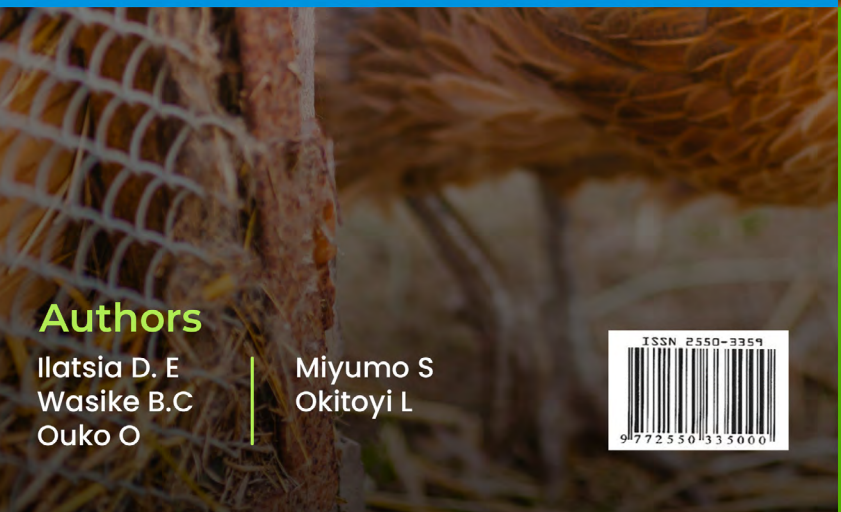
FARA
Forum for Agricultural Research in Africa

Research Report

Commercial Poultry Success Stories in Kenya

Drivers and Lessons

FRR VOLUME 6 No. 11



Authors

Ilatsia D. E
Wasike B.C
Ouko O

Miyumo S
Okitoyi L

ISSN 2550-3359

MAY 2022

Citation: Ilatsia D. E., Wasike B.C., Ouko O., Miyumo S., and Okitoyi L. (2022). Commercial Poultry Success Stories in Kenya: Drivers and Lessons. FARA Research Report 6 (11): Pp 50

Corresponding Author
Ilatsia D. E

ISSN:2550-3359

Editorials
Dr. Fatunbi A.O and Mr. Benjamin Abugri (babugri@faraafrica.org)

Forum for Agricultural Research in Africa (FARA)
12 Anmeda Street, Roman Ridge PMB CT 173, Accra, Ghana Tel: +233 302 772823 / 302 779421 Fax: +233 302 773676 Email: Website: www.faraafrica.org : www.faradatainforms.faraafrica.org

Join the network: https://faraafrica.community/fara-net/join

Register as an AR4D expert: https://experts.faraafrica.org/

Designed By: Samuel Oti Attakorah - FARA Knowledge Management, Learning & Communications Unit (publications@faraafrica.org)

About FARA

The Forum for Agricultural Research in Africa (FARA) is the apex continental organisation responsible for coordinating and advocating for agricultural research-for-development. (AR4D). It serves as the entry point for agricultural research initiatives designed to have a continental reach or a sub-continental reach spanning more than one sub-region.
FARA serves as the technical arm of the African Union Commission (AUC) on matters concerning agricultural science, technology and innovation. FARA has provided a continental forum for stakeholders in AR4D to shape the vision and agenda for the sub-sector and to mobilise themselves to respond to key continent-wide development frameworks, notably the Comprehensive Africa Agriculture Development Programme (CAADP).
FARA's vision is to "Reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises" its mission is the "Creation of broad-based improvements in agricultural productivity, competitiveness and markets by strengthening the capacity for agricultural innovation at the continental-level"; its Value Proposition is the "Strengthening Africa's capacity for innovation and transformation by visioning its strategic direction, integrating its capacities for change and creating an enabling policy environment for implementation". FARA's strategic direction is derived from and aligned to the Science Agenda for Agriculture in Africa (S3A), which is in turn designed to support the realization of the CAADP vision.

Disclaimer

Acknowledgement

This study was developed in the context of the Program of Accompanying Research for Agricultural Innovation (PARI), supported by the Federal German Ministry for Economic Cooperation and Development (BMZ).

Executive Summary

The poultry sector in Kenya has undergone major changes structurally in the last five years due to modern mechanized intensive production methods, imported genetic resources, improved biosecurity measures, increasing expendable income and human population. These changes offer great opportunities for commercial poultry enterprises, particularly large scale producers and processors, to improve their income and impact in food provision. This is evidenced by an expansion of operations of the existing players in the market. Evidence from case studies shows that successful players in the industry have a bright future for growth due to the available untapped opportunities. Despite this, Porter's five forces model revealed several bottlenecks that exist in the market including the high cost of production of poultry and their products as compared to other countries due to existing tax regimes, scarcity of requisite production resources that require importation among other limitations.

Introduction

Over the last decade, Kenya has emerged as one of the growing numbers of economic success stories in the African continent. It has the largest economy in Eastern Africa with a Gross Domestic Product (GDP) growth, averaging about 5.7 percent annually. Poverty levels are on the decrease from 47 percent in 2005, to 36 percent in 2015/16, according to the 19th edition of the Kenya Economic Update (World Bank, 2019). Kenya's economy is more diversified than most countries in Sub-Saharan Africa with 55 percent of the GDP coming from production and service industries that include; Agriculture, Transport, Finance, Tourism and Information Communications Technology (ICT). The country holds great economic potential from its growing youthful population and the dynamic private sector, a platform for change laid down by the new Constitution and its critical role played within the region (KIPPRA, 2020).

Agriculture remains a vital contributor to the Kenyan economy, accounting for 30 percent of the GDP and 74 percent of employment (FAO, 2021). Though devolved to the county governments, it is a key sector in the economic pillar of the Kenya Vision 2030 (the national medium-term development blueprint), practiced in both high potential Arid and Semi-Arid Lands (ASALs). Rain-fed agriculture is practiced in high potential areas that constitute less than 20 percent of the Kenyan landmass. The remaining 80 percent of the country landmass is arid and semi-arid, which is not suitable for rain-fed agriculture due to low and erratic rainfall pattern. Livestock production including poultry remains the primary source of livelihood for people living in the ASALs.

The tangible and intangible benefits from poultry in Kenya are well documented as well as its contribution to livestock, agriculture and ultimately the national GDP (Magothe et al., 2012b). Some of the primary benefits include the provision of readily available protein sources to support nutrition security as well as being a major source of income for both high-end commercial enterprises and the poor rural communities (Kingori et al., 2010; Khobondo, et al., 2015).
About 35% of households sell eggs while about 50% sell live birds

at farm gate prices to generate income (Pym et al., 2006). In addition, the enterprise is also linked to several other economic activities along the value chain thus, creating employment opportunities and improving rural household livelihoods (Bett et al., 2012). Apart from generating income, chicken meat and eggs are affordable and readily available sources of animal protein. Nearly all the chicken meat and over 70% of eggs produced in the country are consumed locally (Kaudia and Kitalyi, 2002); indicating a readily available market for chicken and chicken products. Apart from economic and nutritional roles, chicken also has social, cultural and religious importance and serves as a scaling-up enterprise to larger livestock enterprises such as dairy (Muchadeyi et al., 2007a, 2007b; Moreki et al., 2010). Rearing IC and tropically adapted breed lines have been cited as an enterprise for vulnerable groups such as women, youth and people living with disabilities whose access to capital and business collateral is limited. IC serves as their source of income and savings. Due to their little land requirements, chickens are equally gaining prominence among the landless as population pressure on land increases (Magothe et al., 2012b).

According to the Kenya National Bureau of Statistics (2019), poultry population is estimated at 44,619,000 birds, out of which 43,796,477 (98%) are domestic chickens. Consequently, chicken is the most common poultry in Kenya kept for commercial purposes by both smallholder and large scale farmer. About 36,578,441 (83%) chickens kept in Kenya are indigenous chicken (IC) and their derivatives with exotics (including tropically adapted dual-purpose breed lines), while 3,056,000 (7%) and 4,161,000 (10%) are broilers and layers, respectively. Between year 2006 and 2016, a remarkable difference was observed in broilers and layers production. Broilers production reduced by about 27% (from 4,169,200 to 3,056,747), while layers production increased by about 70% (from 2,448,300 to 4,161,289). Conversely, the indigenous chicken population increased by about 66% in the same period to 36,578,441 (KNBS, 2019). The decrease in the production of broilers and the significant increase in indigenous chicken production may be attributed to a drastic shift in consumer preference for indigenous chicken meat and fertilized eggs (Omiti and Okuthe, 2009). This shift in preference was associated with consumer perception of taste and nutritional benefits linked to indigenous chicken products (Bett et al., 2012). In addition, the increase in production may also be credited to the increased demand for eggs and chicken meat due to increasing human population, urbanization and incomes. Unfortunately, the sub-sector is challenged by low productivity due its genetic conformation, poor management and marketing channels. Consequently, tropically adapted dual-purpose breed lines (also referred to as improved indigenous chicken in the Kenyan market) were considered an alternative to meet the deficit in demand for indigenous chicken meat and eggs.

However, a massive introduction and fast adoption of the dual-purpose breed lines by farmers in Kenya occurred in 2012, resulting in a decline in the production of commercial broilers and layers. The attraction to the tropically adapted dual-purpose breed lines was the low cost of production and consumers preference (organic), compared to the exotic breed lines. An important aspect to note is the success of leading commercial poultry producing firms in Kenya; whose major revenues are generated

from the sale of day-old chicks alongside with processed poultry products, is driven by smallholder farmers. The smallholder farmers' shift from exotic broiler chicken production led to a national decrease in meat production and a resultant decrease in the revenue generated by leading broiler multipliers in Kenya. Three years after this scenario (2015), the effect of reduced meat production was already deep in the country and importation of chicken meat was implemented to cover for the deficit (Figure 1). Although, there is an insufficient amount of chicken meat and eggs to meet the demand as evidenced by the annual increase in the number of imports. This creates an opportunity for commercial firms to identify channels to penetrate the sector and contribute to the deficit without entering directly into competition with the indigenous chicken sector.

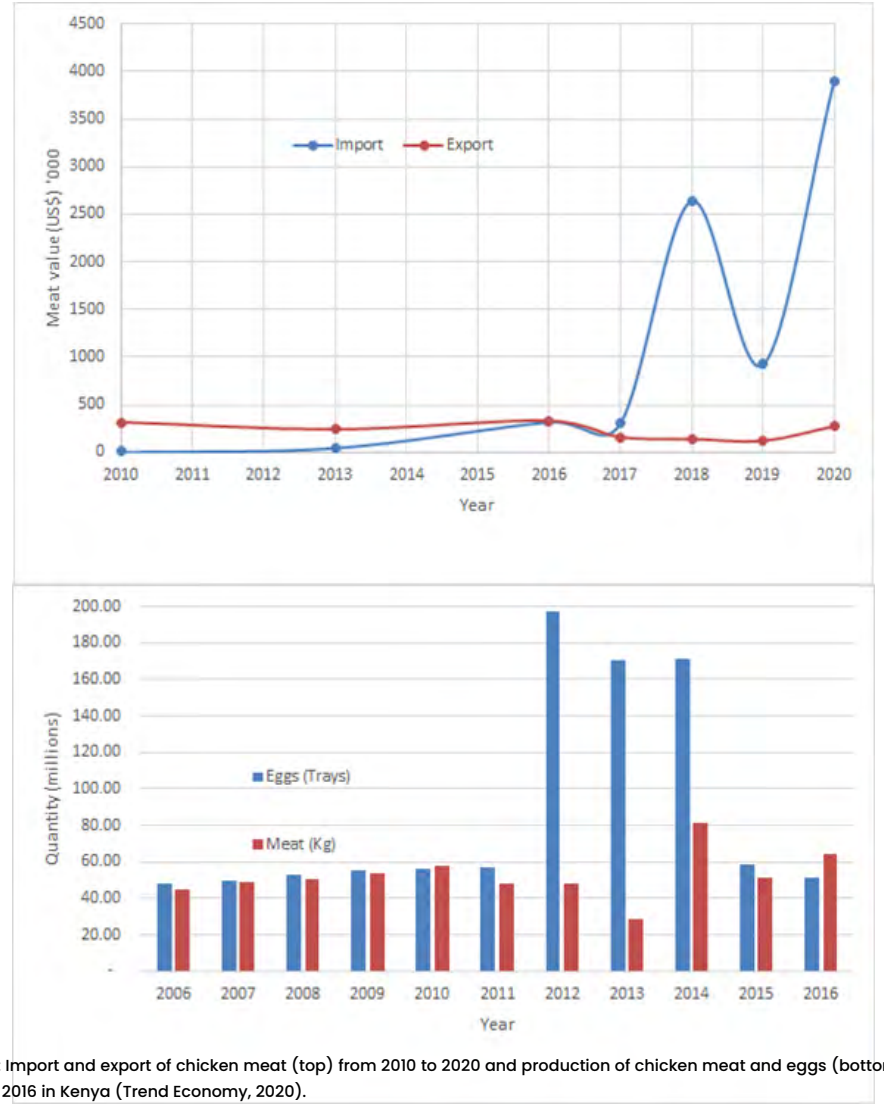


Figure 1: Import and export of chicken meat (top) from 2010 to 2020 and production of chicken meat and eggs (bottom) from 2006 to 2016 in Kenya (Trend Economy, 2020).

