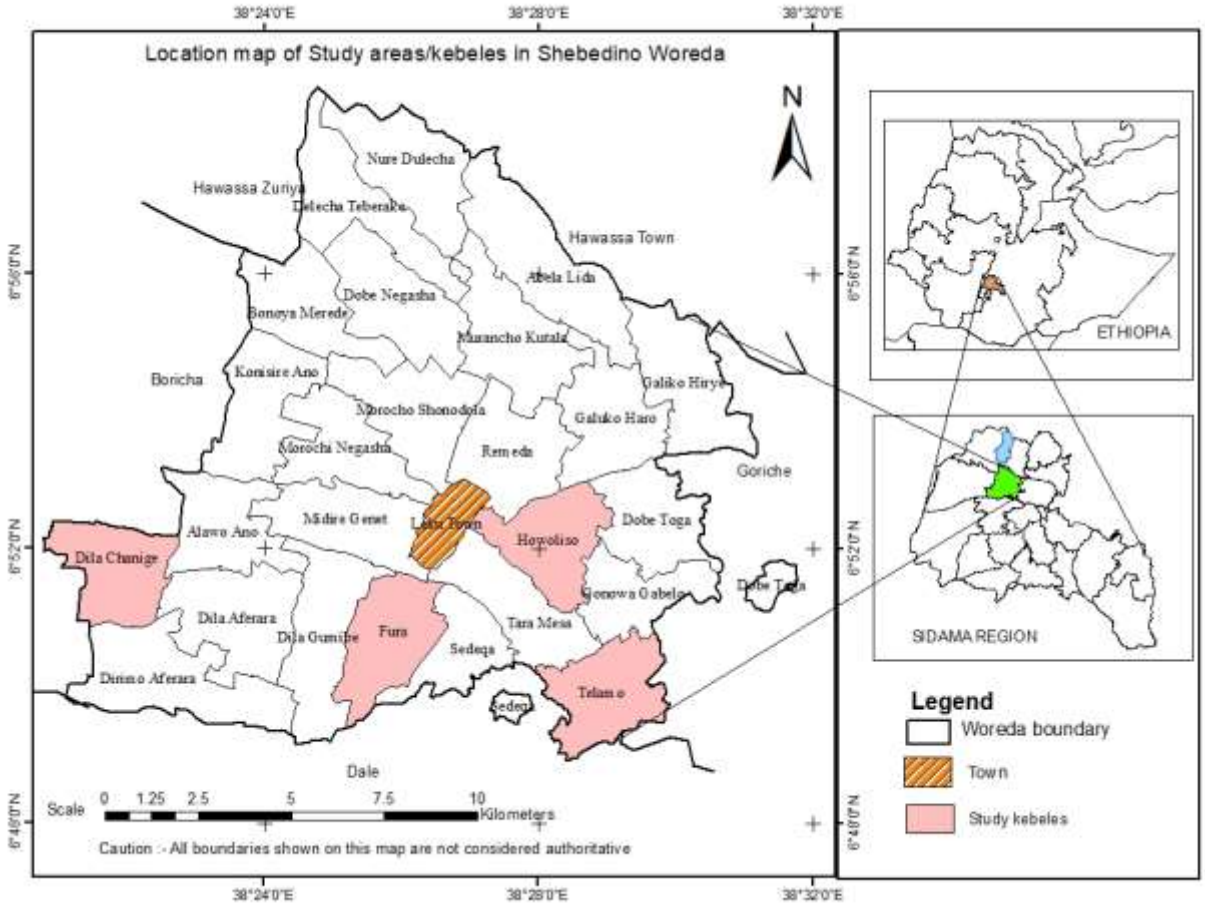

Figure 1. Figure 1 map of Shebedino district/study area

3.2 Research Methodology

The study comprised of survey and egg quality examination of village chickens in two agro-ecological zones (highland and mid land) of the study area. The survey part was accomplished through interview using pre-tested structured questionnaires and was augmented with focus group and key informant discussions and direct field observations.

3.2.1 Sampling techniques

Shebedino district has 25 kebeles and it is classified in two agro- ecologies namely highland and midland. From highland area Telamo and Bedicho Kebeles and from midland area Howolso and

Fura Kebeles were selected. To determine the sample households (HHs) for the study a multi sampling technique were employed. In the first stage four kebeles, two kebeles from each agro-ecology were selected purposively based on the potential and availability of indigenous chicken.

In the second stage, HHs who has at least three years of experience in chicken production possessing greater or equal to three indigenous chickens were purposively selected from each kebele.

3.2.2 Sample size and sampling methods

The sample size is determined using Yamane (1967) framework. This framework provides a simplified formula to calculate sample sizes. The sample size was determined as follows:

$$n = \frac{N}{1+N(e)2}$$

Where: n=Sample size

N= Population size

e= level of precision (e is assumed to be 7%).

$$n = \frac{715}{1 + 715(0.0049)2}$$

n= 140

Sampling proportion = n/N

n/N = 139/715 = **0.194**

3.2.3 Survey

The data for the study was collected from both primary and secondary sources. Primary data was collected using both formal and informal methods. Individual interview using pre-tested

structured questionnaires was employed to generate relevant household level data, and was augmented with focus group and key informant discussions and direct field observations.

The questionnaire was administered to the purposively selected households by a team of enumerators trained and recruited for the purpose with close supervision by the researcher. Enumerator selection was carried out by consultation of experts and local authorities from District Livestock Resources Development offices in the study area. To substantiate the information obtained from the formal interview, local agricultural development agents (DA's), local leaders and poultry owners were also interviewed informally to incorporate local knowledge on poultry production and marketing systems. Secondary data was obtained from Livestock and Fisheries Resources Office.

3.2.4 Statistical Analysis

Qualitative and quantitative data sets were analyzed using appropriate statistical analysis procedures. Statistical Package for Social Sciences (SPSS, Ver. 16.0) and Statistical Analysis System (SAS) version 20 were used for analysis. The descriptive statistics for numerical survey data was subjected to analysis of variance (ANOVA) using the general linear model procedure of SPSS to describe the fixed effect of agro-ecology. Experimental data for egg quality determination were subjected to ANOVA using the procedures of SAS procedure to analyze the fixed effect of agro-ecology and market place.

