BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCES

DEPARTMENT OF ANIMAL SCIENCE

AN EVALUATION OF GROWTH PERFORMANCES, EGG PRODUCTION AND LIVEABILITY OF SASSO AND BLACK AUSTRALORP STRAINS REARED UNDER SCAVENGING VERSUS NO SCAVENGING SYSTEM IN RURAL COMMUNITIES IN CHIREDZI DISTRICT, MASVINGO PROVINCE

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A RESEARCH PROJECT SUBMITTED TO DEPARTMENT OF ANIMAL SCIENCE, BINDURA UNIVERSITY OF SCIENCE EDUCATION, IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE BACHELOR OF AGRICULTURAL SCIENCE HONOURS DEGREE IN ANIMAL SCIENCE AND TECHNOLOGY

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DEDICATION

This project is dedicated to my wife Simelinkosi Muwani, my lovely daughter Elne Muwani and my mother in gratitude for a disciplined upbringing as well as all poultry producers.

ACKNOWLEDGMENTS

I would love to thank the Almighty God for the gift of life, provisions and the strength to carry on with this project. It is my pleasure to acknowledge the assistance of the following people and organisation without whom this project would not have been possible. Maximum gratitude is extended to my wife Simelinkosi, my mother and friends for their contribution in various ways to make my study fruitful. I am very grateful for my Supervisor, Mr T.N.C Mangwiro for being patient, correcting me and helping me with any other material needed for the project. I am also grateful to Headman Chilonga and Village head Mr Chauke to give an opportunity to engage and interact with Chilonga community. Additionally, I also am indebted to Mr Chirove and Mr Mhere (Chiredzi ward 7 Vet-Officer), who assisted in data collection, study site location and farmer interactions. Mr Simango who helped me with my data analysis.

ABSRACT

There has been a research gap in the genetic, physiological, and nutritional aspects of indigenous chickens of Africa over the past decade. These chickens are known to be economically, socially, and culturally important to the people of Africa, especially those from marginalised communities. Although they are associated with poor productivity in terms of the number of eggs laid, poor growth rate and feed conversion rate most consumers prefer their flavoursome meat and eggs from the breeds. Several local chickens have been classified into breeds or ecotypes, but many remain unidentified and are facing extinction. To prevent this, the Food and Agriculture Organization has launched an indigenous poultry conservation programme. The purpose of this review is to provide a detailed understanding on growth performance, egg production and liveability of SASSO and BLACK AUSTRALORP chicken strains kept under no scavenging and scavenging systems if their production will enable to meet national goal for improved food security by year 2030. Agriculture remain one of the key sectors in the country's quest towards achieving the country's vision 2030 through economy recovery, improved food security, no poverty, zero hunger, good health, wellbeing and provision of decent work. Several studies have been conducted on the nutritional requirements of local chickens. This review concludes that improved local chickens play a significant role in improving livelihoods, and strategies to preserve and sustain them must be intensified.

KEY WORDS

FAO *- Food and Agriculture Organisation*

BA *– Black Australorp*

AWG- *Average weight gain*

WC- *Water consumption*

S- *Scavenging system*

e.u- *Experimental unit*

SA- *SASSO*

FI- *Feed Intake*

FCR- *Feed conversion rate*

NS- *No scavenging*

DECLARATION

I, Muwani Simon declare that:

(i)

The research reported in this mini-dissertation, except where otherwise indicated, is my original research;

(ii)

This mini-dissertation has not been submitted for any degree or examination at any other university;

(iii) This mini-dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from those persons;

(iv) This mini-dissertation does not contain other authors' writing, unless specifically acknowledged as being sourced from other authors. Where other written sources have been quoted, then:

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their words have been rewritten but the general information attributed to them has been referenced;

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where their exact words have been used, their writing has been placed inside quotation marks and referenced;

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This mini-dissertation does not contain text, graphics or tables that have been copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the references sections.

Signed:

Date 1 July 2022

Mr T.N. Mangwiro

As supervisor, I agree to submission of this mini-dissertation for examination.

Signed: ………………………………………........................... Date 15/07/22

Mr. K. Kunaka

As co-supervisor, I agree to submission of this mini-dissertation for examination.

Signed: ………………………………………...........................Date 17/07/22

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CHAPTER 1

1.1 INTRODUCTION

Poultry, particularly chickens are the most widely kept livestock species in the world and also the most numerous (Perry 2019; Moreki 2010). The United States of America is the world's largest poultry meat producer with seventeen percent of global output, followed by China and Brazil. In 2020, there were over 9.22 billion chickens living in United States, China came second with around 4.74 billion, approximately half are concentrated in Asia and a quarter in Latin America and the Caribbean. Europe and the Caucasu (FAO 2020). These leading producing countries has two important production types, commercial sector characterized by use of highly intensive units and the traditional village based system. Globally, indigenous chicken production system is recognized as a strategy means for capital build up, poverty, malnutrition and hunger alleviation among the resources poor households owing to their short reproduction cycles, low inputs production requirements, their good scavenging ability and adaptability to harsh and wide production environments (Nyahangare 2015).

Apart from raising chickens under highly intensive system units, the rising of free-range chicken is an important activity in rural proprieties and smallholder farms of the Northeastern of Brazil. However, lack of technical assistance makes an efficient management of the animals difficult and the parasitism could lead to loss of appetite, low food conversion and decrease in meat and egg production (Iqbal RZ, Adnan A 2018). South and Southeast Asia is endowed with a variety of indigenous chickens which are a result of crossbreeding of the Red Jungle fowl kept under the use of highly intensive units and village based system.

Throughout the world, numerous indigenous or local chickens have been reported. Indigenous chickens are predominant species in the rural poultry sector in Africa despite the introduction of exotic and crossbred types because farmers have not been able to afford the high input requirement of introduced breeds (Kaiser 2016)

In Africa, indigenous chickens make up over 70% of the total chicken population (FAO, 2017). Naked neck chickens with normal frizzle feathers are reported to be found in Nigeria, Ethiopia, and Southern Africa as explained by Adelake 2016. Local or indigenous chickens are more abundant mostly in developing and under developed countries than those that are already developed. Local chickens are preferred over exotic chicken breeds because of their succulent meat. They also sell at a cheaper price. Hence, the demand for local chicken products for instance eggs and meat is high. It is estimated that local chickens constitute 80% of poultry production in sub-Saharan countries, with Nigeria known to have the highest number of local chickens with an estimated population of 180 million. Though these figures demonstrate the necessity to increase the production of poultry, the quantity and quality of the product are yet to improve.

In Burkina Faso, Quandaogo (2017), reported that the 25 million rural poultry produce 15 000 tonnes of meat, out of which 5 000 tonnes are exported at a value of us$19.5 million, mainly to Cote d'lvoire, Forssido (2016) estimated that village chickens provide 12kg of poultry meat per inhabitant per year, whereas cattle provide 5.3kg per inhabitant.

In Africa, Kenya has an estimated poultry population of 28.5million. Of these, 22 million (76 %) are free-ranging indigenous chickens (MoLD, 2016). Overall, local chicken farming in southern African countries remains at a developing stage. A case in point is Zambia, where only 0.5% of the total local chicken population reaches the commercial market, with the majority being consumed within a household. Thus, regardless of their importance, local chickens have received little attention in terms of improving their production rates. Many researchers from African countries have addressed the challenges related to improved nutritional management and genetic upgradation of local chicken, but there is limited information on how improvement at these levels can enhance performance. According to a study conducted by (Badubi 2018), the local chickens of Botswana are considered to be bigger than the local chickens of other African states.