The success of the commercial poultry sector in Kenya is highly influenced by market and production dynamics, driven by smallholder chicken producers. These producers acquire day-old chicks from the hatcheries and other multipliers and raise them for meat and egg products for the market.

Due to the social and economic attributes attached to chicken, several organized societies and farmer groups have emerged with the capacity to produce in large scale in order to meet export regulation with adequate processing capacities. An example is the Kenya Poultry Farmers Association (KEPOFA), whose interest is to enable smallholder farmers to obtain favorable market and policy conditions for production. Another initiative is the Kenyan Government's intervention, ensuring that smallholder farmers increase their capacity of production to heights that significantly affects the success of large sector one commercial poultry producers. The government's interventions to promote smallholder poultry production are currently jointly funded by the World Bank, The European Union, Bill and Melinda Gates Foundation, U.S. Agency for International Development.

The poultry sector is highly integrated with other sectors within and outside of agriculture as illustrated in figure 2. This sector integrates with the feed industry, animal health service providers, informal manufacturing/fabrication (jua kali) together with the farming community (dairy and crop producers), fishing industry, the food industry and tourism (the Republic of Kenya, 2017b). It is also linked with sports and culture, cock fighting is a big attraction in some communities in Kenya. Part of the income derived from poultry farming is appropriated as government revenue through taxation; the rest forms an important pathway out of poverty, especially among the rural people. The sectors that the poultry industry is integrated with contribute significantly to Kenya's economy. Example of such is the tourism sector which utilizes poultry products for food, contributing about 19% to the overall economy (Omiti and Okuthe, 2009).

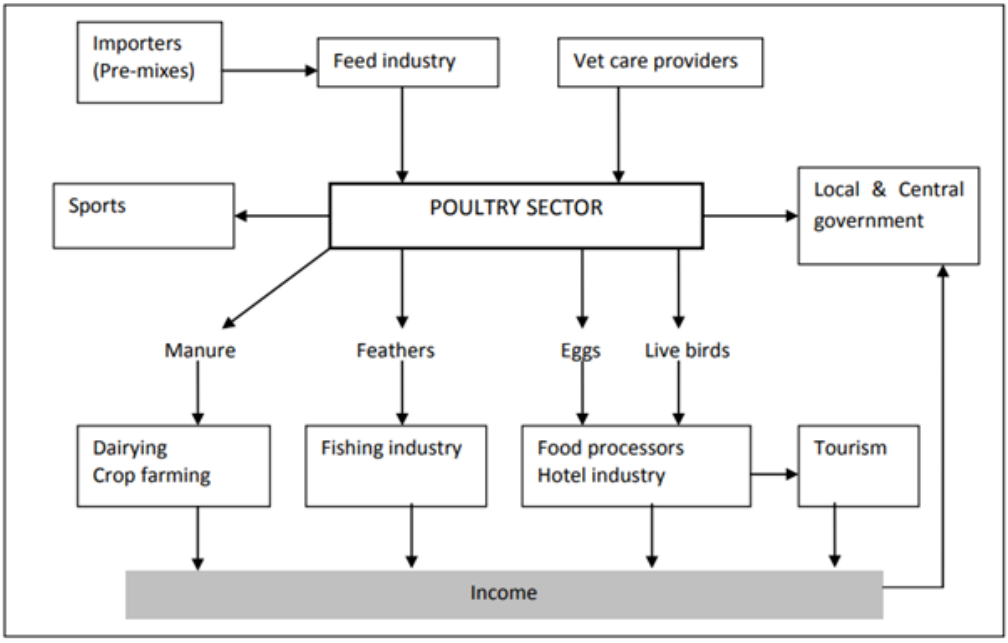


Figure 2: Linkage of the poultry sector with other industries (Omiti and Okuthe, 2009)

Study Methodology

Literature review on success factors in commercial poultry development in the case study country and the region.

The project team, which is comprised of experts in chicken production and business analysis, consulted a wide literature to come up with success factors in commercial poultry development in Kenya. This review was to help in the formulation of the following;

- An initial definition of commercial poultry enterprise
- The main indicators that can be used as a measure of enterprises growth (e.g. level of production, turnover, profit)
- Some initial hypotheses on the success factors of commercial poultry enterprises

The second part of the work consisted of analyzing the evolution of the commercial poultry sector. This was with a focus on the major changes in the last five years. At the end of this analysis and based on the results of the previous tasks, a typology of commercial poultry operations was proposed. At the end of this step, five case studies were identified for inclusion in the data collection process by interviews. The selected enterprises which are in sectors one and two are; Kenchick, KALRO, Muguku poultry farm, Isinya Feeds Limited and Kenbrid Farms.

Data Collection Approach

Well-structured questionnaire based on the hypotheses on the success factors of poultry enterprises in Kenya was used for data collection. This was done in collaboration with FARA and ZEF. The questionnaire was further tested and refined accordingly, to ensure conformity with intended objectives and practicality.

Interviews were scheduled and undertaken with selected commercial poultry enterprises with the aid of a structured questionnaire (Annex 1) to collect the required information. Consideration was given to the design of the questionnaire in order to interest the respondents and to avoid inconsistency in the questions. Research experts from KALRO, FARA and ZEF reviewed the questionnaire; after which it was subjected to a pre-test on KALRO's Poultry Unit before administration to other selected poultry enterprises in Kenya. The pre-test was done to capture any the inadequacy of the intended data to be collected and to determine the duration (time) of the interview.

Five poultry enterprises divided into sector one and two tiers of production were selected based on their level of production, geographical reach and fit. Before the interview, initial communications by emails and phone calls were established with the management of the selected poultry enterprises to intimate them about the study objectives.

The interviews were conducted at the work premises of the poultry enterprises and were initiated with a brief session of introduction and general conversation on matters that were deemed interesting to the interviewee. Once rapport was built, subject matters relating to the research objectives were tabled and discussed.

The research (objectives and expected benefits) was introduced to the interviewee to enable them to have an in-depth understanding of the ongoing intervention. This involved a concise explanation of the purposes of the research, stakeholders involved and how the data collected will be used in the poultry value chain in Kenya. The respondents were made to know that they were under no obligation to answer any question that they wished not to answer. This was important to make the interviewee feel that they are in control and create a comfortable environment for them. The same topic guide was used all through during this study as indicated in Annex 1.

A comprehensive review was done after data collection to ensure the accuracy and to ascertain the genuineness of the information provided by the respondents. A combination of the reviewed literature and the documented interview proceedings, were then consolidated to make a comprehensive document on drivers of successful ventures in the poultry sector.

Evolution of the commercial poultry sector over the last five years

Value chain analysis reliability

The poultry sector in Kenya has experienced tremendous growth over the years. The growth and success can be viewed in terms of expanded chicken businesses and the entry of new players which can be attributed to a variety of factors such as; responsive policy environment, stable socio-political environment, good business environment, deliberate investment in research and adoption of technology and vast consumer population of poultry products.

Despite increasing competition from Uganda and Tanzania and other members of the East Africa Community in the production of chicken and chicken products; there exist a significant increase in the demand for chicken products in the Kenya market. The consumption of chicken is predicted to increase from 54.8 thousand metric tonnes in 2000 to 164.6 thousand metric tonnes in 2030 due to urbanisation, increasing human population and economic growth (Carron et al., 2017). To meet this demand, there is need to increase broiler production in Kenya to about 1,666 metric tonnes by 2030 (FAO, 2008).

Urbanization and rapid increase in human population growth have resulted into an increase in commercial poultry enterprises focusing on producing 'preferred' chicken breeds. In the recent past, consumer preferences have inclined towards scavenging indigenous chicken; an aspect that has been noted as unsustainable since the production of scavenging chicken is incapable of producing sufficient quantities to meet existing demand. This is because scavenging indigenous chickens have altogether faced tremendous challenges limiting their production including; low genetic potential, seasonal fluctuation in quality and quantity of feeds, high disease and parasite prevalence and weather/climatic variability. To this end, commercial producers have had to make adjustments to completely/partially shift to the production of tropically adapted dual-purpose breed lines. This production has not taken the free-range/semi-scavenging approach, but rather a fully commercialized system with state of the art automation where necessary and appropriate biosecurity procedures. The result is a poultry product that the consumers can refer to as 'indigenous' with no regard to its mode of production.

The commercial poultry production system in Kenya rely on imported exotic parent and grandparent flocks that is entirely market-oriented. From the biosecurity standpoint, farms in this production system fall under sector 1-2 classification. The commercial production system is concentrated in major towns including Nairobi, Nakuru, Mombasa, Kisumu and their environs.

An illustration of the profile of a major boiler company in Kenya is indicated in figure 3. The illustration covers sources and flows of chickens/chicken meat in a nearly fully integrated production system (feed mill, grandparent stock, parent stock farms, hatchery and broiler abattoir are company-owned; broiler grower farms are contracted out); chicken products are sold to major retail outlets in the country. This scenario describes the most advanced and successful poultry enterprise in

Kenya; a roadmap that few companies have taken and that other upcoming enterprises endeavor to achieve.

In summary, the past five years have seen leading poultry enterprises import grandparent stock and then produce day old chicks for sale and/or produce for fattening in their farms. The chicks are sold either to farms contracted by the companies for growing, exported to countries within East Africa, sold to independent large scale broilers farms, or agrovets for resale to smallholder farmers. Chickens are then bought from contracted/non contracted farms by the chick producing company for slaughter, processing and sale to leading retail outlets in major cities.

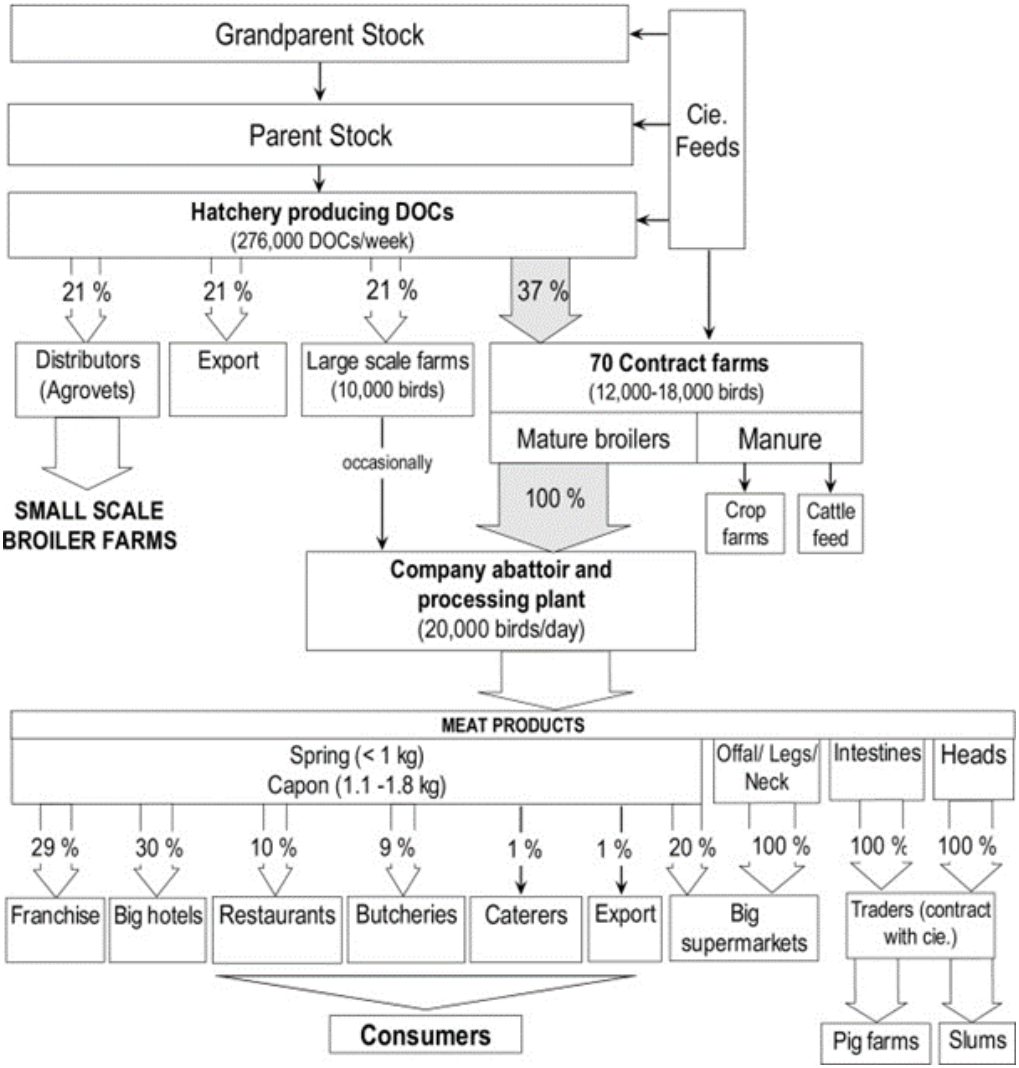


Figure 3: Large integrated broiler company profile (Carron et al., 2017)

The recent past years have seen the commercial egg layers value chain run differently from the broiler meat production systems by leading companies. In this case, large companies import grandparent stock and produce day old chicks for sale to farmers as illustrated in figure 4. These companies with the ability to produce over 200,000-day-old chicks do not produce the birds for egg production but sell them to farmers once hatched. The farmers in return sell the eggs to different clients, alongside the sale of spent layers, manure and empty feed bags (Onono et al, 2018).