Statistical model for Survey: $Yij = \mu + Ai + Єij$ Where:

Yij – the value of respective variable μ – Overall mean of respective variable

Ai – the fixed effect of agro-ecology on the respective variable

Єij – random error

Statistical model for egg quality parameters:

a) Fixed effect of egg source (Farm gate): Yij = μ + Fi+ Єij Where:

Yij – the value of egg quality parameters μ – Overall mean of respective variable Fi – the fixed effect of farm gate on the respective variable Єij – random error

b) Fixed effect of egg source (market place): Yij = μ + Mi+ Єij

Where: Yij – the value of egg quality parameters μ – Overall mean of respective variable Mi – the fixed effect of market place on the respective variable Єij – random error

4 RESULTS AND DISCUSSION

4.1 Socio-economic Characteristics of the Household Farmers

According to the information obtained from Shebedino district office of livestock, the inhabitants of the study site practice were mixed farming (crop production and rearing of livestock). But small trade, government employment and daily work are also means of living. Cereals like wheat, barley, and vegetables like cabbage and carrot are the dominant crops produced in the highland areas. Maize, enset are dominant crops in the midland areas. Coffee is the dominant cash crop produced in many of the midland areas of the study site. Farming is generally seasonal, during the rainy season (mid May to mid September), with the exception of sub-district where irrigation is common. Demographic profile of village chicken owners in the study district is presented in Table 1. The average age of respondents in the district was 55.8 years. A considerable portion (48.57%) of the studied chicken owners was found between 31 to 40 years of age. The remaining 27.1% and 12% of the respondents were aged 20-30, and 41-50 years, respectively. A few (6.4% and 5.7%) of the interviewed farmers were <20 years and >60 years, respectively. Majority of the respondents (80.7%) in the study site were females, males accounting for only 19.3% indicating that females are playing a prominent role in poultry rearing and decision making. 92% of the respondents were married, while 5.7% and 2% of the respondents were unmarried and widowed respectively.

Educational background of respondents were, 32.8% of the respondents attended primary first cycle education (1-4). About 55% of the respondents had gone through primary second cycle education (5-8), 5.7% attended secondary education (9-12) and the remaining 6.4% of the

interviewed farmers were illiterate. Majority of the respondents (97.8%) were male headed, while only 2.1% of them were female-headed.

Average family size in the district was 4.8 persons in the high land and midland respectively as presented in Table 2.

These figures is higher than the national average household size of 4.7 persons (CSA, 2008) and lower than the mean family size of 6.2 reported by Getu et al. (2014) and Fisseha et al. (2010). Average land holding in the area was 0.4175 ha (0.435 and 0.4 ha in highland and midland respectively). The result of the study was lower than the findings of various authors (Mekonnen, 2007; Getu et al., 2014; Halima, 2007) who reported average land holding of 0.86 ha, 3.55 ha and 1.28 ha, respectively, indicating the most fragmented land holding pattern in the district. Livestock production is an integral part of the livelihood of smallholders in the district.

Regarding livestock holding average per HH for cattle, sheep, goats and donkeys was 3.33, 2.09, 0.425 and 0.52, respectively (Table 2).

Table 1. Demographic profile of sample farmers in Shebedino district

Parameter		Agro-ecology		Overall average
		Highland N.of HH	Midland No. of HH	
Age	<20	0	9(100)	6.4
	20-30	20(52.6)	18(47.3)	27.1
	31-40	38(55.8)	30(44.1)	48.57
	41-50	10(58.8)	7(41.2)	12
	>50	2(25)	6(75)	5.7
Sex	Male	5(18.5)	22(81.5)	19.3
	Female	65(57.5)	48(42.5)	80.7
Marital status	Unmaried	2(25)	6(75)	5.7
	Meried	67(52)	62(48)	92
	Widowed	1(33.3)	2(66.6)	2
Educational background	Grade 1-4	25(54.3)	21(45.6)	32.8
	Grade 5-8	36(46.7)	41(53.2)	55
	Grad 9-12	3(37.5)	5(62.5)	5.7
	Illiterate	6(66.6)	3(33.3)	6.4
Types of household	Male Headed	69(50.3)	68(49.6)	97.8
	Female headed	1(33.3)	266.6)	2.1

Table 2. Household characteristics and livestock holding in Shebedino district

Categories	**Agro-ecology**		**Over all Mean**
	Highland (mean)	Midland (mean)	
Family size	4.92	4.73	4.8
Farm Size (ha)	0.435	0.4	0.4175
Cattle	3.76	2.9	3.33
Sheep	2.45	1.73	2.09
Goat	0.23	0.62	0.425
Donkey	0.41	0.64	0.52

4.2 Village Chicken Flock Characteristics

The mean values of chicken flock structure in two agro-ecology and age category are described in Table 3. The average chicken holding in the area was 9.16 and mean holding per HH for hens, cocks, pullets, cockerels and young chicken was 3.22, 1.045, 1.6, 0.55 and 2.7, respectively.

A study conducted by Bosenu and Takele (2014) indicated that the mean flock size per HH for cocks, hens, pullets, cockerels and chicks was 1.12, 4.20, 2.13, 1.54 and 2.63, respectively,

indicating that hens and chicks were the dominant class of the flock in Sidama district of Ethiopia. The mean chicken holding in the study site was higher than the study result (6.23) reported by Meseret (2010). However, a higher chicken size per HH (13.10 and 12.38) was reported by Fisseha et al. (2010) in Bure and Fogera districts, respectively.

A mean flock size per HH of 9.2 was also reported by Mekonnen (2007) in Southern Ethiopia. The result of the study showed that hens (35%) and young chicken (30%) were the dominant class of chickens in the flock structure. This finding is in line with the survey result of CSA (2014) in which hens and chicks accounted for 34.88% and 37.46% of the national population, respectively.

Table 3. Village chicken flock structure in Shebedino district

Categories	**Agroeccology**		**Overall Mean**
	Highland (Mean)	Midland (Mean)	
Hen	3.01	3.43	3.22(35%)
Cocks	1.05	1.04	1.045(11.4%)
Pullets	1.65	1.55	1.6(17.5%)
Cckerels	0.62	0.48	0.55(6%)
Young chickens	3.04	2.45	2.745(30%)
Total	9.37	8.95	9.16

4.3 Chicken Husbandry Practices

4.3.1 Chicken feeding and watering practice

Feed is the single most important factor that influences the productivity of chicken. It is impossible to expect optimal production in the absence of adequate supply of the required nutrients. The survey result of feeding practice of village chicken in the study district is presented in Table 4. The majority of the respondents (93.6%) in the study area practiced scavenging with supplementation while 6.4% of the respondents practiced only scavenging.