Nthimo (2017) conducted another comparison study and found that Lesotho's local chickens are the poorest performers in all production traits compared with other southern African indigenous bloodlines. The factors that contribute to this poor performance are complex, but their nutritional and genetic development appear to be areas that can be explored and should, therefore, be a priority. Therefore, conservation decision-making should look at traits of scientific or economic importance, adaptation to a specific environment, the historical or cultural importance of the species and the degree of extinction.

Rural poultry production in Zimbabwe is spread all over the country without much input. According to C.S. O [1,] the highest number of small scale rural chickens farms are found in Mashonaland East Province with 1801, followed by Masvingo Province with 1315 farms. The province with the least number of farms is Matabeleland North province with 96 farms.

Most rural farmers produce poultry primarily to feed their own families, with small, irregular surpluses being made available on local village markets. For them local markets tend to be limited, easily saturated inefficient and incapable of providing reliable outlets for products. It is a low input-low output profitable system with little care and with almost no extra supplementary feeding. Information on the village poultry is scarce. Improvement programs cannot be chalked out due to lack of accurate data on production of village poultry (Burgess and Glascauer, 2004; NEPAD, 2009). The productive performances of indigenous chickens were relatively poor kept under scavenging production systems often with very limited application of management interventions to improve flock productivity.

The low egg production performance of indigenous chicken was expressed as slow growth rate, late maturity, produce small sized eggs, small clutch size, broodiness and high mortality of chicks. The cost of production of these birds is low, mainly because they feed on household scrap, kitchen refuse and free range scavenging Meth and Dias (2004). Despite their low output (35 to 50 eggs per hen per year) and high mortality, village chickens still comprise the major part of the poultry industry in Zimbabwe. In fact nutrient concentrations of scavengeable feed resources consumed by rural poultry are below recommended levels for optimum growth, egg production, carcass characteristics and liveability performances Goromela and colleagues (2007). Despite this production constraints, 80% of the total poultry population in the world is in traditional village-based production systems, being “low input–low output” systems. Indigenous chicken production is a way of increasing rural incomes and also economic empowerment of the rural women and youth (Katalyi, 1998).

The most common structure of the chicken industry in Chiredzi district, ward 15 is composed of village flocks, which are un-improved and are kept for subsistence and is often characterized by low-input-low output productivity. Local chickens dominate in most smallholder farms in Chiredzi district ward 15 are deemed less productive but appear to be adapted to local harsh free-ranging rearing environment. In an attempt to improve their productivity, Black Australorp and Sasso which are exotic dual – purpose breed were introduced to crossbreed with local chickens in Chiredzi district. The objective was to produce crossbred chicken that would provide more meat and lay more eggs while at the same time, would be more adapted to local environment.

1.2 PROBLEM STATEMENT

The production performance of native indigenous chickens in Chiredzi district is expressed as low egg production, slow growth rate, late maturity, and produce small sized eggs. This is exacerbated by unimproved native chicken breeds, poor housing, lack of coordinated disease control mechanisms, poor feeding and the absence of conservation strategies are some of the challenges.

1.3 MAIN OBJECTIVE

The main objective of the study is to evaluate growth performances, egg production and liveability of black australorp and sasso chickens breeds reared scavenging and no scavenging system in rural communities of Chiredzi district Ward 7.

1.4 SPECIFIC OBJECTIVES

To evaluate growth performance of black australorp and sasso chickens breeds reared under scavenging and no-scavenging system

To evaluate egg production of black australorp and sasso chickens breeds reared under scavenging and no-scavenging system

To determine liveability of black australorp and sasso chickens breeds reared under scavenging and no-scavenging system

1.5 JUSTIFICATION

The project is aimed to evaluate production performance of improved indigenous chicken breeds in the district if they have the capacity to respond to increased food demand through the rapid supply of meat and eggs to meet national goal for improved food security. Improved livestock production systems is predicted to become a major driver in the next food revolution due to increasing demand for livestock products as urbanization and human economic wellbeing improves. Agriculture remain one of the key sectors in the country's quest towards achieving the country's vision 2030 through economy recovery, improved food security, no poverty, zero hunger, good health, wellbeing and provision of decent work.

CHAPTER 2

2.1 LITERATURE REVIEW

Throughout the world, numerous indigenous or local chickens have been reported. Indigenous chickens (*Gallus domesticus*) are chickens that are adapted to harsh environmental conditions that include extensive small-scale village, free-range and organic production systems (Mengesha, M 2012). Sometimes such chickens are referred to as traditional, scavenging, backyard, village, local or family chickens. The indigenous chickens have unique combination of adaptive traits such as disease resilience, heat tolerance and the ability to utilize poor quality scavenge feeds. In literature, local chicken populations are often described and grouped according to geographical location or phenotypic characteristics, while their classification into breeds or types is limited.

It is believed that local chickens of Africa originated from South-East Asia, China and India. Local chickens are hardy and can adapt to local conditions better than other breeds because of their ability to withstand harsh climatic conditions due to their typical genetic development. Further to this, they possess a strong ability to fly and run to escape dangers and predators in comparison with commercial chickens. These traits make them strong enough to survive in an unfavourable environment. According to Swatson (2016), in African countries, local chickens are characterised by a variation observed in morphogical characteristics and production parameters. Most African local chickens have a distinguished plumage pigmentation whereby some tend to have blackish and brownish colours showing extend and pied colouration. Most African countries consists of koekoek, boschveld, Venda and naked neck strains just to mention a few.

The flock size of and mortality rate among local chickens in African countries vary. What make the indigenous chickens desired is that, the chickens are hardy, adapt well to the rural environments, survive on low inputs and adapt to fluctuations in available feed resources (Gichohi and Maina, 2015). They are often left to scavenge for feed around the homestead and in the fields after crop harvests. Consumers’ preference for indigenous chicken meat is attributed to the characteristic leanness, flavour and presumed organic product.

In most developing countries indigenous chicken populations are the result of uncontrolled cross breeding. Programmes between various lines of local and exotic breeds (Dare, 1977). Distinct indigenous chicken ecotypes have been identified and named in Cameroon, Egypt, Kenya, Morocco and Sudan.

According to Horst (2018), the genetic resource base of the indigenous chickens in the tropics is rich and should form the basis for genetic improvement and diversification to produce a breed adapted to the tropics. Horst (2018) described nine major genes of the indigenous chicken that can be used in genetic improvement programmes. There is little information on the genetic make-up of the indigenous chickens of Africa. However, information collated in the FAO Domestic Animal Diversity Information System (DAD-IS) shows that these genes are prevalent in the local populations across the African countries.

The Fayoumi breed was developed in Egypt (Hossary and Galal, 1995), there appears to be no record of a tropical adapted breed developed from indigenous chickens in Africa. A programme to produce such a breed in Nigeria failed after introducing a systematic approach of upgrading the breed by replacing the local cocks with Rhode Island Red (RIR) cocks (Oluyemi, Adene and Ladoye, 1979). The RIR cocks in the Nigerian programme succumbed under the poor rural conditions (Adegbola, 1988). Similar observations on genetic improvement programmes based on the introduction of exotic genes in local populations through cockerel exchange, supply of pullets or hatching eggs have been reported in Malawi (Safalaou, 1997).