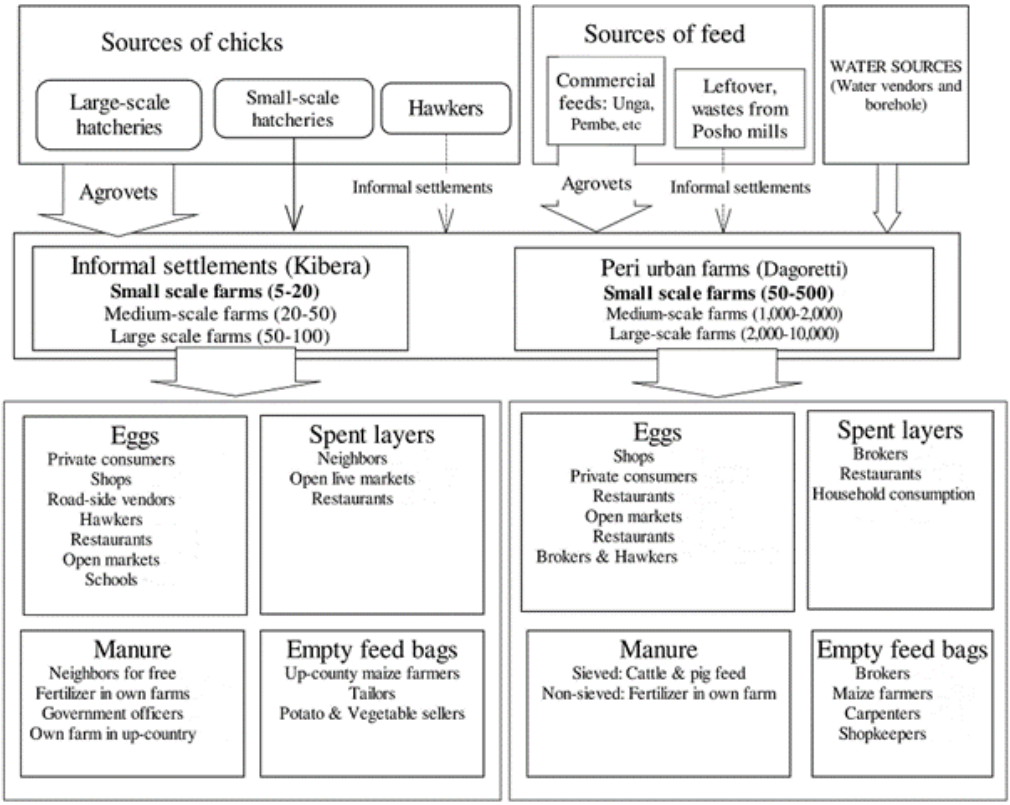


Figure 4: Value chain map for input and products from commercial layer farms in Nairobi (Onono et al., 2018)

Despite the minimal inputs being utilized, the smallholders farmers are the largest producer of chicken in Kenya. However, commercial and intensive poultry farming has dramatically changed, moving from traditionally backyard farms to the large agricultural industry. This change is a result of the frantic effort put in place by the Government' to promote the commercialization of this sector through the Agricultural Sector Development Strategy (ASDS) in a bid to boost poultry farming.

Currently, the country produces over 90,000 metric tonnes of chicken meat and 98,000 metric tonnes of eggs annually. Success in the expansion of the sector can also be linked to the private hatcheries that are involved in the distribution of commercial hybrid chicken. The major

commercial hatcheries in Kenya include; Kenchic (Nairobi, Kajiado, Kisumu, Thika), Isinya Feeds (Kajiabo), Kenbird (Naivasha) and Muguku (Kiambu). Presently, Kenchic is the largest producer of day-old chicks in the country, distributing about 2.9 million layers and 10 million broilers annually. Collectively, these hatcheries produce about 4.4 million layers and 12 million broiler day old chicks annually. Irrespective of the increase in production, , the consumption rate of poultry products continues to be on the rise leading to a supply-demand gap.

In the recent years, there is an incorporation of tropically adapted dual-purpose breed lines in commercial chicken production in a bid to meet the growing demand and consumer preference for indigenous chickens. However, the introduced chickens do not meet the criteria to be classified as 'indigenous', although existing market trends seem to accommodate them fairly well.

Policy interventions

Despite the contribution of poultry farming in the Kenyan's economy and also it major source of livelihood for many Kenyans on both small scale and large scale, there is no single statute that provides for poultry farming in Kenya as a standalone. Originally, it was provided for under the Crop Production and Livestock Act, but the said statute was repealed by the Crops Act in 2013 when the Act came into force. However, the Crop Act does not expressly cover or cater for poultry farming in Kenya. This then leaves regulation of poultry farming by National policies, strategies, and National Institutions with the mandate of implementing the aforementioned. There are, however, bills in parliament that are yet to be made laws: Poultry Development Bill 2012, Animal Health Bill, and Veterinary Public Health Bill. The bills have been drafted based on guiding principles that seek to regulate and promote safe and healthy poultry farming in Kenya per international standards.

Production, Marketing and Trade Policies and Legal Frameworks

Policies and legal frameworks are major factors that influence the business environment and thus the success of commercial poultry enterprises. Several policies have been developed to enhance sectoral growth and National Development of the poultry sub-sector. As earlier mentioned, none of these policies is specific to poultry production. These include policies that are aimed at:

a) Enhancing poultry production (Agricultural Sector Development Strategy (ASDS) for the period 2010-2020; Sessional Paper No. 2 of 2008 on National Livestock Policy, EAC livestock policy, Poultry Policy, Poultry development bill 2012, Draft Breeding policy and Bill, draft National Action Plan on Animal Genetics (2017);
b) Enhancing Product safety (Republic of Kenya, 2009; 2010) (Standards Act (Cap 496 Laws of Kenya), Pest Control Products Act, Cap 355; Animal Diseases Act, Cap 364, Breeder flock and hatchery management protocol of 2018, Weights and measures Act cap 513, meat control act, The Biosafety act of 2009);
c) Enhancing efficiency in trade and marketing of poultry products (online portals for application of business registration and trade and business permits and clearance certificates, Integrated Customs Management System (iCMS) for ease of movement of goods across Kenyan borders, Africa Growth and Opportunity act, EAC Customs management Act 2004, Agreement establishing a tripartite free trade area among EAC, COMESA and SADC).
d) Enhancing the competitiveness of the feed industry (Fertilizer and Animal Feedstuff Act Cap 345 (1967), Standards Act Cap 496 and Animal Disease Control Act Cap 346). These are enforced by the State Department of Livestock, Kenya Bureau of Standards (KEBS) and Kenya Plant Health Inspectorate Services (KEPHIS).

These policies and the resultant strategies cum guidelines have led to increased investment in chicken genetic improvement, production and marketing, as well as research and technology development programs at both the national and county levels (Alila and Atieno, 2006). The COMESA, EAC and SADC agreements have been particularly instrumental in spurring trade in poultry and poultry products through the elimination of internal tariffs within the regional trading blocs (Republic of Kenya, 2008; 2017b). Kenya's total trade with the EAC Partner States has increased by almost 50 percent after the implementation of the Customs Union in 2005. EAC intra trade has expanded by an average of three percent since 2011 (KIPPRA, 2020). This expanded free trade area between the southern and eastern Africa blocks and enabled easy access by Kenyan feed manufacturers to poultry feed raw materials such as maize and soya bean. It has also alleviated the scarcity of these raw materials in the country. However, Governments have continued to selectively apply various types of Non-Tariff barriers (NTBs) to protect some strategic sectors, thus affecting the movement of Kenya agricultural products in the regional and in the global market. According to the September-December 2015 report of National monitoring committees on non-tariff barriers, several countries still impose non-tariff barriers on agricultural commodities which are a setback to the poultry business in the region.

Fiscal Policies and Legal Frameworks and their impact on poultry business success

Several fiscal policies, frameworks and guidelines have been put in place and have had diverse implications on the poultry industry. Over the years Kenya has experienced an expansionary fiscal policy in which three major instruments have been used. Namely Government spending, taxation and borrowing. Some of these policies include:

a) Policies on Value Added Tax (VAT): Implementation of VAT Act 2012 on livestock feeds and the subsequent amendment in 2013 resulted in compounded feeds being exempted from VAT while imported raw materials were subjected to taxation. This Act created a conducive environment for chicken producers due to reduced costs of feeds but negatively affected feed manufacturers who imported raw materials. Before this, animal feeds were zero-rated which meant that the manufacturers could recover the VAT paid on inputs by claiming the reimbursement from the government. This Act later changed in 2014 and 2016, where the law exempted raw materials for the manufacture of feeds from VAT to attract investors to this sector. However, the Finance Act 2018 imposed VAT taxation on inputs (such as fertilizers, seeds) used on agricultural produce, affecting production costs of raw materials. Considering the fact that feeds contribute to 60-70% of the total production costs, the increased feed costs resulting from the Act, negatively affected profit margins. For instance, farmers' profits fell by 70% when feed costs increased (Njagi et al., 2013). Currently, Kenya does not produce sufficient amounts of grains and other ingredients (e.g. soybean, cotton and sunflower, whose by-products, soybean meal, cotton and sunflower seed cake) are required by feed manufacturers and hence, import about 70% of the raw materials from neighbouring countries. The imposition of tax on these raw materials impacts negatively on the poultry sector. The poultry industry faces a severe threat due to the increase of the VAT on feeds to 16 percent, raising fears that the thriving industry might be jeopardised. The introduction of VAT has made poultry production in Kenya less competitive compared to Uganda and Tanzania. As a result, there is an increase in poultry products from the neighbouring countries as the local poultry producers abandon chicken production or reduce their flock capacity. This transition had a ripple effect on Kenchic Ltd, where the management reported a 25% drop in their sales for day-old chicks and attributed this to farmers' gradual withdrawal from the chicken enterprise.

b) The central Bank act amendment of 2009, the banking act amendment of 2010 among others (www.centralbank.go.ke). These frameworks have created an enabling environment for the growth of commercial banks, micro-credit and micro-insurance schemes (McCord, et al., 2012). These institutions are in the front line of availing credit facilities to commercial poultry actors. The reduction of the Central Bank policy rate to 9.0% in a bid to stimulate credit expansion to the private sector has seen an increase in commercial bank loans thus stimulating growth.

c) In terms of government spending, the government implements programs that foster poultry sector development through initiatives such as the Economic Stimulus Program of 2012,

Youth Enterprise Development Fund, Uwezo Fund and Women Enterprise Fund and funding to the Agricultural Finance Corporation. These funding initiatives provide affordable credit facilities and thus, continue to facilitate business start-ups and expansion, resulting in the overall expansion of the commercial poultry sub-sector.

d) The National Payment System act 2011: The role and contribution of mobile phone-based financial services to the growth of the poultry sector cannot be underestimated. A large proportion of small scale poultry producers and agripreneurs rely on these services (Okonjo, 2013). Through these systems and agency banking services, poultry business transactions and payments such as ordering for day-old chicks, payment for feeds and many others are made without the necessity of entering the banking hall. The interconnectivity between these mobile phone wallets/ payment systems and formal financial institutions has increased the efficiency of doing business (GSMA, 2009; Okonjo 2013).