Similar result was reported by Desalew (2012) and Desalew et al. (2013b) in Ada'a and Lume districts of east Shewa where 98.2% of the respondents practiced scavenging with additional supplement. Samson and Endalew (2010) also reported that 94% of the respondents in Mid Rift Valley of Oromia region practiced scavenging with conditional supplementation.

Bosenu and Takele (2014) also reported that all (100%) of the respondents in Haramaya district of Eastern Ethiopia practiced scavenging system with supplementary feeding.

Another study conducted in North Wollo, Amhara Region (Addisu et al., 2013) also revealed that 89.8% of the chicken owners were found to keep their chicken in free range type of production system with occasional supplementary feeds. 58.3% farmers in Western Kenya adopted feed supplementations for indigenous chickens (Justus et al., 2013).

Also 90.3% of the respondents did not have feeding trough and only 9.7% had feeding trough made of plastic (80%) and wood (20%). The owners of chicken (89.3%) provide a handful of local ingredients as supplementary feed including maize, sorghum and wheat once a day. However, provision of supplementary feed is highly dependent on the season of harvest and availability of cereal grains. Source of supplementary feed for the chickens are crop harvest and crop harvest with part of purchased grain for family consumption according to 49.3% and 50.7% of the respondents, respectively.

Water plays a vital role in transport of nutrients, metabolic reactions and elimination of wastes. The vast majority of the respondents (90%) in the district provided water for their chicken. The remaining (10%) did not provide water at all. The result of the current study is in contrary with that of Desalew et al. (2013b) who reported that 96.1% of chicken owners in Ada'a and Lume

district of east Shewa provided water free access for chickens. Tesfu (2006) also reported that all of the chicken owners provide water for the chicken.

Farmers used various sources of water for chicken based on the availability of water in their vicinity. Spring, river, underground water, rain water and pond water were used as source of water for the chickens according to 32.8%, 16.4%, 52.7%, of the respondents, respectively. Most of the chicken owners (66.4%) provide water using watering trough made of plastic. The remaining 20% and 13.6% provide using materials made of clay and wood, respectively.

Table 4. Feeding practices of village chicken in Shebedino district

Parameters	**Discription**	**Agro ecology**		**Overall Mean**
		Highland No.hh	Midland No.hh	
Feeding system	Scavenging only	6	3	9(6.4%)
	Scavenging with supp.	64	67	131(93.6%)
Feeding Trough	Yes	0	13	13(9.3%)
	No	70	57	127(90.3%)
Types of Feeding trough	Made of plastic	0	20	20(80%)
	Made of wooden	0	5	5(20%)
Freque .of supp.	Once a day	60	65	125(89.3%)
Mode of provision	By feeder	0	16	16(11.4%)
	Spreading on floor	70	54	124(88.6%)
Source of supp.	Crop harvest	38	31	69(49.3%)
	Harvest and purchase	32	39	71(50.7%)

Table 5. Watering practice for village chickens in Shebedino district

Parameter	Description	Agro ecology		Total N(%)
		Highland No.hh	Midland No.hh	
Provision of water	Yes	62	64	126(90%)
	No	8	6	14(10%)
Frequency of watering	Once a day	62	64	126(90%)
	Twice a day	8	6	14(10%)
Source of water	Spring	30	16	46(32.8%)
	River	0	23	23(16.4%)
	Underground wter	40	31	71(50.7%)
	Rain water	0	0	0
	Pond water	0	0	0
Type of watering trough	Made of plastic	45	48	93(66.4%)
	Made of clay	12	16	28(20%)
	Made of wood	13	6	19(13.6%)

N=Number of respondents.

4.3.2 Poultry housing

Housing condition is one of the most important factors which influence the health conditions, safety and productivity of chicken. In the present study, the birds are mostly left to scavenge for feeds during the day and confined at night. All of the surveyed households (95%) did not have separate poultry house and family members shared their residencies with the chickens (Table 6).

During the day, birds spend most of their time scavenging around the family dwelling. Although birds are protected from predators, theft and bad weather at night time, there is a risk of disease transmission as they share the same dwelling with family and other domestic animals. Farmers described various reasons for not constructing separate poultry house.

Majority of the respondents (67.8%) expressed the main reason for the absence of separate shelter to be lack of awareness. Lack of attention (32.1%), respectively (Table 6). Birds were kept at various locations in the main house including simple night perches, ceilings of the house and on the ground in the living room according to 81.4% and 18.6% of the respondents,

respectively. In contrary to the current finding, Desalew et al. (2013b) reported that 91.11% and 95.6% of the respondents constructed separate houses for poultry in Ada'a and Lume districts of East Shewa, respectively.

Halima (2007) reported that about 50.77% of chicken owners in northwest Amhara provided separate sheds purpose-made for chickens. According to Fisseha et al. (2010), 22.1%, 59.7% and 3.4% of the respondents constructed separate houses entirely for the chicken in Bure, Fogera and Dale districts of Ethiopia, respectively. The survey result is consistent with the finding of Mekonnen (2007) who reported 97.6% of the respondents in Dale; Wonsho and Lokka Abaya districts of southern Ethiopia did not have separate houses for their chicken. Similarly Meseret (2010) reported that about 94.4% of the respondents in Gomma district did not have separate houses for their chicken.

Table 6. Housing system of village poultry in Shebedino district (% respondents)

Parameter	**Description**	**Agro ecology**		**Total N(%)**
		Highland No.hh	Midland No.hh	
Presence of separate poultry house	Yes	0	7	7(5%)
	No	70	63	133(95%)
Reason for absence of separate poultry house	Lack of awareness	49	46	95(67.8%)
	Lack of attention	21	24	45(32.1%)
	Risk of predators	0	0	0
	Risk of theft	0	0	0
Status of night time sheltering	Night perch	70	44	114(81.4%)
	On ceilings of the house	0	26	26(18.6%)
	On the ground	0	0	0

4.3.3 Poultry diseases and health care

Results of chicken disease and control measures in the study district are presented in Table 7.

The survey result showed that 94.3% of the interviewed chicken owners were able to recognize the occurrence of poultry diseases which are the main causes for the loss of chicken in the area. The awareness of the respondents in the highland (53%) was significantly higher than those in the midland (5.7%) in terms of the occurrence of poultry diseases. The most dominant poultry disease in the area was Newcastle disease (NCD) (locally perceived as Yedoro Beshita meaning: Poultry disease) according to 85% (51.3% in the highland and 48.7% in the midland) of the respondents followed by Coccidiosis, according to 14% of the respondents.