Fayoumi has been introduced in other tropical countries such as Ethiopia (Swan, 1996), the United Republic of Tanzania (Katule, 1989) and Bangladesh (Jensen. 1996). Currently there is a major global thrust on genetic preservation and biodiversity which is reflected in efforts on development of genome and data banks (National Research Council, 1993; Crawford and Gavora, 1993). These initiatives have come at an opportune time, because continued cross-breeding programmes in rural poultry, which do not consider gene preservation aspects, would lead to erosion of the indigenous germplasm (Bessei, 1989).

Numerous studies have shown that local chickens play a key role in improving the socio-economic status of many rural communities. However, poor housing, lack of coordinated disease control mechanisms, poor feeding and the absence of conservation strategies are some of the challenges facing local chicken production systems in Africa. Parasitism in the intestines of local chickens is another problem and results in low weight gain and poor carcass quality (Mengesha, M 2012). According to Swatson ( ), a complex interaction of biological, socio-economic, cultural and agro-technical factors are the reason why household training in poultry management, veterinary support, feed practices and the use of improved indigenous breeds play a role in rural farmers failing to practice commercial farming. Thus, in poor rural communities, it is necessary to ensure the sustainability of free-ranging indigenous poultry development projects. Distance to the nearest market, access to extension services, feed costs, market price and the education level and experience of farmers are further factors that can affect the profitability of local chicken rearing. Despite these challenges, local chickens are a source of income and protein to resource-limited local marginal communities in developing countries.

The chickens which are reared in a free-range system in the district, predominantly scavenging with only 32% of the farmers providing some supplementation (Hatch, 1996). Maize, sorghum, millet and other grains are provided as supplements. The low productivity of these indigenous chickens in free range is mainly due to poor nutrition, housing and lack of proper health care. Growing indigenous chickens in the free- range system require a daily crude protein supplementation of 3.2 g. This supplementation will increase their growth rate by 2.7 times (Katalyi, 1998). Vaccination against Newcastle disease and other poultry diseases reduced mortality, increased eggs per hen per year and increased cash flow income from sale of chicken and eggs.

Realizing that poultry could be a tool of poverty reduction there is also a niche demand on products from local breeds of fowls where consumers prefer the more intense taste of their meat and eggs. It is paramount important to implement new innovations without affecting the production performances of indigenous chicken breeds to provide consistent growth performances, egg production, carcass product quality and liveability to fulfil fundamental requirements for poultry industry. This can be done by promoting sound management practices such as appropriate housing, disease control, improved nutrition and genetics (National Department of Agriculture, 2002).

Chicken production in Zimbabwe has been contributing a lot to improving nutrition, gender participation and income for rural communities (Mammo and Tsega, 2011). Moreover, social cultures and believes of most of the rural communities have been highly attached and attracted by these morphological variations of the birds in the country. The importance of village poultry production in the national economy of developing countries and its role in improving the nutritional status and incomes of many smallholder farmers and landless communities has been recognized by various scholars and rural development agencies for the last few decades and is significant owing to its low cost of production (Abubakar 2007; Fisseha 2010; Abera and Tegene, 2011).

Goromela and colleagues (2007) showed that the nutrient concentrations of scavengeable feed resources consumed by rural poultry are below recommended levels for optimum growth and egg production. Understanding the performance of indigenous poultry is vital to enable planning and informing policy on conservation and sustainable utilisation of these resources, especially among resource poor household. Indigenous chickens are hardy, adapt well to the rural environments, survive on low inputs and adapt to fluctuations in available feed resources (Gichohi and Maina, 1992)

The poultry sector in Zimbabwe can be characterized into three major production systems based on some selected parameters such as breed, flock size, housing, feeding, health, technology and bio-security. These are large scale commercial poultry production system, small-scale commercial poultry production system and village or backyard poultry production system (Bush, 2006). The large-scale commercial production system is highly intensive production system involving an average of 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 systems. It is estimated that this sector accounts for nearly 2% of the national poultry population. 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).

Small-scale intensive production system is characterized by medium level of feed, water and veterinary service inputs and minimal to low bio-security. Most small-scale poultry farms obtain their feed and foundation stock from large-scale commercial farms (Nzietchueng, 2008). Village or indigenous production system Village/indigenous production system characterized by little or no inputs for housing, feeding (scavenging is the only source of diet) and health care with minimal level of bio-security, high off take rates and high level of mortality.

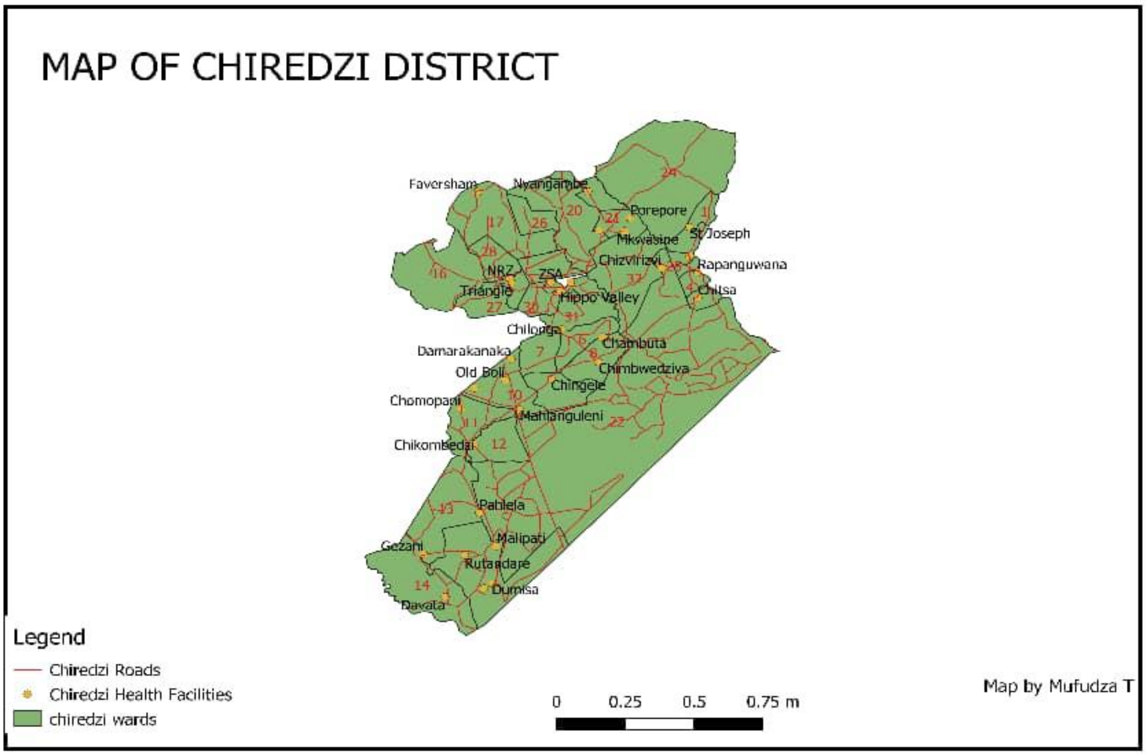
The supplements are either broadcasted on the ground or placed into improvised feeders once or twice a day. Birds of all ages live and scavenge together. Drinking water is irregularly provided in tins or broken clay pot pieces (King'ori, 2004). Indigenous chickens are excellent foragers and tolerate tropical conditions (Barua and Yoshimura, 1997), it does not involve investment beyond the cost of the foundation stock, a few handfuls of local grains and possibly simple night shades, mostly night time in the family dwellings. Mostly, indigenous chickens are kept although some hybrids and exotic breeds may be kept under this system (Dawit 2008).