Policy Issues and Challenges

Although Kenya has developed policies, regulations and guidelines to facilitate the development of the poultry subsector, the challenge lies in their implementation which has varied implications on poultry businesses (Alila and Atieno, 2006). Regionally, countries are at different stages in policy development and implementation and this equally impacts regional trade in poultry and poultry products and production resources such as feed materials. It is therefore important to address the following issues and challenges:

- Conflicting areas of interest between countries: these limit movement of poultry and poultry products across the borders.
- Policies limiting trade and movement of commodities/products across countries. these include non-tariff barriers imposed on imported poultry and poultry products
- Policies, laws, and guidelines that prevent or could potentially prevent the transfer of genetic materials, germplasm, planting materials, breeding stock, crops and livestock.
- Absence of regional system for application of Intellectual Property Rights; and/or policy framework/protocol to facilitate movement of jointly developed technologies
- Absence of harmonized Genetically Modified Organisms (GMO) policies in the region since some countries have not embraced biotechnology
- Differences in accreditation and compliance to international bodies
- Absence of legislation on movement of germplasm in some participating countries
- Absence of harmonized regional standards for livestock germplasm, products, animal feeds and vegetative materials.
- Some of the participating countries lack an established livestock genetic improvement system.
- Inadequate participation of the private sector in seed systems limits production and access to quality seed by smallholder farmers.

Technological innovations

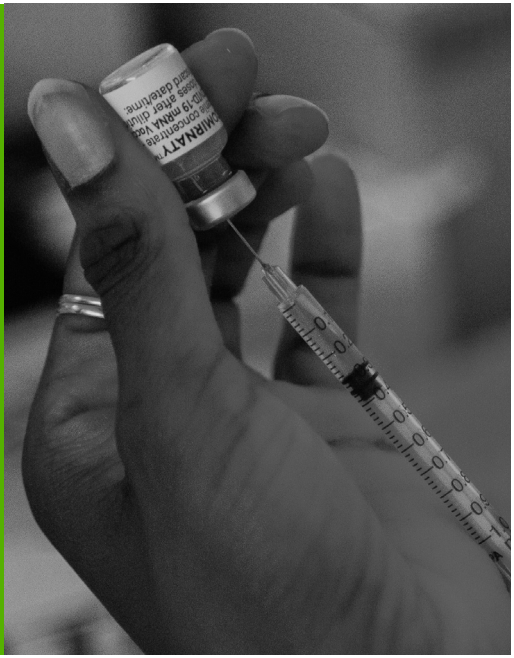
Availability of a large variety of breeds

Kenya has seen an enormous introduction and adoption of highly productive and specialized breeds for meat and eggs alongside dual-purpose breed lines (Magothe et al., 2012). In 1960s, pure breeds of chickens were introduced into the country and kept in small numbers. The period of keeping pure breeds was followed in 1970s by the introduction of hybrid layer and broiler flocks which were hatched from imported eggs and later from imported breeding stocks grown in the country (Nyaga, 2007).

The year 2012 saw an influx in the introduction of tropically adapted dual-purpose exotic breeds of chicken in the country. These birds were readily accepted by small and middle scale farmers and the same period saw the expansion of breeder farms focusing on these breeds. The breeds include; KALRO, Kuroiler, Sasso, KenBro, Primer and Rainbow rooster. Specialized breeds in the country include; Arbor Acres, Shavers, ISA brown, Ross, Hybro, Cobb, Hypeco, and Bovern (Nyaga, 2007; Omiti and Okuthe, 2009). Over time, the farms involved in the dual-purpose breeds have incorporated automated production regimes, processing and packaging of chicken and chicken products. In addition, investments by the private sector in the dual-purpose breeds have increased; with the breeds getting a niche market and a new name "improved Kienyeji " adopted. To complement this, the National Agricultural Research Systems (NARS) have poultry research facilities and knowledgeable manpower that participated in poultry research, which lead to the development of new breeds and introducing the new breeds to the communities. Such is the KALRO breed line developed by the Kenya Agricultural and Livestock Research Organisation.

Disease control interventions

Diseases are major reasons for failure in the poultry industry, they impact negatively on production, economic returns and health status of the bird (Okeno et al., 2011a; Okeno et al., 2011b). From a commercial point of view, prevention and not cure is considered the most economical and effective method of controlling diseases. The commercial poultry sector has achieved this through consistent improvement of facilities, optimizing the stocking densities and even improving some management techniques (providing isolation and quarantine facilities, practicing an all-in-all-out system and regular change of disinfectants/drugs type to prevent pathogen adaptation (FAO, 2013; Otiang et al., 2021).



More importantly, high biosecurity measures and vaccination have been proven to be effective, especially when used in conjunction with proper sanitation and hygiene conditions. The efficacy of the vaccine is basically dependent on handling and storage conditions, most commercial producers move vaccination from the farm towards the hatchery (Abdul-Cader et al., 2018). Vaccination of day-old chicks in the hatcheries was initiated in the early '70s with the use of Mareks vaccine (Kenchic, n.d.). Currently, Kenchic has adopted a two-thronged approach in dealing with gumboro and new castle diseases by vaccinating at the hatcheries.

The State Department of Veterinary services has established regional investigation laboratories to enable confirmatory diagnosis and postmortem investigation of diseases. This has enhanced the management of diseases through proper treatment of the birds and reduced improper use of antibiotics. Also, the division hosts a vaccine production institute that conducts research and produces vaccines for some of the endemic animal diseases.

Feeds resources and feeding

Feeding constitutes the single largest cost component in poultry production. Feed availability and quality have a significant impact on poultry production (Gakige et al., 2015; Njoroge et al., 2021). The introduction of compounded feeds with balanced nutrients for chicken at different production stages has been of significance to the commercial sector given that the chickens are fully confined and dependent on the producer to meet their nutritional needs (Said and Mbugua, 2005). Fluctuations in the availability of feed resources, particularly grains and plant proteins, have led to the identification of suitable alternatives (FAO, 2013). For example, Sorghum (low tannin) has been used in place of maize as an energy source. Similarly, black soldier fly and Moringa plant are currently under research to test their suitability as protein sources.

Majority of plant-based feed resources have anti-nutritive factors such as tannins, phytic acid, gossypol and many other, they tend to limit the availability of nutrients to the animals (Gakige et al., 2015; Njoroge et al., 2021). On the other hand, fear of disease transmission from animal-based feed resources abound. Fortunately, processing techniques such as fermentation, germination, debranning, autoclaving and soaking have enabled the control of these factors to manageable levels (Samtiya et al., 2020). For example, high levels of tannin (negatively affecting protein digestibility and absorption of minerals) in sorghum was reduced by 30% through fermentation, leading to increased absorption of iron (Onyango et al., 2013). In commercial feed processing, raw materials with anti-nutritive factors rarely exceed 10% inclusion levels (Mutayoba et al., 2011). Post-treatment of cottonseed meal reduced gossypol leveland bone meal was sterilized against pathogens. Inclusion levels range between 7% to 9.5% and 2.4% to 0.6% depending on the stage of production.

Knowing that the ingredients in compounded feeds may not completely meet the nutritional needs of the chicken in confinement, a variety of feed additives have been utilized to enhance

animal nutrition and feed efficiency (Darwish et al., 2013). To ensure adequate dietary balance for protein synthesis, the addition of essential amino acids such as methionine, lysine and tryptophan in broiler rations has proved effective in meat production (Coffey et al., 2016). Mineral and vitamin premixes have also been used to advance feed quality and digestion (Njoku, 1986). As a preventive measure, anticoccidials are added to the feeds, particularly, for the chick and growing stages to caution against protozoal pathogens (Ohe and Arakawa, 1975). The use of commercial exogenous enzymes and antioxidants have been beneficial in improving digestibility and reducing anti-nutritive factors and mycotoxins in feeds (Chamorro et al., 2017).

Kenya has a vibrant animal feed industry that has enabled the constant availability of livestock feeds in the country. The industry has a strong feed producers' association, The Association of Kenya feed manufacturers (AKEFEMA) that brings together stakeholders for self-regulation, maintenance of feed quality and improving service delivery (Argwings-Kodhek, 2005). Through the Association, the industry has continued to steer feed research activities in collaboration with the NARS, build capacity on feed manufacturing, promote market access through collective action, link members with both government and non-government organizations, and provide a platform for public-private partnership in the industry (http://www.akefema.or.ke). Feed quality is of utmost importance in animal performance and as such, the availability of commercial/ research, academic laboratory facilities and institutions such as the Kenya Bureau of Standards (KEBS) provide feed manufacturers with nutritional and chemical services that ensure quality control (Oloo, 2010). Collaboratively, AKEFEMA and KEBS work together to execute the standard mark of quality to eliminate counterfeit feed products in the market.

Marketing and Information dissemination

Tremendous developments have been made in enhancing access to markets and information by poultry farmers. The increasing numbers of supermarkets in urban centres offer opportunities for producers to fetch premium prices for their products (Kenya Retail Sector Report 2020 - Nairobi). The opening s of poultry product shops in residential areas have become common practice in most urban areas. The use of virtual marketplaces such as Jumia and social media platforms such as Facebook is also on the rise. There is ample evidence of producers's willingness of increasing production and this is closely linked to the existence of efficient markets for their produce (Gausi et al., 2004, Ayieko et al., 2014).

Mobile phone technology has increased access to information,owing to wider network coverage, poultry producers can access information on the production and marketing of poultry and poultry products from their mobile devices in a variety of forms. These digital devices are slowly replacing human-based extension and information dissemination systems. The availability of mobile phone payment systems has widened cashless systems, thus rendering marketing safer (del Torso, 2019).

The market prices of chicken products from the commercial sector are fairly stable, possibly due to contractual supply to various outlets, while in the indigenous chicken sub-sector prices tend to fluctuate due to seasonal variation in demand of the products, particularly that of live birds (Bett et al., 2012). On the other hand, value addition processes are on the increase to improve market price of products. However, the free-range production system has not yet benefited from improved pricing due to informal marketing channels. This implies that producers and traders can either confine themselves to business as usual markets or move towards collective actions

to supply consumer quality demanded products to these emerging markets. Despite these innovations that support productive engagement in the poultry sector, several gaps remain that need to be addressed to enable better understanding and engagement in the sector. Venooij et al. (2018) listed these gaps to include;

- Identifying all the actors in the formal and informal sector, e.g. Statistics of egg and chicken sellers, turnovers and their specialization. Therefore, quantification of key actors is necessary to allow planning and policy formulation in the Industry.
- Dearth information on the identity of different chicken processors whose products are on
- Documentation of all feed millers, processors and their level of integration.
- Poultry census, documentation of their roles, numbers and distribution. This is because there are various and conflicting estimates of poultry figures depending on the sources consulted.
- Inventory of all hatcheries, their status and performance.
- Routine animal health and husbandry practices are done at the breeder farms and hatcheries: identification of practices, frequency and product sources are not documented.
- Utilization of other poultry by-products, such as feathers and offal.
- Identification of the different methods used in the transportation of live birds and day-old chicks from source to the production units.
- Quantification of Poultry manure produced from the intensive poultry production systems, and the current disposal and utilization methods.
- The flow of live birds from main slaughterhouses to kiosks and other slaughter sites within cities and towns (volumes, site mapping, actors and their numbers).
- Integration in the commercial poultry systems (type of integration, level of integration and the number of integrated systems).
- Investigate the hygiene and sanitary practices in all the commercial hatcheries.
- Mapping of poultry live bird markets in the country and the volume of trade and trade governance.
- Mapping of poultry and product routes in the country.
- Documentation of all the poultry and poultry products brought into the country and their destinations over time.
- Documentation and mapping out legal and illegal imports of poultry and poultry products (type, quantity, and country of origin, how long trade has been carried out) over time.
- Understanding of the main drivers of the lucrative illegal and legal trade in poultry and poultry products and the relative importance of these factors

Business environment

Kenya has a vibrant private sector and is considered a promising place to do business, with growing markets and good opportunities (KIPPRA, 2020). The private sector contributes to 97% of GDP and provides 80% of formal employment. Kenya is as well composed of a formal sector that is relatively healthy and productive, dominated by large poultry businesses in the breeding and genetic material segment as well as formal retail market chains. The small businesses on the other hand dominate the informal segment of the market where they act as either multipliers or commercial flock producers for sale of eggs and meat in the informal market segment. The political and economic reforms in the country have driven sustained economic growth and social development over the past decade. Both International and National citizens take part in business ventures without major limitations, apart from normal trade barriers (tariff and non-tariff) which limit movement of agricultural products including poultry across the borders. Though the business environment still remains uneven, several reforms have taken place in the last decade to make the environment more favourable (World Bank, 2020). Examples of such reforms are:

Registering property: This was made easier by introducing an online system to clear land rent rates by the Ministry of Lands and Physical Planning through the eCitizen portal. This enables property owners to determine the amount owed in land rent, make an online payment and obtain the land rates clearance certificate digitally. This process has enabled the rent payment process to be streamlined and now requires a lesser number of procedures and takes less time. Another important milestone in the Kenya business environment is the Kenya Trade Network

Agency (Kentrade); which is a State Corporation under the National Treasury that implements and manages the National Electronic Single Window System (KenyaTradeNet System) to facilitate trade. This is an online platform that serves as a single entry point for parties involved in International trade and transport logistics to submit documents electronically for processing, approvals and to make payments electronically for fees, levies, duties and taxes to the Government, on goods imported into or exported out of the country.