Studies conducted in different parts of the country by various authors (Halima, 2007; Fisseha et al., 2010; Hunduma et al., 2010; Mekonnen, 2007 and Meseret, 2010) also confirmed that NCD is the major cause of death for village chickens. Samson and Endalew (2010) also indicated that disease accounted for 34% of chicken mortality in Mid-rift valley of Ethiopia. A study carried out in Osun State of Nigeria also revealed that NCD (47.37%) and Coccidiosis (26.32%) were the major diseases affecting poultry keeping in the area (Adedeji et al., 2014).

Regarding control measures, about 30.7% of the respondents practiced traditional medicines. The most common ingredients utilized by the interviewed farmers were lemon juice, garlic, green pepper, salt and a mix of Gesho and water. Dessie et al. (2013) also reported that traditional treatments against NCD and other diseases and parasites include a local alcoholic drink (arekie), garlic, supper dip (Flavoured Instant Powder Drink), antibiotics such as tetracycline in central and western highlands of Ethiopia though the treatments are not always effective.

The remaining 20.7%, 27.1% and 12.8% of the chicken owners in the area practiced vaccination, treatment and hygiene, respectively.

About 8.6% of the respondents didn't take any control measure. There was a significant difference (X2= 1.28, P<0.05) between the two agro-ecologies with respect to the control measures. Desalew (2012) reported that 50.6% (21.2% in Ada'a and 80% in Lume districts) of the respondents in East Shewa used vaccines to control poultry diseases.

Predators are also mentioned by the interviewed farmers and key informants in the district as the major causes for the loss of village chicken next to diseases. The most common predators in the area include eagles, hawks, fox, cat, dogs and wild cat (Shelemetmat). Another study conducted by Samson and Endalew (2010) indicated that the main causes of chick mortality were birds of prey (34%), cats and dogs (16.3%), wild animals (15%), diseases (34%) and accident (0.7

Table 7. **Poultry diseases and health care practices in Shebedino district**

Parameters	**Discption**	**Agro ecology**		**Total N(%)**
		High land N(%)	Midland N(%)	
Occurrence of disease	Yes	70(53%)	62(46.9%)	132(94.3%)
	No	0	8	8(5.7%)
Most prevalent disease	Newcastle	61(51.3%)	58(48.7%)	119(85%)
	Coccidiosis	9	12	21(15%)
Control measures	Traditional method	26	17	43(30.7%)
	Vaccination	15	14	29(20.7%)
	Treatment	17	21	38(27.1%)
	Hygiene	7	11	18(12.8%)
	no control measure	5	7	12(8.6%)

N=Number of respondents.

4.4 Production and Productivity Performance of Village Chicken

Results of production and productivity performance of local chicken in the study area are presented in Table 8. Mean age at first egg in the study district was 7.6 months (7.8 and 7.4 months for highland and midland agro-ecologies, respectively). There was no significant difference between the two agro ecologies on age at first laying. The current finding was

comparable with the result reported by Mekonnen (2007) who reported the average age at first egg of 7.07 months in Dale, Wonsho and Loka Abaya districts of Southern Ethiopia and higher than the mean age at first lay of 5.35 months reported by Mamo (2006) and the review conducted by Mamo (2012) which revealed the average age at first egg laying of indigenous chicken ranging between 157 to 161 days. Meseret (2010), Aberra et al. (2012) and Tesfu (2006) reported average age at first laying of 6.33 months, 6.60 months and 6.69 months in Gomma district, Jimma Zone, Ethiopia, in different agro-ecologies of Ethiopia and around the villages of Dire Dawa Town, respectively which is lower than the finding of the current study. According to Dana et al. (2006) birds attain egg laying age at 5 months in Lume, Ada and Akaki districts. Age at first egg ranged between 5-6 months in south Tunisia (Larbi et al., 2013). Sonaiya and Swan (2004) also reported that indigenous village birds in Ethiopia attain sexual maturity at an average age of seven months (214 days) which is in agreement with the result of the current study.

Mean clutches per year was 3.85 (4.1 and 3.6 for highland and midland agro-ecologies, respectively) . This is in agreement with the national average (4.00) reported by CSA (2014) and a bit higher than the result reported by Fisseha (2009) who reported number of clutchs per year of 3.83 for local chicken ecotypes in Bure district, north-west Amhara. Meseret (2010) reported average number of clutches per year of 3.43 which is lower than the current finding but higher than the result reported by Halima (2007) who reported a maximum of 2 to 3 clutches/hen/year. The result of the current study is also higher than the mean value of 3.67 reported by Tesfu (2006) and lower than mean clutches of 5.2 indicated by Mamo (2006).

Mean clutch length in the study district was 15.95 days (20 and 19.5 days for highland and midland agro ecologies, respectively). Based on the report by CSA (2014) the national average length of single egg laying period per hen is 21 days. The present study is higher than mean

clutch length of 16 days reported by Sonaiya and Swan (2004) and lower than 26.2 days reported by Fisseha et al. (2010). Average eggs per hen per clutch in the study area were 14.85 (15.1 and 14.3 for highland and midland agro ecologies respectively). The result indicated that there was a significant difference between the two agro-ecologies in the study area. This is higher than the national average of 12 eggs reported by CSA (2014). Mekonnen (2007) also reported eggs per hen per clutch of 14.9 in Dale, Wonsho and Loka Abaya districts of Southern Ethiopia which is in line with the current study. According to Fisseha (2009) and Mamo (2006), average eggs per hen per clutch were 15.7 and 15.4 for local chicken ecotypes of Bure district, North Amhara and Jamma district, South Wollo, Ethiopia, respectively. It was also reported that the average number of eggs laid/clutch/hen ranged between 10 and 18 (Samson and Endalew, 2010) and 9 and 19 (Halima, 2007), respectively. Mean eggs per hen per year in the district were 59.4 (61.2 and 55.4 for highland and midland agro ecologies, respectively). The average annual egg production differs significantly among the two agro-ecologies. The result of the current study is lower than the annual egg production of 60 eggs for Ethiopian indigenous chickens (FAO, 2008a) and higher than the finding of Halima (2007) who reported the total number of eggs produced ranged 18-57/hen/year in North West Ethiopia. Mekonnen (2007) also reported mean eggs/hen/year of 55.2 which is lower than the present finding. Similarly, total egg production per hen per year of 60 was reported by Fissseha (2009) in North West Amhara, Ethiopia. Mamo (2012) reviewed that the average number of eggs produced per year per bird to range between 45 and 96 for indigenous chickens under scavenging system. The result is also higher than the finding of Meseret (2010) who reported mean annual egg production of 43.8 eggs in Gomma district. But, the result of the current study was much lower than the finding of Desalew et al. (2013a) who reported a mean annual egg production of 276.1, 266.32 and 187.04 eggs for IB, BB and PK