The production performances of indigenous chicken were relatively poor. The low production performance of indigenous chicken was expressed as slow growth rate, late maturity, produce small sized eggs, small clutch size, broodiness and high mortality of chicks (Bogale, 2008; Fisseha, 2009; Meseret, 2010). In most developing countries indigenous chicken populations are the result of uncontrolled cross breeding programmes between various lines of local and exotic breeds (Dare, 1977). Replacement stocks originate from hatching own chicks or are purchased from the local market, or from neighbours or given as gift. Breeding stock is rarely replaced and inbreeding is common leading to low flock productivity (Mburu, 1994)

Sasso is specialized colored chicken that are resistant and adapted to environment. These chickens are efficient both for meat and egg production. Recent field tests in Nigeria, Tanzania and Ethiopia, have proved that smallholder farmers can substantially improve their performance by using a dual purpose breed from sassso and black australorp stocks with the best combined overall performance which included growth, liveability, heat tolerance (FAO 2021). These improved dual purpose breeds show less mortality, better growth rate and more eggs per bird. However, poor housing, lack of coordinated disease control mechanisms, poor feeding and the absence of conservation strategies are some of the challenges facing local chicken production systems in local chickens. Parasitism in the intestines of sasso and black australorp stock is another problem and results in low weight gain and poor carcass quality which could hinder the productivity of these dual purpose breeds. These dual purpose chickens that are adapted to harsh environmental conditions that include extensive small-scale village, free-range and organic production systems but are prone to parasitism and diseases (Van Marle-Köster, E.; Casey, N.H. 2018). However, there is need to support rural local members with education on best practices for vaccination, nutrition, housing and bio-security.

CHAPTER 3

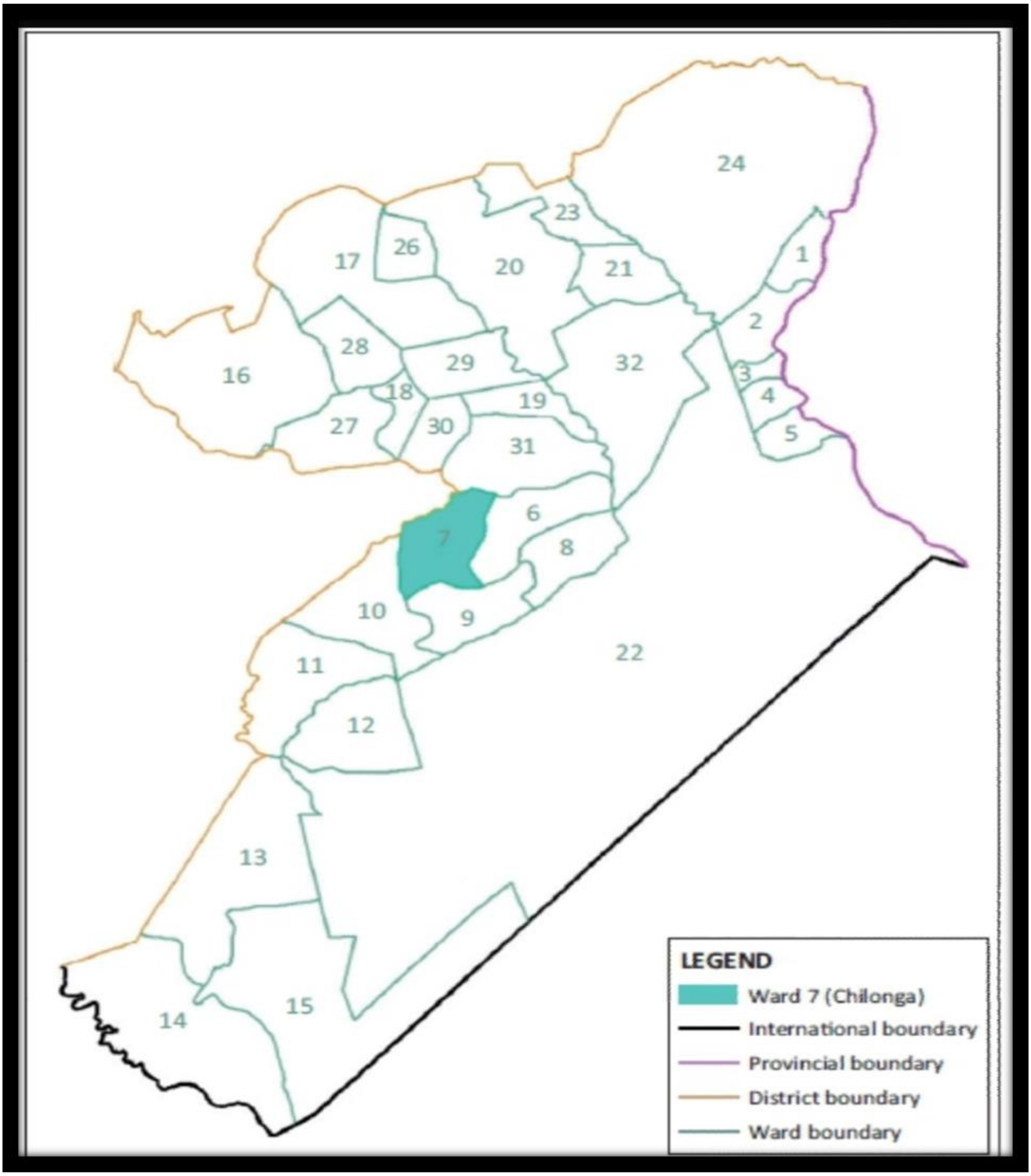
3.1 Study Area



Description of the study site

Chiredzi district council is in Masvingo province, which is in southern part of Zimbabwe. It is bordered on the east by Chipinge district, on the north by Zaka district and the western side with Chivi district. There are 32 wards in the district, with 13 commercial agricultural sectors and 12 communal and small-scale farming areas. Ward 7 is the chosen study area, located in the Agro-Ecological Zones V at an altitude of between 1 300 and 1 550 meters above sea level. The average annual temperature is 30^0c and it experiences seasonal droughts and severe dry spells even during the rainy season. The main crops grown in this region include commercial sugarcane and sorghum production, cotton, pearl millet. In addition to these, backyard vegetables and root crops (potato, sweet potato, carrot, cabbages, and red root) are also produced in the district. Farmers in the region are into commercial cattle ranching, small-scale commercial poultry production, and subsistence rearing of goats, sheep and pigs. Forms of land use include wildlife management and game ranching, irrigation farming and citrus production. The soil ranges from heavy clays and well drained deep loamy soils and drainage

Study Map Showing District Wards



3:2 Research Ethics

The study and its aims were presented to local traditional leaders and state veterinary personnel prior to any contact with the local people, and the purpose of the research was explained. The goal of the study is to evaluate production performance of sasso and black australorp chickens kept on no scavenging versus scavenging systems. Individuals were approached for involvement after chief Chilonga and village heads and ward 7 Counsellor who gave their permission to interact with Chilonga community. An interview with the Ward 7 Veterinary Officers was also conducted a mini-hatchery owner at Chilonga Livestock Rearing Project Centre. Each person who took part in the study gave their verbal consent first. The research records were written in English, but interviews and focus group discussions were conducted in the local language to ensure that everyone understood each other with an assistance from Mr. R. Gezani a local poultry farmer.