Credit access: Access to credit was strengthened by introducing a new secured transactions law; 'The Movable Property Security Rights Act, 2017, which created a secured transactions legal framework, and established a new unified collateral registry. This Act also benefits small and medium-sized enterprises, which experience difficulty in accessing finance from the formal sector by availing opportunities for easy access to credit. Poultry projects have been targeted in government credit access/poverty alleviation/economic stimulus programs to the vulnerable groups. Programs such as the Women Enterprise Fund, UWESO fund, Kenya Youth Employment Opportunities Project (KYEOP) have provided seed financing to entrepreneurship ventures for women and youth projects.

Paying taxes: The tax paying process is streamlined in Kenya through the merging of all permits into a single unified business permit. In addition, the filing of taxes has been made easier by simplifying the value-added tax schedule on the Kenya Revenue Authority's iTax platform. This has made it easy for investors to comply with tax regulations alongside transparency in all matters regarding taxation.

Trading across borders: Employing electronic submission and processing of documents for exports and import:

- Uganda fully implemented the Centralized Document Processing Centre, an electronic processing platform that centralizes all documentary checks. Traders in Uganda also began using the Uganda Electronic Single Window, which allows for the electronic submission of documents as well as for the exchange of information between trade agencies.
- Strengthening of border infrastructure for exports: Rwanda reduced border compliance time to 83 hours from 97 hours by having staff from the Rwanda Revenue Authority and the Tanzania Revenue Authority at the Rusomo one-stop border post, the result of the implementation of the Single Customs Territory.
- Enhancement of customs administration and inspections for exports and imports: Mauritius made exporting easier by introducing a risk-based management system which reduced border compliance time by 14 hours.

Despite the uncertainties that have been previously created in many African countries (including Kenya) due to political and social unrest, continued improvement in the business environment as a result of stability in the region alongside government interventions is expected. This comes as the Kenyan government remains committed to pro-market reforms, adopting a robust regulatory

framework and investing in systems that are aimed at improving the business environment much further, thus, attracting more investors. The commercial chicken meat and eggs market channels (Figure 5) are affected by a dynamic interplay of factors including the business environment. It is therefore envisaged that the poultry industry will grow further due to the existing favourable conditions.

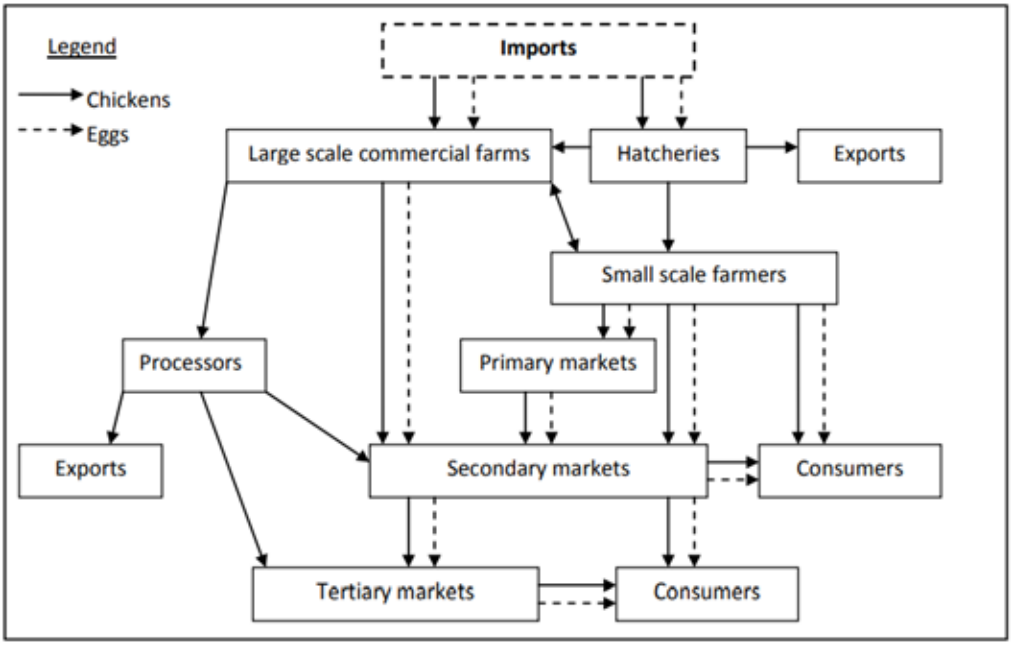


Figure 5: Market channels for commercial chickens and eggs in Kenya (Omiti and Okuthe, 2009)

Management of risk factors and challenges in the commercial poultry sector

Risk and Challenges in poultry production

Like any other livestock enterprise, several risk factors and challenges in poultry production abound. These range from changes in the policy environment governing trade of poultry and poultry products, importation of inputs for poultry production, availability of germplasm to hostile political environments (Okeno et al., 2012b). These risk factors and challenges are potentially detrimental to the poultry industry and associated businesses.

Poultry enterprises perceive production, financial, and human risks as an important threat to their incomes (Adeyonu et al., 2021). To address this, the adoption of disease prevention and financial management strategies to mitigate the effects of various risks associated with their businesses is critical (Magothe et al., 2012a; Adeyonu et al., 2021). Years of experience in poultry production and the agro-ecological location of the enterprises are important determinants of the choice of

disease prevention and financial management strategies to mitigate some of the risks.
The feed industry relies heavily on the importation of raw materials such as grains and oilseed cake by-products since the country does not produce reasonable quantities of these materials (ABS-TCM, 2013). Consequently, the industry is not cushioned against breakdowns in supply due to factors such as adverse weather conditions, changes in policies of the exporting country, high transportation costs and quality control challenges.

The increased intensification of the poultry industry has seen a spike in immunity and health challenges that stifle its future growth (Hafez and Attia, 2020). Consumer confidence, product quality and safety, product types, and the emergence and re-emergence of diseases continue to be major challenges to the industry (Magothe et al., 2012a; Hafez and Attia, 2020). In addition, several foodborne and zoonotic diseases are associated with poultry and their eradication, elimination, and/or control present a grave challenge to the poultry industry (Dale et al., 2013).

Consumer perspective on the public health hazards from consuming foods with high antibiotic residues will remain a critical issue. This situation has diverted demand for the commercially produced chicken to backyard production (Omiti and Okuthe, 2009).

Management of risks and challenges in poultry production

Risk management interventions for disease regulation and feed safety depend on hygiene, applying the proper and standard farm biosecurity, vaccination programs, and appropriate education programs for poultry personnel (Hafez, 2005). In addition, candidates with suitable educational qualifications have been recruited by leading players in the industry to institute biosecurity regimes and establish protocols required to safeguard against zoonotic diseases (Hafez, 2008). Combined efforts among feed processors to carry out the bulk purchase of raw materials increases their bargaining power when importing feed ingredients and ensure a consistent supply of feed (ABS-TCM, 2013).

Examples of Successful Commercial Poultry Farms

The table below presents a list of some successful large scale sector 1 and sector 2 poultry players in Kenya. All enterprises have their operations within the country, excluding Kenchic which has operations in the entire East African region. In terms of operations, majority of the farms run hatchery, production and processing units. Value addition and marketing is done by only a handful of enterprises. Firms selected for the case study were chosen based on their level of production, geographical reach and fit into sector one and two tiers of production.

Table 1: Examples of sector one and two commercial poultry farms in Kenya

Name	Activities	Location
Kenchic	Chicken production, hatchery, processing, value addition and marketing	Various farms across Kenya, Tanzania, Uganda and Rwanda
Kenya Agricultural and Livestock Research Organization	Chicken production, hatchery, processing	Nakuru
Muguku poultry farm	Chicken production, hatchery, processing	Kiambu
Western Seed Limited	Production, hatchery	Trans-Nzoia
Chicken Basket	Chicken production, hatchery, processing and marketing	Kisumu
Kenbrid Farms	Chicken production, hatchery, processing	Nakuru
Kim's Poultry Farm	Chicken production, hatchery, processing and marketing	Nakuru
Ziwani Poultry	Chicken production, hatchery, processing	Kiambu
Yegen Farms	Chicken production, hatchery, processing	Uasin Gishu
Kukuchic Limited	Production and hatchery	Uasin Gishu
Isinya Feeds Limited	Chicken production, hatchery, processing	Kajiado
Lake chick hatcheries	Chicken production, hatchery, processing	Kisumu
Bixa Kenya Limited	Chicken production, hatchery, processing	Mombasa
Brade Gate poultry industries	Production, hatchery and processing	Nyeri

Initial Hypotheses on Success Factors

Factors deemed to influence the success of the poultry enterprise in Kenya have been documented and possible solutions provided (Kingori et al., 2010; Magothe et al., 2012 b; Khobondo et al., 2014). The major factors as described by Kingori et al. (2010) include; elaborate feed and feed formulation regimes, infrastructure that supports poultry production and access to markets, information and input supplies and elaborate biosecurity and disease control options. Other key aspects to success in this industry is the elaborate telecommunication infrastructure in Kenya, simplifying information transfer to market outlets and utility supplies. Munyaka (2010) pointed out the availability of trained human resources in poultry management as a key factor for the

success of poultry ventures. This is in addition to; the availability of inputs locally, financial support from financial institutions and a favorable legal platform.

The impact of conflict can adversely affect the poultry industry in Kenya by disrupting the supply and distribution of inputs and poultry products, creating price shocks and causing massive displacement of human resources (Kimenyi et al., 2014). Thus far, Kenya has remained politically stable; a position that has enhanced success in businesses therein.

The Drivers of Growth of Commercial Poultry Businesses in the Last Five Years: A Case Study Analysis of the Poultry Enterprise

Companies' history, production focus, source of genetics and technology, marketing strategy, ownership and management,

All case study farms were established between 1965 and 1985 as indicated below, in table 2. In spite of this, new entrants into the market have emerged over time, including the last five years. Notwithstanding, several players with origins dating between 1965 and 1985 have exited the scene due to competition. An example is Brade Gate Poultry Industries which started its operations in 2005 and had closed down by 2017. Survival of businesses in the poultry industry in Kenya cannot be defined with years of operation, but resilience to industry dynamics, and formal market management strategies. For instance, all case studies apart from KALRO rely on importation for genetic material due to reliability and sustained supply. This is in addition to going into contracts with farmers to produce chicken for processing.

Day-old chick sale was noted as a common item sold by studied firms despite the known fact that selling live chicken is less profitable as compared to processed poultry products. The predominance of chick sales among the studied firms could be attributed to their foundational history. Leading chicken processing farms in Kenya were started as chick multiplication centers for leading breeding farms. Over time, these Kenyan farms incorporated processing and packaging of meat and eggs into their production line in a bid to diversify their product range. Since a market share and multiplication infrastructure for day-old chicks were already established, these farms continued with multiplication to date. It is worth noting that, these firms later purchase chicken from contracted farmers for processing, packaging and later marketing for consumption both locally and internationally from farmers. The contracted farmers engaged via a legal agreement or work within the open market system. The sale of day-old chicks is done through selected agro-veterinary shops across the country whereas specialized trucks are used to ferry mature birds for processing in designated aggregation locations.

Elaborate marketing strategies have enabled the leading firms to thrive in the poultry industry despite the myriad challenges. These strategies included branding, advertisements and utilization of sales agents who double up as extension officers. The utilization of contract farmers was noted in all studied farms apart from KALRO. A synopsis of the enterprises studied is presented in table

Table 2: Synopsis of case study poultry enterprises in Kenya

Name	Establishment Year	Products	Source of Genetic Material	Breed	No. of Workers	Flock size	Ownership	National Contribution (%)
Kenchic Ltd	1983	Chicks, Meat and processed meat products	France and the United Kingdom	Cobb 500, Ross, Isa Brown and Hy-line	800	500,000	Shareholding Company	70
Muguku poultry Farm	1965	Chicks, Meat and processed meat products	United Kingdom	Ross	350	200,000	Family business	10
Kenbrid Farms	1985	Chicks, Meat and Eggs	United States of America	Hy-line and Cobb700	110	100,000	Limited Company	< 5
Isinya Feeds Ltd	1984	Chicks, Meat and Eggs	Netherlands and United Kingdom	Lohman Brown Classic and Cobbs 500	120	100,000	Limited Company	< 5
KALRO	1981	Chicks, Meat and Eggs	Kenya	Local Chicken	100	70,000	Government Organization	< 3

Porter's five forces theory of business competitiveness of the poultry enterprises in Kenya.