(improved chicken), respectively. The average hatchability in the district was 75 (both of the two agro ecologies has the same hatchability (75%). There was no significant difference between the studied agro-ecologies in the district. Hatchability obtained in the study area is higher than the hatchability of 70% for indigenous chickens reported by FAO (2008a) and 22% by Meseret (2010). A higher hatchability performance of 89.1% was reported by Mekonnen (2007). Dessie et al. (2013) also reported a higher hatchability of 78.1% and 90.0% in Horro and Ada'a districts, respectively. Similar result was reported by Fisseha et al. (2010) who reported that hatchability performance of local chickens in Bure, Fogera and Dale districts of Ethiopia were 82.6%, 78.9% and 89.1%, respectively.

Table 8. **Production and productivity performance of village chicken in Shebedino district**

Parameter	**Agro ecology**		**Overall mean**
	Highland	midland	
Age at first egg /month/	7.8	7.4	7.6
Clutches per year	4.1	3.6	3.85
Clutch length /days	16.5	15.4	15.95
Eggs/hen/clutch	15.1	14.6	14.85
Eggs/hen/year	60.4	58.4	59.4
Hatchability (%)	75	75	75

4.5 Decision Making and Ownership

Chicken production in the home is mainly the business of the women, who manage them freely and without any traditional feedback required of the husband (FAO, 2008a). Despite all the regional differences in smallholder poultry production, one observation seems to remain the same, whether talking of smallholder households in Africa, Asia or Latin America – namely that the day-to-day management of poultry is undertaken by women, often with assistance from their children (FAO, 2010). Village poultry in the district were predominantly possessed by women (85.7%) and only 14.3% was owned by children (Table 9). Men had no role in the ownership of

rural poultry in the district attributed to the traditional belief in the community that possession of poultry by men is considered to be a taboo. Chicken management was also mainly the business of women (65%), limited role to be played by men (9.3%) and children (25.7%) in this regard.

Chicken and egg marketing in the area was the responsibility of women and children according to 70% and 27.8% of the respondents, respectively. Women had a decisive role in the area with respect to decision making in matters regarding village poultry. Majority of the respondents (80%) indicated that decision making was the responsibility of women only 15% mentioned that it was the responsibility of children. Dana et al (2006) reported that females have significant contribution (55%) than the contribution of males (45%) and in some cases all the activities were fully handled by females. Dessie et al. (2013) also indicated that women and girls have greater responsibilities compared to men, being involved in house cleaning, feeding, watering, and selling of birds and eggs. According to a study conducted in Machako, Kenya (Wanjugu, 2015), 57% of the local indigenous poultry are owned by women, indicating the responsibility of taking care of the indigenous local poultry likely to be done by women is 67%. The same author reported that women are the main decision maker (60%) regarding the slaughter and sale of the indigenous local poultry. The finding is consistent with Justus et al. (2013) who reported that women were the majority (76%) with men representing only 24% of the sampled farmers keeping indigenous chickens in Western Kenya. A study carried out by Samson and Endalew (2010) in Mid Rift Valley, Oromia, Ethiopia also revealed that majority of village chicken production (92.4%) was owned by women and children.

Table 9. Decision making and ownership for chicken production in Shebedino district

Parameter	Discription	Agro ecology		Total N(%)
		Highland N(%)	Midland N(%)	
Ownership	Women	58	62	120(85.7%)
	Men	0	0	0
	Children	12	8	20(14.3%)
Chicken management	Women	48	43	91(65%)
	Men	8	5	13(9.3%)
	Children	14	22	36(25.7%)
Chicken and egg marketing	Women	53	45	98(70%)
	Men	0	3	3(2.1%)
	Children	17	22	39(27.8%)
Decision making	Women	58	54	112(80%)
	Men	4	3	7(5%)
	Children	8	13	21(15%)
	Total	70	70	140(100%)

N=Number of respondents

4.6. Purpose of Keeping Chicken

The results on purpose of poultry keeping in the study district are presented in Table 10. Sale, home consumption and stock replacement were the major reasons cited by the interviewed farmers for keeping chicken in the district.

Majority of the respondents (88.6%) in the study area kept their chicken for sale as an immediate source of cash for basic household necessities of the owners. 40.7% and 76.4% of the respondents also highlighted that they kept chicken for home consumption and stock replacement, respectively. On the other hand, eggs were used for hatching, sale and home consumption according to 73.4%, 89.3% and 36.4% of the respondents, respectively. Mekonnen (2007) reported that the main objective of chicken production in Southern Ethiopia was for sale (44%) followed by replacement and consumption which accounted for 34% and 22%, respectively. According to Mammo (2006), majority (46.2%) of the poor households in South

Wollo kept poultry for sale. Similar result was also reported by Matiwos et al. (2013) indicating a remarkable portion of the total respondents (50%) kept poultry as a source of family income. Home consumption and income generation was also reported by Wondu et al. (2013) as the main objective of keeping poultry by 82% of the respondents.

Table 10. Purpose of keeping chicken in Shebedino district (% respondents)

Purpose	Response	Agro ecology		Over all N(%)
		Highland N(%)	Midland N(%)	
Live chicken				
Sale	Yes	66	58	124(88.6%)
	No	4	12	16(11.4%)
Home consumption	Yes	32	25	57(40.7%)
	No	38	45	83(59.3%)
Stock replacement	Yes	55	52	107(76.4%)
	No	15	18	33(23.6%)
Egg				
Hatching	Yes	52	54	106(%73.4)
	No	18	16	34(26.6%)
Sale	Yes	66	59	125(89.3)%
	No	4	11	15(10.7%)
Home consumption	Yes	23	28	51(36.4%)
	No	47	42	89(63.6%)

N=Number of responses

4.7 Village Chicken and Egg Marketing

4.7.1 Profile of the market participants

Details of the market participants in the two sample markets are presented in Table 11. 63.3% of the respondents were females and males constitute 36.6% of the interviewed actors in the markets. 76.6% of the respondents were married, whereas 23.3% and 0% of the respondents were unmarried and divorced, respectively. Concerning educational background, 18.3% of the respondents were able to read and write. About 38.3% of the respondents attended primary education (1-6), 6.6% attended secondary education (7-12) and the remaining 36.6% of the

interviewed farmers were illiterate. Market was the sole source of information (100%) for producers, consumers and traders. All (100%) of the respondents also indicated that they sell chicken when immediate HH cash income is needed.