3:3 Data collection procedures

Before distributing the questionnaires, the participants read and signed a consent form. Questionnaires were used as a quantitative research instrument to collect data on respondents' on evaluate growth performances, egg production and liveability of sasso and black austrolorp chickens. Interviews with extension officers from the District Veterinary Officer, traditional leaders, and farmers served as qualitative approaches that supplemented the findings from the surveys. Respondents aged 20 to 60 years old were selected at random from the district to represent a range of experiences. Local indigenous chicken breeders and experts in indigenous chicken scavenging and semi-scavenging production systems were also interviewed. For certain farmers who were having difficulty answering the questionnaire or were unable to attend the interviews, voice recordings were made while conducting focus group discussion.

3.3.1Sampling of Respondents

Three villages, Village 1, Village 4 and Village 8, were selected from a total of six villages in the ward. These three villages were approximately 5 km apart. A village was composed of an average of 100 households. Only those farmers who owned chickens and were willing to participate in this study were considered. A total of 100 households, made up of 35, 30 and 35 households were randomly selected from Village 1, Village 4 and Village 8 villages, respectively.

3.3.2 Evaluation of the performance of two different chicken strains

The design of the study was a Complete Random Design (CRD) to evaluate the performance improved indigenous chicken strains of Sasso and Black Australorp. The study was of two chicken strains in rural communities, the indigenous breed of black australorp and sasso. The selection of the chicken strains types was done based on the distinct phenotypic differences of these two types of chicken strains. A total of 100 day old chicks from each chicken strain were randomly selected at day old at a mini hatchery in the local area following the vaccination of the Newcastle (ND) vaccine at the hatchery, before the delivery of the chicks to the chicken supply company. The birds were brought to the experimental study site at Chilonga Livestock Rearing Project Unit which already prepared and ready for the placement of the chicks. The mesh wire demarcation was created as two separate houses and was defined as experiment unit A and B with each experimental unit contain 50 chicks reared under intensive system up to six weeks of age.

Within the experimental unit A, total of 40 chicks of sasso strain were randomly selected from the first sampled flock and further divided into Experimental unit A^1 and A^2. Experimental unit A^1 was used to rear sasso chickens under semi-scavenging system and experimental unit A2 was used to rear 20 sasso chickens strains under scavenging system. The experimental unit B was also further divided into experimental unit B^1 and B^2 with a total number of 40 black australorp randomly selected from the first sampled flock. Experimental unit B^1 was used to rear 20 black australorp breed under semi-intensive scavenging system and B^2 was used to rear another 20 strains under scavenging system.

Design of an evaluation of two different Chicken strains at Chilonga LRPU

The study had 4 experimental units, Table 3.3 summaries the design of the study

Table 3.3 Design of the study

Experimental units	A (50 chicks)		B (50 chicks)	
Chicken Strains	SASSO		BLACK AUSTRALORP	
Sub-division of Experimental Units	A^1 (no scavenging system)	A^2 (scavenging)	B^1 (no scavenging system)	B^2 (scavenging)
Number of Birds	20	20	20	20

Preparation before Chick Arrival

The day before the placement of the chicks in the experimental units, water and feed equipment was placed at the correct rate recommended by the chicken breeder of two trays per 20 chicks and one chick font for 20 chicks. The brooders were warmed two days before the arrival of the chicks using the charcoal burner at rate of 25 chicks per burner. The temperature was warmed and maintained to a temperature of 34^0c and it was well monitored at a desired level according to the brooding chart. Water was also provided to the chicks and was done by giving treated water with the vitamin booster which was done for about 20 to 30 minutes before the chicks are placed in the house.

Chick Placement

In the placement stage, the chicks were place in blocks according to the experimental design units. The placement was done to make sure that all chicks have equal access to vitamin treated water and feed. The process of checking the chicks crop feel content was done by checking the chicks' percentage of 75% to 80% of the whole batch or the experimental unit. This was done about 6 hours after the placement of the chicks and also it was done under and according to the guideline of the pro-feeds guideline handbook on road runners. The other practise which was done is the checking the behaviours of the chickens which was monitored, assessed and scored according to the (Pro-feeds guideline book 2020 on the adequacy of the chicken brooding.

Brooding

The crucial and important factor for brooding among others was the temperature ranges in the experimental units. The temperature in the experimental brooding units was maintained and monitored at the required range of 32 to 34^{0}c for the period of first two week of the growth stages of the chicken. After two weeks of the growth stage the temperature was gradually dropped by 3^{0}c in that following weeks of its growth stages. There was also another tool which was used as a guideline of temperature control in the brooding area and it was the chick's behaviour. The feeding and drinking of the chicks was also monitored very well as it is also crucial in the growth rate of the chicks. The drinkers and feeders were constantly monitored and once the drinkers or chick fonts is empty, they were replaced with fresh and clean water immediately upon a close supervision

Light Provision

During the 1st to 2 weeks, chicks require 40-60 watts/m^2 and lighting can be reduced to 15 watts/20 m^2. With chicks between 30 to 33 chicks/m^2 for day old chicks, 10 to 12 chicks/m^2 for 21 to 25 day old chicks and 8 birds/m2 onward

Time	Light intensity	Photoperiod
0 – 4 days	20 lux	23 hours
5 – 18 weeks	5 lux	8 hrs up to 14 wks; increased to 16 hrs by 18 weeks.
Laying period	5 lux	16 hrs (or more, but NOT less)

Water and Feed management

The clean fresh water from the borehole was used for the chicks and that borehole water was treated by the vitamin stress pack and this was given to the chicks during the first week of the growth stage which was the first 7 days. After 7 days the chicks were given pure fresh water from the borehole which was given ad-libitum but only restricted during the vaccination period as the drinking water vaccines was the method used for vaccinate the chick against diseases. The ad-libitum water provision to the chicks was done in accordance to the recommended animal welfare and ethics.

Experimental Diets

The composition of the experimental diets is presented in Table 3.1. Chicks of both breeds were fed road runner starter concentrate diets from day 0-8 weeks of age, grower concentrate from 9-16 weeks and layers concentrate from 17 weeks up to laying. As for chickens reared under semi-extensive system were allowed to scavenge outside the poultry house fed on weighed ration in form of concentrates, maize, sorghum, millet, wheat, household scrub, mill scrub and sweet potato. At the beginning of 3 weeks, birds kept under semi-scavenging system were allowed to semi-scavenge from 6:00 am to 6:00 pm with free access to open grass area of 1 bird per $4m^2$

Feeding of Indigenous chickens

Table 3.1

0-8 weeks	**9-16 weeks**	**17weeks to laying**
Mix 2 parts Chick Starter Concentrate to 3 parts crushed maize.	Mix 2 parts Grower Concentrate to 3 parts crushed maize	Mix 2 parts Layer Con to 3 parts crushed maize.