The five poultry firms selected for case study analysis were evaluated for their competitiveness to depict the Kenyan poultry industry using Porter's Five Forces Theory. The theory assesses the firms' competitiveness to threats of new entrants, bargaining power of buyers, threats from substitute products, bargaining power of the suppliers and rivalry among current players. This assessment is thus able to depict the stability of the business environment within the industry.

The threat of New Entrants

The major barrier to entry into the commercial poultry market in Kenya is economies of scale. This scenario is multifaceted, with fiscal policies creating a non-favourable environment for low capital based interventions in the commercial poultry industry. Since poultry processing and related matters are capital intensive, starting businesses will take up to three years before earning revenues. For instance, startups with less than 100,000 chickens as a production flock will find it almost impossible to compete with established players in the sector. The high cost of production in Kenya has seen poultry products from other countries in East Africa to be more competitive,unfortunately, this cost is occasioned by the tax regime in Kenya. To protect producers in Kenya, import bans have been executed from time to time. The economy of scale limiting entry into the commercial poultry business affects all aspects of production including; feeding, medication, product marketing and distribution.

Existing poultry firms have over the years created a wide client base with product loyalty embedded to clients through generations. This includes having outlets in all major towns and products found in all leading retail outlets, implying that major trading routes, outlets and shelf spaces in leading retail outlets are occupied. New entrants will need to face this fact and find an entry point that guarantees consumer quality with reasonable pricing. The years of experience by the existing poultry firms gives them an edge in determining the most cost-effective production options in the market. For instance, the case studies revealed that Kenchic, Kenbrid and Muguku poultry farm relied on Unga Group Limited for the supply of poultry feeds,while Isinya feeds and KALRO made their feeds in a bid to reduce their cost of production.

In January 2021, a ban on the importation of poultry products from within and beyond East Africa was instituted by the Kenyan Government. This was in a bid to protect the Kenyan poultry enterprises and support its producers recover from the disruptions occasioned by the COVID-19 pandemic. This ban has so far been lifted after a series of diplomatic negotiations. Such bans are occasionally implemented by the Kenyan government to ensure the economic survival of local firms and/or as a biosecurity measure in the face of pathological threats. Despite their importance in biosecurity, these bans have in the long run created serious barricades for potential entrants into the industry.

The COVID-19 pandemic affected the commercial poultry sector in Kenya in various ways. The

supply chain and distribution logistics involving agricultural goods and services were negatively affected by movement restrictions within the country. Traders and transporters, especially had trouble accessing farms and markets due to restricted movement and lockdowns in major towns. This was coupled with waits for East African cross-border trade which resulted to a decrease in the number of cargo trucks being cleared by 80%. The immediate community response at the onset of movement restrictions (Mid-March 2020) contributed a major increase in the sale of poultry products due to panic purchase by individuals. By May 2020, 8% of businesses had completely stopped operations and 63% decreased production volume (Gain, 2020). This is because several people were laid off from their work places at a rate of 8% per month, thereby reducing the purchasing power. On the other hand, the closure of restaurants and other foodservice outlets led to a further decline in demand for poultry products. Post pandemic movement restrictions (lifted in October 2020) brought about a gradual recovery of the consumer ability to purchase more poultry products due to ease of doing business.

Bargaining power of buyers

The buyer bargaining power in the chicken industry in Kenya is variable depending on the factor being considered. For instance, in terms of customer base, there is a higher concentration of customers than the number of companies supplying chicken products, implying low buyer bargaining power. Comparing buyer profiles across companies show that customer base and size of order per customer is dependent on the type of product and scale of production. For instance, the primary products for Kenchic Ltd include day-old chicks and processed chicken and meat products. Individual farmers or farmer groups are the main customers for day-old chicks. The exact number of farmers is not known because their multiple satellite agents are distributed across the country and deal directly with the farmers. However, an approximation shows that the customer base is in tens of thousands. The size of order per customer usually depends on an individual's production scale; small-scale producers order a minimum of 100 chicks while large scale producers order a minimum of 2000-5000 chicks. Contracted farmers keep a minimum of 12000 chicks. Because of high input costs for these commercial birds, non-contracted farmers tend to prefer a minimum of 1000 chicks to break-even. On processed chicken and respective products, the company works with a cross-section of customers ranging from global brands such as Kentucky Fried Chicken (KFC), international hotel chains, airline catering and the whole grocery retail trade. With this type of customer base, the size of orders for the processed products is often in bulk. In the case of KALRO, their primary product is chicks (day-old and month-old) while secondary products include table eggs and processed chicken. For chicks, the customer profile varies from individual farmers to farmer groups to develop programs (either through the government or NGOs). The preference for either day-old or month-old chick is customer dependent. Farmer groups and development programs have the largest orders ranging from 5000-8000 birds compared to individual farmers (about 50 to 500 chicks). The secondary products are entirely based on individual customers whose orders could be as low as 1 tray to as high as 100 trays of eggs, while processed chicken ranges between 2 to 10 slaughtered birds. Generally, their customer base is in thousands with buyers of chicks being the most dominant.

On the other hand, companies are operating under a highly competitive environment while customers are price sensitive and well informed of the chicken products, an indication of higher buyer bargaining power. Taking this into account, companies in this industry have had to lower their prices, improve product quality, and offer better services to survive the competitive environment of business. Taking Kenchic Ltd as an example, the company is the largest producer in the country, (accounting for 70% of the commercial poultry products) and has the largest customer base. When compared to its competitor, Muguku Farm (second largest producer), the farm accounts for 10% of the poultry products in the country. The difference between the two companies is huge and indicates that Kenchic Ltd has more market power than Muguku Farm in Kenya. Recently established commercial enterprises (such as KALRO, Isinya and Kenbrid) in the industry are also gaining traction in the market although, their contribution is still below 5%. The ability of Kenchic Ltd to be the most competitive rests on several factors. Initially, the company's main activity was the production of day-old chicks but with time product variety was expanded by gradual integration of value-added products (processed chicken - either fresh or frozen and either whole or cut up; marinade and further processed products - sausages, burgers, smoked sausages, pâtés, breaded nuggets, strips and burgers). Since its establishment, the company has grown tremendously in terms of expansion of operations internally by increasing their farm capacity and externally by involving contract farmers to up-scale production to meet the increasing demand for their products. Considering the demand for both local and global levels of service and product quality, the company's farming practices conform not only to Kenyan standards but also to the European Union and World Health Organization requirements. This has given Kenchic an upper hand towards attracting international markets. Currently, through contracts, they have a secured market with global fast food outlets (such as KFC), international hotels catering, airlines catering and country-wide grocery retailer stores. In relation to the high concentration of customers than suppliers, there is higher price sensitivity exerting pressure on major poultry companies to lower their prices to retain customers, particularly on products with higher demands. For instance, day-old chicks being the most demanded product in the industry, buyer bargaining power has resulted in low prices for this product such that variation in prices across companies is low and averages at one US dollar. On the other hand, in regards to value-added chicken through processing and its subsequent products, price sensitivity has opened doors for other companies that can serve the local market.

The threat of Substitute products

The indigenous chicken (including imported tropically adopted dual-purpose chicken) have a niche market in Kenya fetching a higher price per unit weight. However, they do not compete with with exotic chicken products, since the latter has a market of its own. The focus of indigenous chicken and their derivatives are common among low income consumers where bio-sanitary and food safety conditions are not a priority. The exotic chicken products fall into all outlets where hygiene and bio-sanitary protocol satisfaction are prioritized. In this case, leading retail outlets, high end hotels and institutions that are keen about safety standards, prefer exotic chicken. This is in addition to their constant production, supply, and price that cannot be matched by indigenous chicken.

The main products from poultry systems are eggs and meat which are used as sources of protein for humans. These products are served in different forms in human diets. Chicken meat is served mainly as table birds. However, innovative entrepreneurs are now also fabricating chicken after slaughter and selling parts of the chicken e.g. packs of drumsticks, livers, hearts, gizzards etc. Being white meat, chicken meat has a corresponding substitute, namely pork and fish. Though chicken is still a delicacy in many of the Kenyan diets, there is an impending threat posed by pork and fish. The threat of chicken meat from pork as a main meal is not as much owing to some cultural restrictions surrounding pork. However, it is a real threat especially as a breakfast item where eggs are substituted for bacon and sausage. The popularity of fish is on the rise, especially with the government programs that are promoting aquaculture to enhance fish availability nationwide. The threat of fish on chicken meat is pronounced especially in western and coastal regions of Kenya.

Chicken occupies a vital position in the hierarchy of animal production. It is the first choice animal that a resource-poor farmer keeps as they project their progression into livestock production. Interestingly, as the producers sell their chicken to ascend the production ladder into goats/ sheep then into large ruminant production, the chicken enterprises do not fold but are also kept alongside. In situations where producers venture into other poultry species, chicken production equally persists. Therefore, there is no threat of substitution of chicks as a product from the chicken enterprise.

Number of substitute products available

As alluded earlier, various sources of protein exist as potential substitutes to the white chicken meat and eggs. The substitute in Kenya are; pork, bacon, fish (fish fingers) as well as red meat from both domestic and wild species. These substitutes have varied popularity in different parts of the country. Fish is a popular substitute for chicken in western Kenya and the coast. Pork is popular in western Kenya and in many urban areas, red meat products are a substitute in most of the areas dominated by pastoralists. Health enthusiasts are de-campaigning consumption of eggs. Despite the campaign, there is no perfect substitute for eggs and as such, the consumption of eggs has not been affected as much save for people with allergic reactions.

Buyer propensity to substitute

Since the last decade, the Kenya populace's marginal propensity to spend on protein consumption has increased as a result of an increase in their disposable incomes. Chicken meat and its products are considered as higher-level protein compared to plant protein sources. Therefore, this increase has resulted in an increase in consumption of chicken meat, its products and eggs. With this increased income, the demand for other protein sources has also increased. More households are now able to purchase beef, mutton, chevon, pork and their processed products such as sausages which easily replace chicken products. With this increased diversity, households are increasing their variety of food baskets, thus increasing their propensity to substitute chicken and its products.

It is important to note that the Kenyan population is very sensitive to price changes and as a result, price is a key determinant on the level of product consumption. The retail price of a kilogram of chicken sausage is cheaper than beef and pork sausage by KES. 2 and KES 71 respectively (Table 3). As a result, chicken sausages are doing better than beef sausages and pork sausages in terms of price. The retail price of a kilogram of pork and beef is higher than broiler chicken (capon) which is considered to be even cheaper than chicken meat from indigenous or tropically adapted dual purpose birds. The majority of the retail butcheries (meat shops) have digital scales that can afford a cut of any weight or price. This lends itself well to pork/beef/chevon/mutton shops. Such cuts are only limited to standard weights/sizes in chicken such as full, half or quarter chicken. This is a setback to the competitiveness of chicken meat against other meats. In terms of price of commodities, the buyer propensity to substitute chicken for other meat products is low since chicken is still cheaper (Table 3). However, with increased elasticity in the quantity that one can buy that comes with use of digital scales; this situation may easily change.

Perceived level of product differentiation

Chicken products are sold in different forms in the market. The level of differentiation of chicken products varies between meat and egg products. Chicken meat and eggs are also differentiated in the market based on the breed. For instance, marketing of chicken meat and eggs is differentiated as either indigenous chicken meat/eggs or broiler or eggs from exotic layers.

1. Differentiation of eggs: Other than the differentiation on the basis of breed, differentiation of eggs is only limited to packaging material and number of eggs in the packages. Eggs are packed in trays of 30, 15 or 10 eggs. The trays also vary such that some are made from paper while others are made of plastic material. Some retail outlets sell unpacked eggs too. All these forms of packaging influence the pricing of the eggs and hence their consumption. The commercial egg market is inclined towards large eggs without colour preference while the "indigenous chicken" market prefers small eggs with white to cream colour.
2. A lot of effort has been put into the differentiation of chicken meat products. This differentiation is in terms of developmental stages at the point of slaughter, cuts (sizes), processed products and packaging.

a) Stage of development at point of slaughter: whole chickens are slaughtered and marketed as either spring chicken or capon. Spring chickens are much younger than capons

b) Cuts (sizes): chicken meat is marketed as either whole or in cuts. Whole, chicken is sold as either quarter, half or full chicken. Though marketed this way, the price of the cuts is determined by the weight of the cut. It is now commonplace to find a pack of various parts of chicken in retail markets e.g. drumsticks, necks, thighs, wings etc. In addition, packs of internal organs such as chicken livers/hearts, gizzards are also common.

c) Processed products: Other than table birds, the meat is processed into sandwich slices, brawns, different kinds of sausages, chipolatas etc. These products are sold in different measures of weight. The common measures on the market include 200g, 400g, 500g and 1kg.

d) Packaging: Chicken meat is packaged and sold as either full chicken, half or quarter. The meat is mainly wrapped on a polystyrene base using a polythene film. This form of packaging is common in high end markets and formal retail outlets. However, in municipal food markets, chicken may be sold live or frozen whole or half.