Table 11. Profile of the market actors in Shebedino district

Parameter	**Description**	**Market place(N=6O)**	
		Leku N (%)	Diramo Anfarara N (%)
Sex	Female	21(55.3%)	17(44.7%)
	Male	9(41%)	13(59%)
Market type	Local	0	0
	Urban	47(50%)	47(50%)
Marital status	Single	6(43%)	8(57%)
	Married	24(52%)	22(48%)
	Divorced	0	0
Educational background	Illiterate	12(54.5%)	10(45.45%)
	Reading and writing	4(36.3%)	7(63.6%)
	Grade 1-6	13(56.5%)	10(43.5%)
	Grade 7-12	1(25%)	3(75%)
Source of information	Neighbours	0	0
	Market	30(50%)	30(50%)
Reasons for selling chicken	HH income	30(57.7%)	30(42.2%)
	Needs		

N=Number of respondents; HH=Household

4.7.2 Marketing characteristics of the study Area

The district is characterized by absence of formal and organized market channel for poultry and eggs. The common markets prevailing in the district were informal markets where chicken and eggs sold in open markets. Majority (64.3%) of the respondents in the area sold their chicken in small markets (primary markets) in the village either to local consumers directly or small traders (collectors) who take chickens and eggs to secondary market (district market at Leku town) and resold to urban consumers or hotels and restaurants in big cities. In rare circumstances, chickens were also sold to wholesalers who transported them to tertiary/terminal market (Hawassa). The remaining 21.4% and 14.3% of the respondents sold at farm gate to local consumers or small

collectors/kiosks and secondary market (district market), respectively (Figure 2). The predominant means of transport for chicken to market in the study area was carrying by hand (68.6%) followed by public transport (23%, car and Bajaj) and tracking by animal (8.6%) as presented in Table 13.

Death of chicken during transport was occurred according to 10 % of the respondents. The result of the current study clearly showed a considerable difference in prices of chicken and eggs at different locations and seasons of the year. Concerning market prices of chickens and eggs at different market places and seasons, no significant difference was found between the two sample market places (Table 14).

Since there was a remarkable involvement of intermediaries prices varied considerably at different locations (farm gate, primary market and secondary market). The farther the market, the higher the price for both chickens and egg. Price difference was also observed among market places based on proximity of market places to the producer. Prices of chickens and eggs around Leku market were higher than the prices around Telamo market places .

Prices of chicken and eggs were higher during public and religious holidays in the two market places, the higher prices registered during the Ethiopian New Year followed by Christian holidays (Christmas and Easter).

Table 12. Marketing characteristics of poultry and poultry products in Shebedino district

Parmeter		Response	
		N.	Percent
Means of transport	Carrying by hand	48	68.6
	Trekking by animal	6	8.6
	Public transport	16	23
Location of sale	Farm gate	15	21.4
	Primary market	45	64.3
	Secondary market	10	14.3
Death during travel	Yes	15	25
	No	45	75

N=Number of responses

Table 13. Prices of eggs and chicken in different markets and seasons in Shebedino district

	Market (N=60)	
Price (ETB)	Leku(N=30) (mean)	Telamo (N=30) (mean)
Live Chicken (Adult)		
Farm gate	155.25	150.5
Primary market	185.5	170.4
Secondary market	200.75	175.55
Egg		
Farm gate	3	3
Primary market	3.5	3.75
Secondary market	4	4
Live Chicken (Adult)		
Christian holiday	250.58	235.5
Muslim holiday	230.50	200.67
Ethiopian New Year	275.56	250.75
Any other time	250.35	230.54
Egg		
Christian holiday	3	3
Muslim holiday	3.5	3.5
Ethiopian New Year	4	4
Any other time	2.75	2.50

N=Number of respondents; SEM=Standard Error of Mean; ETB=Ethiopian Birr

4.7.3 Marketing constraints

Major constraints related to marketing of chicken and eggs in the studied sample markets are presented in Table 14. Majority of the respondents in the market places disclosed that price

fluctuation, demand seasonality, involvement of middle men and disease outbreak were the leading constraints influencing marketing of eggs and chicken with no significant difference between the three market places. Lack of information and limited market access were also constraints reported by the interviewed market participants regarding marketing of chicken and eggs. The result of the current study was in line with the findings of various authors who reported seasonal fluctuation of price (Matiwos et al., 2013; Hunduma et al., 2010 and Mekonnen, 2007), access to market (Aklilu et al., 2007), involvement of intermediaries (Aklilu et al., 2007) and lack of information (Mekonnen, 2007) as the major constraints that influence marketing of poultry and poultry products. Moreover, lack of organized marketing system was reported by Mekonnen (2007), Matiwos et al. (2013), Hunduma et al. (2010) and Bosenu and Takele (2014). Absence of packaging and weight standardization of market eggs as a marketing constraint was also reported by FAO (2008b).

Table 14. Marketing constraints of live chicken and eggs in study area (% respondents)

Factors	Leku	Telamo
Price fluctuation	160	130
Demand seasonality	130	120
Involvement of intermediaries	95	90
Disease outbreak	88.5	87.3
Lack of information	60.6	55.7
Limited market access	50	52.4

Farmers in the study area did not receive fair price for their produce as they had no access to permanent market places and lack of formal and organized market in the village. All the market places in the district did not have any infrastructure; poultry and eggs were sold together with other commodities. Involvement of various actors in the market chain resulted in long marketing channel for poultry and eggs. This resulted in reduced price for the producers in the district. The result of the current study is in agreement with Aklilu et al. (2007) who observed that increased

involvement of intermediaries leads to reduced prices for the producer. Similar result was also reported by Fisseha et al. (2010) who indicated the involvement of middlemen in the marketing channel. On the other hand, Dawit (2010) reported a shorter market channel for both poultry and eggs in Alamata and Atsbi-Wonberta districts of Tigray region.

4.8 Egg Quality Traits

Following the survey, eggs laid during one week was collected from 15 households involved that were in the interview from each RK and transported to Hawassa University for quality analysis. The eggs were labeled with the code given to the RKs at the time of collection from the respective households.