Feeding guide lines for indigenous chickens

Table. 3. 2

Nutrient	**Starter** **(0-8 weeks)**	**Grower** **(9-16 weeks)**	**Layers** **(17-laying)**
Protein %	21.0	17.0	15.0
Met. Energy, kcal/0.5kg	1325-1400	1375-1425	1300-1450
Feed requirement	2kg/bird	5kg/bird	120-135g/bird/day

Growth rate

The birds kept were weighed once per week at from day old up to 20 weeks of age, using a hanging scale. All the birds in a given flock of an experimental unit were weighed and an average weighted was calculated by adding total weight obtained and divide by the number of birds.

Measuring Daily Weight Gain

The daily average weight gain was computed from the weekly weight measurement for each group and the results were divided by seven

Measuring Feed Intake

The feed intake was measured by calculating the weight of the feeders and feed before feeding and this was subtracted from the feed left over weight and the feeder's weights. The process of weight measuring was done at the same time of the day. Feeds were placed on top of the mash wires with the collecting vessels underneath used to collect all the feed spilt to account for the spilt feeds which were added as part of left overs in the calculation of the daily feed intake.

Determining Feed Conversion Rate

Feed conversion rate was measured after computing total amount of feed by the flock and divide by the average weight gain produced per a specific time period.

Egg production between two chicken strains

Egg production was evaluated by measuring daily production, weekly, and total egg production. Eggs were collected manually twice a day. Proper record keeping was done on daily egg production, average egg weight, percent hen day production, daily feed consumption, weekly weight, house temperature and daily mortality. Egg production was calculated by computing the number of eggs in hen days in the period by totalling the number of hens alive on each day of the period taking into account egg breakages.

Liveability between two chicken strains

Liveability was determined by recording daily, weekly and total mortality. Liveability up to first laying age (20weeks) was detected by mathematical calculation (number of live hens up to specified time divide by total hens multiplied by hundred). Liveability means the percentage of live birds for a specified time, which affect productivity.

CHAPTER 4: RESULTS

Respondent Characteristics

	Age Groups			
Sex of Respondent	20-30	31-40	41-50	51-60
Male	5	13	8	6
Female	7	21	11	13
Chicken Strains	**SA (NS)**	**BA (NS)**	**SA (S)**	**BA (S)**
GR (0-8weeks)	0.070-0.620kg	0.068-0.620kg	0.070-0.620kg	0.068-0.620kg
(9-17weeks)	1.540kg-2.475	1.487-1.860kg	1.445-1.711kg	1.440-1.655
Liveability	85-90%	87-95%	70-80%	75-85%
Egg Production	230-250 egg/year	350-364eggs/year	205-235eggs/year	320-345eggs/year

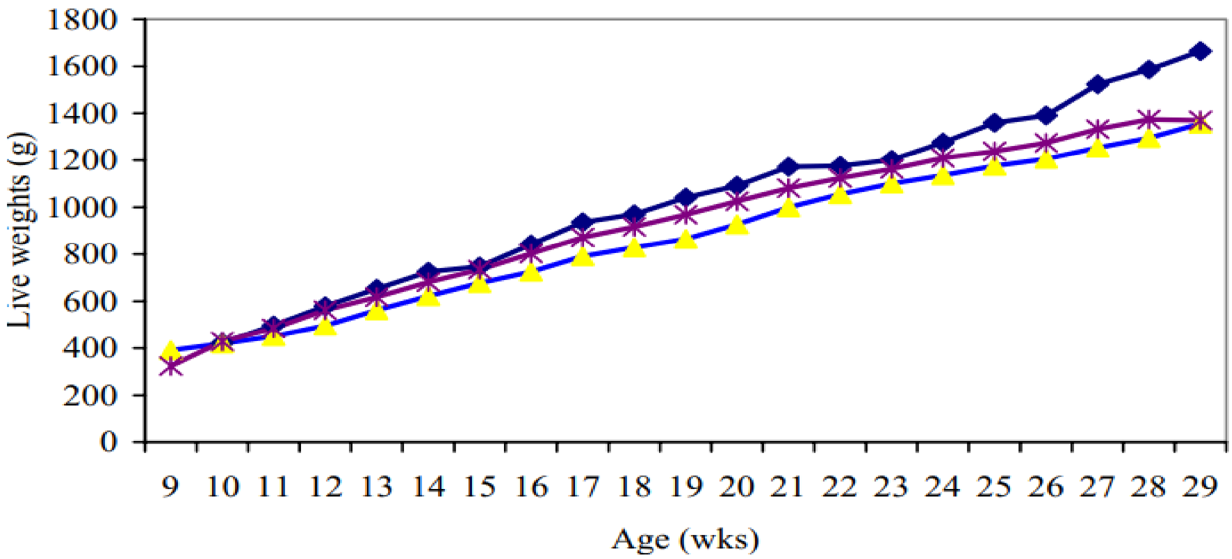
The respondents with age group from 20-30 years were not fully active in chicken production with age group between 31-40 years were highly participated in chickens production and those age of farmers were producing crops for their family consumption, also leftover crops was used for their chickens feeds. On each age group women were highly participated in chicken production as compared to men. The majority of the information gathered was qualitative, and direct explanations were provided. The data from the interviews was categorized and organized into themes. Excel and the SPSS application were used to organize and analyse the data. Feedback from respondents have shown that, significant difference on growth performance between SA and BA kept under no scavenging system with average of 1.540-2.475kg for SA as compared to 1.487-1.860kg for BA. Under scavenging system SA recorded average of 1.445-1.711kg against 1.440-1.655kg for BA. BA strain was numerically superior to SA on egg production both under no scavenging and scavenging system. The results indicated that in production life time BA had an average of 320-364 eggs/year than 205-250 eggs/year for SA strain. Bird mortality was high on scavenging system than no scavenging due to exposure to diseases causing pathogens and predation as well as insufficient feed and water of birds under scavenging system. Liveability was ranging between 75%-95% for BA against 87%-90% for SA. Comparison was not made on mortality after 20th week since some farmers had started consuming or selling some chickens under observations as they have reached point of lay**.**

Growth Performances of two Chicken Strains (NS)

Chicken Strains	Sasso (e.u A[1])				Black Australorp (e. u B[1])			
Age (weeks)	AWG(g)	FI(g/b/d)	FCR	WC(ml/b/d)	AWG(g)	FI(g/b/d)	FCR	WC(ml/b/d)
1	72	15	0.90	30	72	15	0.85	21
2	129	21	1.11	42	121	21	0.94	26
3	196	25	1.44	50	184	25	1.11	35
4	273	29	1.51	58	257	29	1.40	41
5	371	36	1.60	72	349	36	1.55	51
6	474	40	1.75	80	446	40	1.79	57
7	577	43	2.04	86	543	43	2.00	62
8	690	47	2.15	94	650	45	2.09	68
9	803	53	2.22	106	757	49	2.15	74
10	917	56	2.35	112	863	52	2.25	78
11	1020	62	2.48	124	960	58	2.35	87
12	1112	66	2.56	132	1048	62	2.45	93
13	1195	71	2.78	142	1125	67	2.68	101
14	1267	74	2.88	148	1193	70	2.75	108
15	1339	76	2.98	152	1261	72	2.88	113
16	1411	79	3.01	158	1329	75	2.99	117
17	1583	82	3.31	164	1397	78	3.21	158