Switching costs

There is no perfect substitute for eggs in the market. As a result, there is no basis of comparison of cost of switching from eggs. However, a survey of the market prices of the various meats and meat products relative to chicken meat indicates that the price of unprocessed chicken meat is much lower than pork and beef. For instance, the price of 1 kg capon is retails at KES 503 compared to KES 1450 and KES 600 for a kg of pork and beef, respectively. Similarly, retail price of processed chicken products is much lower than beef and pork as shown in the table 3.

Table 3: Comparative prices of sampled processed products from chicken, pork and beef in Kenya as at November 2021

Processed product	Price of products (KES*)		
	Chicken	Pork	Beef
Brawn (200 g)	108	123	115
Sandwich (200 g)	270	360	295
Sausages (1kg value pack)	590	661	592
Viennas (500 g)	425		467
Polony (200 g)	194	283	
*USD. 1 = KES. 113.18			

d) Bargain power of suppliers

The power of suppliers in the commercial poultry value chain to the leading players is presented in table 4. The main supplies from poultry systems are inputs such as feeds, vaccines and drugs, poultry housing, feeding and drinking equipments. These inputs are either imported or produced locally. The main feed suppliers include Unga feeds, Isinya feeds and Jubilee feed millers. They produce a wide range of feeds such as chick mash, growers mash, layers mash, hi-grow broiler starter mash, hi-grow broiler finisher mash, finisher pellets and broiler starter crumbs. Large commercial producers such as Kenchic, Kenbrid farms have contracted Unga feeds to supply feeds at factory prices. The main reason for this would be the availability of laboratory services within Unga feeds that guarantee quality standards of feeds. Isinya poultry farm produces feeds for their own use alongside selling surplus to other farms. This too assures them of the quality of feeds on the farm.

The main suppliers for vaccines and drugs are Kenya Veterinary Vaccine Production Institute (KEVEVAPI), Hi-Chem and Anchem. KEVEVAPI supplies mostly locally manufactured products such as Avivax –F which is from strain F NCD virus common in Kenya, Avivax- I 2 is a thermostable NCD vaccine in Kenya, Avivax – L also from strains of viruses commonly found in Kenya. Fowl vax is a fowl pox vaccine, Turkey vax is for turkeys Hi-Chem company supplies mostly imported infectious bursal disease (Gumboro) virus intermediate strain vaccine, Freeze dried fowl pox vaccines, MAREK CELL FREE vaccine, combined Lentogenic /F strain of Newcastle disease virus and H-120 strain of infectious bronchitis. Aden Chem Company also supplies mostly imported Infectious coryza and Fowl cholera vaccines.

The main suppliers of poultry equipment include Big Dutchman which deals mostly with imported poultry housing, feeding and watering equipment. They have a distribution network across the country through input suppliers stores, commonly referred to as agro vets. Jua Kali sector—literally "work under the hot sun" refer to an informal sector in Kenya comprising of informal traders and artisans, who often work out by the roadside (in the hot sun), and are renowned for their ability to create almost anything on demand and have a huge share of supply of equipment in the poultry system in Kenya.

Most commercial producers contract supplies of inputs in order to guarantee quality. It is rare that they substitute input suppliers due to the sensitive nature of poultry production. Where input supplies are not contracted, commercial producers opt to manufacture their own for the same reason to guarantee quality and consistent supply. All commercial poultry enterprises import genetic material from America, Europe and Asia since Kenya lacks local breeders of broilers and layers. The choice of supply of genetic resources is driven by cost of importation and logistical simplicity. Table 2 indicates counties where selected farms obtain genetic resources. With this information, new entrants into the Kenyan market are able to follow suit due to an existing market. The commonly imported breeds are: Cobb 500, Ross, Isa Brown and Hy-line, Lohman Brown Classic

a) Rivalry among existing competitors

Industry players employ various strategies to out compete each other. New entrants into the market normally use price competition to attract buyers to their products. There is also the use of closely similar brands and logos where the new entrants/ less dominant enterprises ape and alter the logos or brand colors of the dominant market players. This is despite registration of the logos and brands as trademarks. Some of these actions have resulted in litigation. The aim is to woo buyers who are loyal to particular brands but are not keen on checking brand authenticity. To enhance brand loyalty among the approved agents and dealers, the enterprises have also invested in extending credit facilities to them as well as sales on commission basis. There have also been cases of vicious advertisement campaigns where enterprises have campaigned against products of their rivals. In order to safeguard and expand market shares, enterprises have also engaged into restrictive contractual agreements with their agents by restricting them to sell only their products with prescription on standards and quality.

Table 4: Bargaining power of poultry input suppliers in Kenya

Successful Entity	Input type	Suppliers	Uniqueness of product/service from main suppliers	Strength of supplier	Cost of switching from a supplier to another
Kenchic (K) Ltd	Feeds	Unga feeds	Provide after sale services Provide laboratory services to clients Manufacture special feeds formulated by Kenchic	Have outlets in all parts of the country	Kenchic are bound by contracts they have made with Feeds supplier
	Vaccines and drugs	KEVEVAPI	Avivax –F is from strain F NCD virus common in Kenya Avivax- I 2 is a thermostable NCD vaccine Avivax – L also from strains of viruses commonly found in Kenya Fowl vax if a fowl pox vaccine Turkey vax is for turkeys	Supply locally manufactured vaccines Efficacy of poultry vaccines is high	
		Hi-Chem marketing ltd	Gumboro New castle Infectious bronchitis Fowl pox Mareks vaccine		
		Adenchem Stores Limited	Supply Infectious coryza, Fowl cholera vaccines	Supply imported poultry vaccines and medicines	
	Poultry equipment	Big Dutchman		Supply imported poultry equipment Have outlets across the country	

Isinya poultry farm	Feeds	Isinya Feeds Limited	Manufacture own feeds for their parental flocks and for farmers		
	Poultry equipment	Isinya feeds Ltd	Produce own housing and feeding equipment Their feeders have a handle, an anti-waste grid around the base of the feeder and a removable lid. They are designed to be portable, durable and easy to clean.		
Kenbrid	Feeds	Unga feeds	Provide after sale services Provide laboratory services to clients Manufacture special feeds formulated by Kenchic	Have outlets in all parts of the country	
	Vaccines and drugs	KEVEVAPI	Avivax –F is from strain F NCD virus common in Kenya Avivax- I 2 is a thermostable NCD vaccine. Avivax – L also from strains of viruses commonly found in Kenya. Fowl vax if a fowl pox vaccine Turkey vax is for turkeys		
	Poultry equipment	Big Dutchman			
Muguku poultry farm	Feeds	Jubilee Feeds Industries Ltd	Manufacture special feeds formulated by Muguku poultry farm		
	Poultry equipment	Big Dutchman			
KALRO	Feeds	Utafiti feeds	Provides laboratory backup , Provide after sales services		
		Isinya feeds Ltd	Manufacture breeders mash according to specifications from Kalro		
	Poultry equipment	Big Dutchman	Sturdy and easy to clean equipment		

		KALRO-Non-Ruminant research institute	Designed feeders that minimize wastage of feeds " Naivasha feeder		
		JUA Kali	Manufacture special poultry equipment designed by KALRO	Supply locally manufactured poultry equipment	
	Vaccines and drugs	Kevevapi	Supply Avivax –F is from strain F NCD virus common in Kenya. Supply Avivax- I 2 is a thermostable NCD vaccine Avivax – L also from strains of viruses commonly found in Kenya. Fowl vax if a fowl pox vaccine Turkey vax is for turkeys	Supply locally manufactured vaccines Efficacy of vaccines is high	
		Hi-Chem marketing ltd	Supply Gumboro, New castle dsease, Infectious bronchitis Fowl pox and Mareks vaccines		
		Adenchem Stores Limited	Infectious coryza vaccines Fowl cholera vaccines		

Lessons Learned from the Study

The working strategy for success in the commercial poultry sector in Kenya is vertical integration for maximized profits. Studied cases had specialized personnel or institutions in charge of key biosecurity and production parameters to ensure that operations from chick production to marketing are maintained under specified standards. Vertical integration of the poultry industry allows a combination of different biosecurity and sanitation practices, housing technologies and feeding options to improve food safety. This allows greater governance over each aspect of food safety from the breeder farm to the hatchery through the processing plant. As was observed, once the chickens are removed from the production houses, they are immediately delivered to the processing plant where strict testing regimes are in place throughout the plant to minimize the spread of bacteria. Marketing strategies are then utilized to ensure that processed products are sold out as fast as practically possible.

Diversification of sources of inputs, products sold, and selling points is key in ensuring survival. As previously mentioned, leading firms have branded outlets in leading towns to sell their products, availing these products to leading retail outlets in the country. This strategy helps survive alongside existing competition from emerging firms with limited market penetration.

Investment into a dynamic marketing strategy is important to enable product penetration and continuous sale to consumers. All of the cases studied apart from KALRO had a marketing department that deliberated on interventions and opportunities to be exploited in the country. Options which include latest technological innovations are found to come in handy. For instance, contractual farming was noted to be a great booster to the success of the leading poultry firms in Kenya. One of the marketing strategies involved sales agents reaching out to farmers for the provision of contractual engagements or technical backstopping.

Kenya lacks a sustainable source for parent flocks for commercial broilers and layers; thereby all successful enterprises source their genetic materials from Europe, America and Asia. This situation presents a valuable business opportunity not only in Kenya, but East and Central Africa. Such intervention will not only provide valuable genetic resources, but also contribute to increasing per capita consumption of meat and eggs. At the moment, all efforts focused on poultry breeding have targeted small holder farmers and this case, worked to produce dual purpose breed lines which do not perfectly fit into the commercial poultry industry.

The depiction of the indigenous and exotic chicken both fitting in the Kenya commercial market and

growing alongside each other is driven by availability, cost effectiveness and culture. Indigenous chicken have been in the Kenyan diet for a long time, such that several communities have customs, ceremonies and rituals tied to them. In addition, consumer perception, taste and preference have created market for both indigenous and exotic chicken. Restaurants and other eateries that focus on the low and middle income earning population focus on indigenous chicken while the higher economic segment focuses on exotic chicken. Demand for either exotic or indigenous chicken is not entirely tied to level of income, but availability. In rural set-ups, indigenous chicken are the only available option while urban setting has a mix of both exotic and indigenous chicken. In this case, the market for exotic chicken in not under threat from the consumption of indigenous chicken or vice versa. Each has a unique segment of the market that they fit into.

Fiscal policy and regulations have a direct impact on the success of commercial poultry enterprises in Kenya. For instance, the free trade within the East African Community has been faced with challenges from time to time. An example is a ban on importation of poultry products that was imposed by the Kenyan government in January 2021. This ban was in a bid to protect the businesses of local poultry producers amidst the COVID-19 pandemic. Unfortunately, this created a diplomacy conflict that resulted into other East African countries introducing bans on Kenyan products. Such interventions by the government has direct implications on commercial poultry enterprises. Where such initiatives are driven by public outcry or political ambitions without regard to economic viability, the well-being of the poultry enterprises are negatively affected. Despite this, the tax regime in Kenya as compared to other East African countries is high thereby corroborating to a higher cost of doing business. Regardless, poultry enterprises have evolved over time and learnt how to live within policy regulations and adjustments without jeopardizing the success of their businesses.

Conclusion

The success of the poultry industry in Kenya is pegged on an amalgamation of multifaceted opportunities and risks that make it dynamic and keeps evolving in a bid to remain profitable and in line with the ever changing consumer preferences. A wide range of opportunities exist in Kenya including a ready market in Kenya and in the East African region. This is alongside a robust transport and telecommunication infrastructure coupled with an efficient human resource capacity. Policy regulations governing production and trade in the industry are streamlined and have created a lucrative business environment, thereby attracting local and international investors.

Despite the opportunities for success in the poultry industry in Kenya, several bottlenecks exist that players in the industry have long learned to overcome. For starters, Kenya imports most of the feed manufacturing ingredients including soy meal and cottonseed cake. This importation increases the cost of production, making products more costly than those produced from neighbouring countries. In this case, preparedness and curbing of risks and uncertainties in the industry is an important aspect for success in the commercial poultry business.

References

Abdul-Cader, M. S., Palomino-Tapia, V., Amarasinghe, A., Ahmed-Hassan, H., De Silva Senapathi, U., & Abdul-Careem, M. F. (2018). Hatchery vaccination against poultry viral diseases: potential mechanisms and limitations. Viral immunology, 31(1), 23-33.

ABS-TCM. (2013). Study on the Kenyan animal feed and fodder sub-sectors. Kenya Feed Industry Policy and Regulatory Issues. Sub-Report III. Nairobi: SNV Kenya/Netherlands Development Organization.