Eggs from pure indigenous, bred hens were identified at collection. Both internal and external egg quality parameters were measured on all eggs acquired from each households selected for this purpose and the four RKs. A total of 120 eggs were acquired for this experiment and two eggs were collected from each household. However, they are not being given due attention in the developing world where the majority of the eggs are coming from free scavenging village chickens as compared to that of the developed world (Aberra et al., 2012). The mean values of different parameters concerning egg quality traits in the two agro-ecologies of the study district are shown in Table 15.

Egg quality was assessed in terms of egg weight, shell thickness, yolk heigh, albumen weight, albumen heigh, Shell weight (g),yolk weight, yolk color ,yolk diameter and Haugh unit. Egg weight was measure by taking the individual egg and putting on the sensitive balance and takes the weight measure. The egg shell thickness was measured on eggs sample taken at three sites, at equator, from the blunt and pointed end of each of the RKs eggs using a micrometer gauge. The

average of the three measurements was taken as thickness of each egg and RKs values were computed as average of the eggs (Ajuwon et al., 2002).

The albumen of the broken eggs was carefully separated from the yolk. Tripod micrometer was used to measure the albumen height.

Albumen weight was measured using sensitive balance. Albumen and yolk diameters were measured by ruler after breaking the eggs on flat tray. The four RKs eggs sample were individually weighted, marked and broken on flat tray and the height of the thick albumen of each egg was measured with a tripod micrometer and the average Huagh Unit value for each RK was calculated by using the formula given by Stadelman and Cotterill (1986).

Yolk color was measured after yolk membrane was removed, and yolk sample was taken on pieces of white paper and computed by Roche fan measurement strips which have 1-15 strips from pale to orange yellow.

The overall mean egg weight in the study district was 41.26g. Based on the result of this study, the average values of the egg weight of Highland (42.3g) was significantly higher than that of midland(40.23g) indicating quality deterioration as a result of longer period of storage at relatively higher temperature (Table 15). Agro-ecologies which might be attributed to better access to feed resources such as grains and cereals Teketel (1986) also reported an average egg weight of 46g for Ethiopian local breed chicken. A higher egg weight of 58.75g, 60.27g and 48.84g was reported by Desalew (2012) and Desalew et al. (2013a) for Isa Brown (IB), Bovan Brown (BB) and Potchefstroom Koekoek (PK), respectively, for exotic chickens under village production system in East Shewa, Ethiopia. Similarly, Niraj et al. (2014) reported a higher egg

weight of 55.56g and 50.91g for Rhode Island Red (RIR) and Bovans White (BW), respectively, under intensive management in Mekelle, Ethiopia. Furthermore, a higher egg weight of 57.78±0.20g was reported by Rath et al. (2015). On the other hand, a lower mean egg weight of 39.60g and 38.65g were also reported by Aberra et al. (2012) and Halima (2007), respectively.

The average shell thickness for highland and midland were 0.3087mm and 0.299 mm , respectively with the mean shell thickness for the district of 0.3 mm (Table 15). The result obtained for shell thickness was lower than the value of 0.71 mm and 0.69 mm reported by Halima (2007) for eggs collected from intensively managed local chicken ecotypes of North West Amhara and the result of the analysis was higher than 0.296 mm reported by Aberra et al. (2012) but lower than the finding (0.32±0.00mm) of Rath et al. (2015).

Mean albumin height in the highland and midland were 4.43, 4.52 mm, respectively, with an average albumin height of 4.475 mm for the district. There was no significant difference between the midland and highland agro-ecologies. Average yolk height (mm) in the district was 15.58 (16.733 and 14.433) in the highland and midland agro-ecologies, respectively). Similarly, a statistically significant difference was found between the midland agro-ecology and the remaining highland agro-ecologies.

Mean albumin weight, yolk weight and egg shell weight in the study district were 21.246g, 15.29g and 3.64g, respectively, with a statistically significant difference among agro ecologies. Average yolk diameter in the area was 3.83 mm (Table 15). The result of the current study for albumin weight was comparable with the findings of Halima (2007) who reported a mean albumin weight of 21.69g. However, a higher albumin weight (g) (33.05±2.77 and 30.48±2.56)

was reported for RIR and Bovans White chickens, respectively, under intensive management in Mekelle, Ethiopia (Niraj et al., 2014).

The yolk weight obtained in the study area was lower than the finding of Desalew (2012) who reported mean yolk weight (g) of 16.14±1.89, 15.97±1.77 and 15.90±3.57 for IB, BB and Koekoek (improved exotic chicken), respectively, in Ada;a and Lume districts. The average egg shell weight (g) recorded in the district was lower than the findings of various authors who reported mean egg shell weight of 5.20 for RIR (Niraj et al., 2014), 5.00 (Halima, 2007), 5.52 in Fogera district (Fisseha et al., 2010) and 5.03 for BW (Niraj et al., 2014). But, a lower egg shell weight (g) value of 2.3 was reported by Fisseha et al. (2010) in Bure district.

The colour of the egg yolk is mainly dependent on the type of ration and the management systems of the chickens. The eggs collected from scavenging birds had a higher yolk colour count because scavenging birds have free access to green plants and other feed sources rich in xanthophylls (Halima, 2007). The overall mean yolk color count in the area was 9.48(9.48 and 9.28 in the midland and highland respectively). Yolk colour did not differ significantly between highland and midland agro ecologies. The result of the current study was consistent with the mean color count value of 9.74 reported by Desalew (2012) for IB. Moreover, Aberra et al. (2012) and Halima (2007) reported mean colour count of 9.26 and 9.41, respectively.

Average Haugh unit score in the study district was 73.275 (74.42 and 72.13 in the highland and midland respectively). The current finding was in agreement with the mean Haugh unit value of 73.2 reported by Aberra et al. (2012).

Table 15. Egg quality traits of village chicken in two agro-ecologies

Parameters	**Two Agro-Ecologies**		**Overall mean**
	Highland(Mean)	Midland(Mean)	
Egg weight(g)	42.8	40.23	41.5
Shellthickness(mm)	0.3087	0.299	0.3
Yolk height	16.733	14.433	15.58
Albumin height	4.72	5.13	4.925
Albumin weight(g)	22.61	19.883	21.246
Yolk weight(g)	15.065	15.533	15.299
Shell weight(g)	3.716	3.566	3.64
Yolk diameter	37.265	39.465	38.365
Yolk colour	9.283	9.483	9.38
Haugh unit	72.13	74.42	73.275

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The study was conducted in four RKs located in midland and highland altitude in Shebedino districts, south, Ethiopia, with the objectives of assessing indigeneous poultry production system and some quality parameters of eggs produced under scavenging production system. The four RKs in each of the agro ecology were purposively selected based on poultry population and accessibility of the kebeles.