AWG – Average Weight Gain FI- Feed Intake WC- Water Consumption

FCR- Fed Conversion Rate



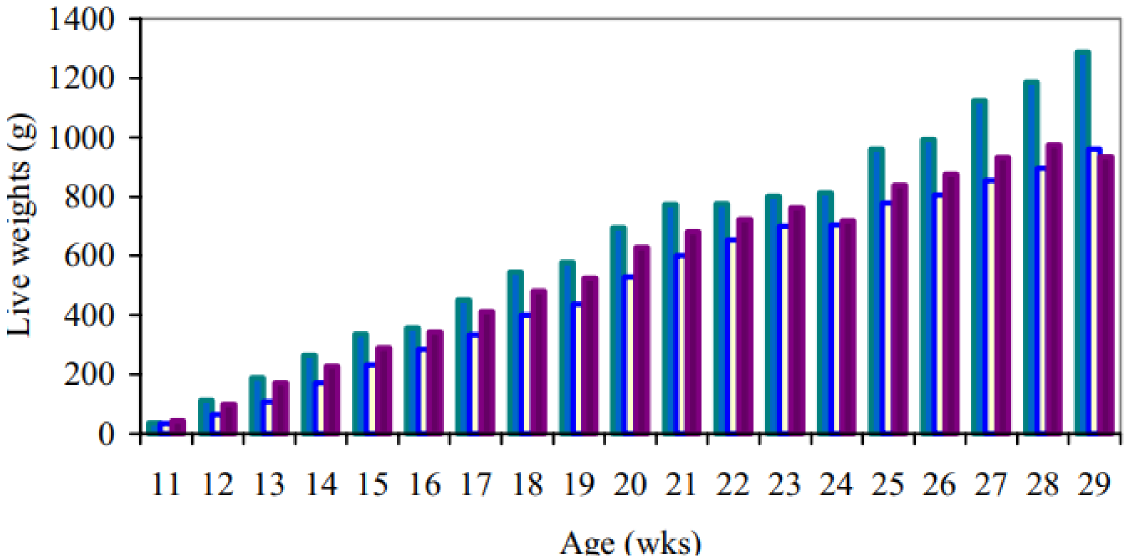
The table shows average live weight gains for SA and BA under no scavenging management system. AWG for SA and BA under no scavenging management were not different (P>0.05) in the first week. Significant differences (P<0.05) were observed due to breed from the second week on average weight gain. By fifth week, SA were 3.05% AWG superior to BA. The trend continued with time where SA fed intensive were 3.03 % superior to BA by 11th week. Significant difference on growth performances was attributed to breed, hence SA strain had superior growth performances than BA under no scavenging system.

Growth Performances of Chicken Strains (S)

Chicken Strains	Sasso (e.u A[1])				Black Australorp (e. u B[1])			
Age (weeks)	AWG(g)	FI(g/b/d)	FCR	WC(ml/b/d)	AWG(g)	FI(g/b/d)	FCR	WC(ml/b/d)
1	70	15	0.90	22	68	14	0.90	21
2	125	18	1.11	27	121	17	0.94	26
3	190	24	1.44	36	184	23	1.11	35
4	265	28	1.51	42	257	27	1.40	41
5	360	35	1.60	52	349	34	1.55	51
6	460	39	1.75	58	446	38	1.79	57
7	560	42	2.04	63	543	41	2.00	62
8	620	46	2.22	69	650	45	2.04	68
9	780	50	2.31	75	757	49	2.06	74
10	890	53	2.33	79	863	52	2.07	78
11	990	59	2.36	88	960	58	2.08	87
12	1080	63	2.38	94	1048	62	2.10	93
13	1160	68	2.41	102	1125	67	2.12	101
14	1231	71	2.44	106	1193	70	2.14	105
15	1300	73	2.49	109	1261	72	2.17	108
16	1370	76	2.51	114	1329	75	2.20	113
17	1440	79	2.55	118	1287	78	2.23	117

AWG – Average Weight Gain FI- Feed Intake WC- Water Consumption

FCR- Feed Conversion Rate



Key SA (S) BA (S)

The table shows average live weight gains for SA and BA under scavenging management system. AWG for SA and BA under no scavenging management were not different (P>0.05) by the first week. Significant differences (P<0.05) were observed due to breed from the second week on average weight gain. By fifth week, SA were 3.05% AWG superior to BA. The trend continued with time where SA fed intensive were 3.03 % superior to BA by 11th week.

Egg Production of Chicken Strains (NS)

Chicken Strains	Sasso (e.u A^1)				Black Australorp (e.u B^1)			
Age (weeks)	Total Hens	No of Eggs	Cumulative	(%) HHP	Total Hens	No of Eggs	Cumulativ e	% HHP
20	20	60	60	38	20	80	80	45
21	20	60	120	36	20	85	165	40
22	20	65	185	40	20	80	245	48
23	20	80	265	45	20	85	330	44
24	20	80	345	46	20	100	430	50
25	20	80	425	40	20	100	530	52
26	18	70	495	48	20	90	620	55
27	18	75	570	50	20	90	710	58
28	18	70	640	55	20	100	810	52
29	16	65	705	50	19	80	890	60
30	16	68	773	60	19	80	970	
Total			773				970	
Percent Hen Day Production (%HDP)				**57.51%**			**60.77%**	

By week 20th for SA under no scavenging system percent housed hen production was 38% against 45% of BA under the same system. As the study continued by week 25, %HHD was 40% for SA against 52% for BA. At the end of the study, %HDP was 57.51% for SA while 60.77% was attained for BA hence BA had higher egg production. The results indicate that with in this case BA perform better than SA when properly managed in the case of no scavenging system.

Egg Production of Chicken Strains (S)

Chicken Strains	Sasso (e.u A^2)				Black Australorp (e.u B^2)			
Age (weeks)	Total Hens	No of Eggs	Cumulative	% HHP	Total Hens	No of Eggs	Cumulativ e	% HHP
20	20	40	65	41	20	60	80	40
21	20	46	125	38	20	50	150	40
22	20	50	195	40	20	66	250	45
23	20	55	275	44	20	70	320	51
24	20	60	340	43	20	66	400	50
25	17	65	405	45	20	68	475	45
26	17	68	473	40	20	70	545	46
27	17	66	539	56	17	65	610	55
28	15	62	601	52	17	60	670	60
29	15	64	665	55	17	70	740	65
30	15	66	731		17	65	805	
Total			731				805	
Percent Hen Day Production (%HDP)				**58.01%**			**56.37%**	

%HHP- Percent Housed Hen Production

By week 20th for SA under scavenging system percent housed hen production was 41% against 40% of BA under the same system. As the study continued by week 25, %HHD was 45% for both SA and BA. At the end of the study, %HDP was 58.01% for SA while 56.37% was attained for BA hence BA had higher egg production

Liveability of Chicken Strains (NS)

Chicken Strains	Sasso (e.u A[1])			Black Australorp (e.u B[1])		
Age (weeks)	Total Chicks/Hens	Mortality	Mortality Rate	Total Chicks/Hens	Mortality	Mortality Rate
1-4	50	3	6	50	1	2
5-8	47	1	2.127	49	0	0
9-12	46	0	0	49	2	4.08
13-16	46	3	6.52	47	0	0
17-20	43	0	0	47	0	0
Total	7			3		
Liveability	86%			94%		

Mortality was 6 % in SA, 2 % in BA both kept under scavenging free – ranging system by the fourth week of study. By 16th week mortality was 6.52% in SA, 0% for BA. Zero mortality was recorded in both strains of chicken by 20th week. Birds mortalities were attributed to chilling, low humidity, ammonia burns, carbon monoxide poisoning and dehydration other than diseases, hence BA have shown better liveability of 96% as compared to 86% for SA under no scavenging system.

Liveability of Chicken Strains (S)

Chicken Strains	Sasso (e.u A[2])			Black Australorp (e.u B[2])		
Age (weeks)	Total Chicks/Hens	Mortality	Mortality Rate	Total Chicks/Hens	Mortality	Mortality Rate
1-4	50	3	6	50	2	2
5-8	47	2	2.12	48	1	0
9-12	45	2	2.12	47	2	4.08
13-16	43	1	6.52	45	1	0
17-20	40	2	0	43	1	0
Total	10			7		
Liveability	80%			86%		

Mortality was 6 % in SA, 2 % in BA strains kept under scavenging free – ranging system by the fourth week of study. By week 12, bird mortality recorded was 2.12% in SA against 4.08% hence BA have shown better liveability of 86% as compared to 80% for SA under scavenging system. These dual purpose chickens showed that they are less adapted to harsh environmental conditions that include scavenging, extensive small-scale village, free-range and organic production systems as they are prone to parasitism, predation, unbalanced feed such as deficiency of salt and essential amino acids to meet their genetic potential and diseases.

CHAPTER 5: DISCUSSIONS

Live weight gains for SA and BA under no scavenging management system. AWG for SA and BA under no scavenging management were not different (P>0.05) in the first week. Significant differences (P<0.05) were observed due to breed from the second week on average weight gain. By fifth week, SA were 3.05% AWG superior to BA. The trend continued with time where SA fed intensive were 3.03 % superior to BA by 11th week. Significant difference on growth performances was attributed to breed, hence SA strain had superior growth performances than BA under no scavenging system. For both breeds, high coefficient of variation were observed, these were high in SA than BA, they might have expressed variation due to breed mechanism. SA under no scavenging system percent housed hen production was 38% against 45% of BA under the same system. As the study continued by week 25, %HHD was 40% for SA against 52% for BA. At the end of the study, %HDP was 57.51% for SA while 60.77% was attained for BA hence BA had higher egg production. The results indicate that with in this case BA perform better than SA when properly managed in the case of no scavenging system. Mortality was 6 % in SA, 2 % in BA both kept under scavenging free – ranging system by the fourth week of study. By 16th week mortality was 6.52% in SA, 0% for BA. Zero mortality was recorded in both strains of chicken by 20th week. Birds mortalities were attributed to chilling, low humidity, ammonia burns, carbon monoxide poisoning and dehydration other than diseases, hence BA have shown better liveability of 96% as compared to 86% for SA under no scavenging system. In a nutshell significant difference on growth performances, egg production and liveability on two different strains kept under two different system of no scavenging and scavenging were observed due to breed and management. Chicken strains kept under no scavenging system had shown better performances in terms of growth for instance efficiency in daily weight gain, feed conversion rate, egg production and liveability. Sasso chicken strain had shown high growth performances on both production systems under study as compared to black australorp. Black australorp chicken strain had better performance on egg production and liveability under both production systems under study as compared to sasso strain. Chicken strains kept under scavenging system have expressed variation due to coping mechanism as they were adapting to the environment for instance feeding

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

The study was carried out in Chiredzi District ward 7 in Masvingo province which was an evaluation for growth performance, egg production and liveability of sasso and black australorp kept under no scavenging system versus scavenging systems. It is concluded that appreciable growth performances can be attained in no scavenging sasso breed when supplemented with high to medium diets at a level around 75%- 90% of their daily feed requirements. As for egg production and liveability it is also concluded that high egg production of around 364 eggs per year for BA. The recommended day length for laying hens is 16-18hours daily to influence egg laying. A feeding program that uses only one type of feed during the entire laying period will be simple and easy to manage. The feed has a high nutrient density to meet the maximum requirements at the lowest level of feed consumption expected throughout the year. The average feed conversion efficiency for layers is between 2.1 and 2.3 kg / kg egg mass (or 2kg feed per dozen eggs). Parasitism in the intestines of sasso and black australorp stock is another problem and results in low weight gain and poor carcass quality which could hinder the productivity of these dual purpose breeds. These dual purpose chickens that are adapted to harsh environmental conditions that include extensive small-scale village, free-range and organic production systems but are prone to parasitism and diseases. However, there is need to support rural local members with education on best practices for vaccination, nutrition, housing and biosecurity. It had been proved that smallholder farmers can substantially improve their performance by using a dual purpose breed from sassso and black australorp stocks with the best combined overall performance which included growth, liveability and heat tolerance. Disease, predators, feed resource, lack of proper housing were the major constraints that affected the chickens' productivity in the area under scavenging system. The Fowl typhoid, Coccidiosis and Newcastle disease were the major disease followed by Fowl cholera, Fowl salmonella, Fowl pox and Fowl crazy diseases which impeded the productivity of the chickens in the study area, there is need for strategy vaccination and implement biosecurity measures to eradicate diseases incidences in poultry production.

REFERENCES

Abdelqader, A., C.B.A. Wollny & M. Gauly. (2020): Characterization of local chicken production system & potential under different level of management practice in Jordan. Journal of Tropical animal health and production. Volume 39. Pp155-164.

Abera, M. and Tegene, N. (2011): Phenotypic and morphological characterization of Indigenous chicken population in Southern region of Ethiopia. Animal Genetic Resource Information Journal, 49: 19-31.

Abubakar MB, Ambali AG and Tamjdo T., (2017): Rural chicken production: Effects of gender on ownership, and management responsibilities in some parts of Nigeria and Cameroon. International Journal of Poultry Science 6(6):413–416

Achenef Melaku, (2012): Study on Status and Constraints of Village Poultry Production in Metema District, North-Western Ethiopia, Faculty of Veterinary Medicine, Gondar University, Ethiopia. Tel: +251-918065724, Fax: +251-581142145. 246

Addis Getu, (2014): Review work on farmer trite preferences for their breeding objectives of local chicken ecotypes in Ethiopia

Addisu H, Hailu M, Zewdu W (2013): Indigenous Chicken Production System and Breeding

Practice in North Wollo, Amhara Region, Ethiopia.

Aklilu, H., (2007): Village poultry in Ethiopia; Socio-technical analysis and learning with farmers. PhD. Thesis, Presented to the Wagningen University, Wagningen, the Netherlands.

Alem Tadesse, G.T. Yayneshet, (2013): Rural poultry marketing systems and associated marketing constraints in two agro-ecological zones of central Tigray, Northern Ethiopia.

Alemayehu, T. Yilma, Z. Shibeshi and T. Workneh,(2015): Village Chicken Production Systems in Selected Areas of Benishangul-Gumuz, Western Ethiopia, Ethiopian Institute of Agricultural Research, Assosa Agricultural Research Center, P.O. Box 265, Assosa, Ethiopia