Backyard poultry production is an important component of the livelihoods of rural poor; it is easily managed by the household labor and directly accessible to women. They provide emediet cash income for the family, hence, they are considered as an important asset especially for the disadvantaged members of the community though they are not the sole means of livelihood. Indigenous checken in the study area were a source of livelihood and predominantly possessed and managed by women indicating the potential of the sector to play a significant role for the resource-poor farmers. However, scant information is available in the district regarding the productivity of the chicken, the production and marketing systems at which the indigenous chickens are exposed. This study was conducted to characterize the prevailing production and marketing systems, the handling and constraints associated with production and marketing systems and thereby provide preliminary information for concerned stakeholders for future research and development.

The inhabitants of the study site practiced mixed farming (crop production and rearing of livestock). Average family size in the district was 4.8 persons. Majority of the respondents (80.7%) in the study site were females, males accounting for only 19.3% indicating that females are playing a prominent role in poultry rearing and decision making.

The current study also showed that village poultry in the district were predominantly possessed (85.7%) and managed (65%) by women. Women were also responsible for decision making (80%) on matters pertaining village poultry. Average land holding in the area was 0.417 ha. Livestock production is an integral part of the livelihood of smallholders in the district. Average holding per household for cattle, sheep, goats and donkeys was 3.33, 2.1, 0.425 and 0.52, respectively.

The average chicken holding in the area was 9.16 and mean holding per HH for hens, cocks, pullets, cockerels and young chicken was 3.22, 1.045, 1.6, 0.55 and 2.7, respectively.

The result of the study showed that hens and young chicken were the dominant class of chickens in the flock structure, indicating the intention of farmers to retain sustainable stock. Majority of the respondents (88.6%) in the study area kept their chicken for sale as an immediate source of cash for basic household necessities of the owners. 40.7% and 76.4% of the respondents also highlighted that they kept chicken for home consumption and stock replacement, respectively.

Generally, husbandry practices by poultry owners in the district were suboptimal. The predominant poultry production practice in area was traditional scavenging family poultry system with only a handful of supplementation of locally grown and purchased grain mainly maize, sorghum and wheat once a day. The majority of the respondents (93.6%) in the study area practiced scavenging with supplementation while 6.4% of the respondents practiced only scavenging. Supplementary feed provided for the chickens was inadequate in terms of quantity and quality, to meet the nutrient requirement for production apart from maintenance.

The vast majority of the respondents (90%) in the district provided water for their chicken.

The entire (100%) surveyed households in the area did not have separate poultry house and family members shared their residencies with the poultry. Chickens were busy seeking their food around the home with no guaranteed protection against bad weather, predators and disease causing agents. In the traditional rural setting dominated by smallholder farms, poultry have little shelter, are allowed to scavenge for feed, and are free to wander. This system is cheap as little husbandry and few management skills are required. There are considerable problems with this system, including slow growth and poor productivity because of energy and protein deficiencies, poor bird genetics, losses because of predators and theft and damage to gardens.

The result of the study also revealed that Newcastle disease (NCD) was the most dominant poultry disease affecting poultry keeping in the area followed by Coccidiosis according to 85% and 15% of the respondents, respectively. Farmers practiced various measures to control poultry diseases in the area. The most common ingredients utilized by the interviewed farmers were lemon juice, garlic, green pepper, salt and a mix of Gesho and water.

Lack of access to veterinary services contributed to loss of chickens to a greater extent according to the farmers during group discussion with key informants. Production performance of village chickens in the district was generally low as they receive little attention by the owners. Mean age at first egg in the study district was 7.6±0.06 months, indicating that village chickens in district had longer age at first egg. Average eggs per hen per clutch in the study area was 14.85±0.20 with annual egg production of 59.4±1.09 eggs per bird. The result for annual egg production was one of the lowest performances reported for village chickens in the country. The overall mean hatchability (75%) in the district were 75 and 75, respectively, which can be viewed as low as an attribute to the fact that village chickens in the area has, so far, received little care.

The common markets prevailing in the district were informal markets where chicken and eggs sold in open markets. The main market actors in the district were producers, collectors (small traders) and consumers. Since there was a remarkable involvement of intermediaries prices varied considerably at different locations (farm gate, primary market and secondary market). The farther the market, the higher the price for both chickens and egg. Prices of chicken and eggs were higher during public and religious holidays in the two market places, the higher prices registered during the Ethiopian New Year followed by Christian holidays (Christmas and Easter).

Regarding egg weight, the result of the current study showed that the average weight of eggs collected from two agro ecology of the study district was 41.5g and the shell thickness was found to be 0. 0.3087 and 0.299 mm for highland and midland, respectively.

Average yolk color was 9.283 for 9.483 local breed, in midland and highland, respectively. In generally there was a significant difference between highland and midland eggs collected from the farmers in egg weight and Yolk Color. In all the parameters, highland had higher mean values than that of the midland eggs collected except yolk weight, yolk color and yolk diameter of indigenous.

Therefore, based on the results of the study the following improvement options are recommended in any attempt to move away from traditional scavenging family poultry production system to the improved semi-intensive system :-

- Interventions aimed at improving the productivity of indigenous chicken should focus on training and education of women, as most of the chickens are owned and managed by women
- Strong extension service delivery is needed to boost up the existing sub-optimal husbandry practice (feeding, watering, housing and health care) so as to improve the productivity performance of indigenous chicken. Training and technical support to both farmers and extension staff on supplementary feeding, watering, housing and health care should be provided.
- Appropriate intervention is needed to control disease and predators so as to minimize loss of chicken. Access to veterinary services would play an essential role in this regard.
- Improvement of market infrastructure in the area forming marketing group could help farmers obtain optimum price for chicken and their products.
- To improve egg quality attention should be paid to adequate nutrition, safe storage and handling of eggs. Prolonged storage of eggs should be avoided in order to minimize deterioration of quality.
- Sound genetic improvement programs need to be designed to improve the genetic merits of indigenous chickens coupled with improvement of the production environment.
- Further research should focus in the areas of adoption of farmer-friendly and low cost technologies (improved housing and nutrition).

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