Adeyonu, A. G., Otunaiya, A. O., Oyawoye, E. O., & and Okeniyi, F. A. (2021). Risk perceptions and risk management strategies among poultry farmers in south-west Nigeria. Cogent Social Sciences, 7(1), 1891719.

Alila P. O. and Atieno R. (2006). Agricultural Policy in Kenya: Issues and Processes. Paper presented in the Future Agricultures Consortium WorkshKESop, 20-22 March 2006. Institute of Development Studies, Nairobi.

Argwings-Kodhek, G. (2005). Background Document on Umbrella Legislation for Kenyan Agriculture. Tegemeo, Institute of Agriculture Policy and Development. Nairobi, Kenya.

Ayieko, D. M. O., Bett, E. K. and Kabuage, L. W. 2014. An analysis of the efficiency of indigenous chicken marketing channels in Makueni County, Kenya. Journal of Agricultural Economics and Development Vol. 3(2), pp. 026-034

Besbes, B. (2009). Genotype evaluation and breeding of poultry for performance under sub-optimal village conditions. World's Poultry Science Journal, 65(2), 260-271.

Bett, H. K., Bett, R. C., Peters, K. J., Kahi, A. K., and Bokelmann, W. (2011a). Estimating farmer's preferences in selection of indigenous chicken genetic resources using non-market attributes. Animal Genetic Resources, 49, 51-63.

Bett, H. K., Bett, R. C., Peters, K. J., Kahi, A. K., and Bokelmann, W. (2012). Linking utilisation and conservation of indigenous chicken genetic resources to value chains. Journal of Animal Production Advances , 2 (1), 33-51.

Bett, H. K., Peters, K. J., and Bokelmann, W. (2011b). Hedonic price analysis to guide in breeding and production of indigenous chicken in Kenya. Livestock Research for Rural Development , 23(6).

Bett, H. K., Peters, K. J., Nwankwo, U. M., and Bokelmann, W. (2013). Estimating consumer preferences and willingness to pay for the under-utilised IC products. Food Policy, 41, 218-225.

Carron, M., Alarcon, P., Karani, M., Muinde, P., Akoko, J., Onono, J., & and Rushton, J. (2017). The broiler meat system in Nairobi, Kenya: Using a value chain framework to understand animal and product flows, governance and sanitary risks. Preventive veterinary medicine, 147, 90-99.

Chamorro, S., Viveros, A., Rebolé, A., Arija, I., Romero, C., Alvarez, I., & Brenes, A. (2017). Addition of exogenous enzymes to diets containing grape pomace: Effects on intestinal utilization of catechins and antioxidant status of chickens. Food Research International, 96, 226-234.

Coffey, D., Dawson, K., Ferket, P., and& Connolly, A. (2016). Review of the feed industry from a historical perspective and implications for its future. Journal of Applied Animal Nutrition, 4.

Dale, E. and Brown, C. 2013. Zoonotic Diseases from Poultry. Brazilian Journal of Veterinary Pathology, 6(2), 76 - 82

Darwish, W. S., Eldaly, E. A., El-Abbasy, M. T., Ikenaka, Y., Nakayama, S., & Ishizuka, M. (2013). Antibiotic residues in food: the African scenario. Japanese Journal of Veterinary Research, 61(Supplement), S13-S22.

Del Torso O. 2019. Mobile Payment Systems and Financial Inclusion: the case of M-Pesa. Thesis. LUISS Guido Carli, Libera Università Internazionale degli Studi Sociali, Rome Italy.

FAO (2013). Poultry Development Review: Poultry feed availability and nutrition in developing countries. Retrieved on September 8, 2021, from http://www.fao.org/3/i3531e/i3531e.pdf#page=78

FAO (2013. Poultry Development Review: Poultry health and disease control in developing countries. Retrieved on September 8, 2021, from http://www.fao.org/3/i3531e/i3531e.pdf#page=96

FAO. (2007). The structure and importance of the commercial and village based poultry systems in Kenya, Rome, Italy, pp 92

FSD. (2016). 2016 Fin Access household survey. Nairobi: Financial Sector Deepening.

GAIN. 2020. Impact of COVID-19 on Kenya's Food Systems: A Situation Report - Edition 1. November 2020

Gakige, J. K., Kingori, A. M., and Bebe, B. O. (2015). Effects of targeted phase supplementary feeding on performance of scavenging ecotypes of indigenous chickens in Kenya. In proceedings of the 9th Egerton University International Conference (p. 8). Nakuru: Egerton University Press.

GSMA (2010). Mobile Money for the Unbanked, Annual Report 2009. London, UK, GSM Association.

Hafez H. M. (2005). Governmental regulations and concepts behind eradication and control of some important poultry diseases. World Poult Sci J. 61:569–82

Hafez H. M. (2008). European perspectives on the control and eradication of some poultry diseases. In: Tserveni-Goussi A, Yannakopoulos A, Fortomaris P, Arsenos G, Sossidou E, editors. Advances and Challenges in Poultry Science. Thessaloniki: University Studio Press; p. 62–72

Hafez, H. M., & Attia, Y. A. (2020). Challenges to the poultry industry: current perspectives and strategic future after the COVID-19 outbreak. Frontiers in veterinary science, 7, 516.

Kaudia, T. J. and Kitalyi, A. J. (2002). Commercialising rearing of village chicken in Kenya. INFPD/FAO Electronic Conference

Kenchic. (n.d.). Hatchery vaccination for day-old chicks. Retrieved September 8, 2021, from https://www.kenchic.com/farm-centre/kenchics-solution-to-gumboro-and-newcastle-diseases-hatchery-vaccination-for-day-old-chicks.

Kenya National Bureau of Statistics. (2010). The 2009 Kenya population and housing census (Vol. 1). Kenya National Bureau of Statistics (KNBS).

Kenya Retail sector report 2020. https://cytonn.com/topicals/kenya-retail-sector-report-2020; accessed on 8/9/2021

Khobondo, J. O., Muasya, T. K., Miyumo, S., Okeno, T. O., Wasike, C. B., Mwakubambanya, R., Kingori, A. M. and Kahi, A. K. (2015). Genetic and nutrition development of indigenous chicken in Africa. Livestock Research for Rural Development 27 (7) 2015

Khobondo, J. O., Mwakubambanya, R., Wasike, C. B., Kahi, A. K., and Upreti, H. K. (2015). Variation and repeatability of natural antibodies against keyhole limpet hemocyanin of indigenous chicken in Kenya. Genomics and Applied Biology 7(3), 1-8.

Khobondo, J. O., Okeno, T. O., Lihare, G. O., Wasike, C. B., and Kahi, A. K. (2014). The past, present and future genetic improvement of indigenous chicken of Kenya. Animal Genetic Resources, 55, 125-135.

Kimenyi, M., Adibe, J., Djiré, M., & and Jirgi, A. J. (2014). The impact of conflict and political instability on agricultural investments in Mali and Nigeria.

Kingori, A. M., Tuitoek, J.K., Muiruri, H. K., Wachira, A. M. and Birech, E. K. (2007). Protein intake of growing indigenous chicken on free range and their response to supplementation. International Journal of Poultry Science 6:617-621

Kingori, A. M., Wachira, A. M., and Tuitoek, J. K. (2010). Indigenous chicken production in Kenya: A review. International Journal of Poultry Science, 9(4), 309-316.

Magothe, T. M., Muhuyi, B. W., and Kahi, A. K. (2010). Influence of major genes for crested-head, frizzled-feather

and naked-neck on body weights and growth patterns of indigenous chicken reared intensively in Kenya. Tropical Animal Health and Production, 42, 173-183.

Magothe, T. M., Muhuyi, W. B., and Kahi, A. K. (2011). Genetic parameters for egg and body weight of indigenous chicken in Kenya. Animal Production Society of Kenya, 36.

Magothe, T. M., Okeno, T. O., Muhuyi, W. B. and Kahi, A. K. (2012b). Indigenous chicken production in Kenya: II. Prospects for research and development. World's Poultry Science Association, 68: 133-144

Magothe, T. M., Okeno, T. O., Muhuyi, W. B., and Kahi, A. K. (2012a). Indigenous chicken production in Kenya: Current status. World's Poultry Science Association, 68, 119-132.

McCord, M. J., Steinmann, R., Tatin-Jaleran, C., Ingram, M., & and Mateo, M. (2012). The landscape of microinsurance in Africa 2012. Munich/Eschborn: Munich Re Foundation, GIZ, AfDB.

MOLD, 2015. Economic review of Agriculture [ERA] Ministry of Agriculture, Livestock and Fisheries, Kenya pp 136

Moreki, J. C., Dikeme, R., and Poroga, B. (2010). The role of village poultry in food security and HIV/AIDS mitigation in Chobe District of Botswana. Livestock Reseach for Rural Development, 22(3), 1-7.

Muasya, T. K., Miyumo, S., Ngeno, K., Khobondo, J. O., Wasike, C.B., Magothe, T.M. and Kahi, A.K. (2015). Preliminary selection results for body weight in indigenous chicken in Kenya.In: Proceedings of the Animal Production Society of Kenya annual symposium, 21-23 April 2015, Mombasa, Kenya

Muchadeyi, F. C., Eding, H., Wollny, C. B., Groeneveld, E., Makuza, S. M., and Shamseldin, R. (2007a). Absence of population sub-structuring in Zimbambwe chicken ecotypes inferred using microsatellite analysis. Animal Genetics, 38(4), 332-339.

Muchadeyi, F. C., Wollny, C. B., Eding , H., Weigend, S., Makuza, S. M., and Simianer, H. (2007b). Variation in village chicken production systems among agro-ecological zones of Zimbabwe. Tropical Animal Health and Production, 39(6), 453-461.

Munyaka, F. G., Ouma B. O. and& Ndirangu A. W. (2015). Factors affecting the performance of small and medium scale poultry farming enterprises in Karuri, Kenya. Research Journal of Finance and Accounting, 6(9), 119-130.

Mutayoba, S. K., Dierenfeld, E., Mercedes, V. A., Frances, Y., & Knight, C. D. (2011). Determination of chemical composition and anti-nutritive components for Tanzanian locally available poultry feed ingredients. International Journal of Poultry Science, 10(5), 350-357.

Ngeno, K. (2011). Genetic analysis of growth patterns of different ecotypes of indigenous chicken populations in Kenya in Kenya. Msc thesis, Egerton University, Njoro, Kenya.

Ngeno, K., van der Waaij, E. H., Megens, H. J., Kahi, A. K., van Arendonk, J. A., and Crooijmans, R. P. (2015). Genetic diversity of different indigenous chicken ecotypes using highly polymorphic MHC linked and non-MHC linked microsatellite markers. Animal Genetic Resources, 1-7.

Njagi, T., Kamau, M., Gitau, R., Onyango, K., Kinyumu, N., & and Mathenge, M. (2013). Implications of implementation of the VAT Act 2013 on animal feeds. Policy brief, (10).

Njoku, P. C. (1986). Effect of dietary ascorbic acid (vitamin C) supplementation on the performance of broiler chickens in a tropical environment. Animal Feed Science and Technology, 16(1-2), 17-24.

Njoroge, E. K., Wambui, C. E. and Wasike, B. C. 2021. Nutritional composition, in vitro gas production and in sacco degradability of processed Croton megalocarpus nuts for ruminant feeding. Online J. Anim. Feed Res., 11(2): 36-45. DOI: https://dx.doi.org/10.51227/ojafr.2021.7

Nyaga, P. (2007). Poultry sector country review, Kenya.

Ohe, O., & and Arakawa, A. (1975). Effect of feed additive antibiotics on chickens infected with Eimeria tenella. Poultry science, 54(4), 1008-1018.

Okeno, T. O., Bett, R. C., Kahi, A. K., and Peters, K. J. (2011b). Economic values for resistance to helminthosis and Newcatle disease in indigenous chicken in tropics. Journal of Veterinary Advances, 1, 1-10.

Okeno, T. O., Kahi, A. K., and Peters, K. J . (2011a). Breed selection practices and traits of economic importance for indigenous chicken in Kenya. Livestock Research for Rural Development, 23.

Okeno, T. O., Kahi, A. K., and Peters, K. J. (2012a). Characterization of indigenous chicken production systems in Kenya. Tropical Animal Health and Production, 44 (3), 601-608.

Okeno, T. O., Kahi, A. K., and Peters, K. J. (2013). Evaluation of breeding objectives for purebred and crossbred selection schemes for adoption in indigenous chicken breeding programmes. British Poultry Science, 54 (1), 62-75.

Okeno, T. O., Magothe, T. M., Kahi, A. K., and Peters, K. J. (2012b). Application of risk-rated profit model functions in estimation of economic values for indigenous chicken breeding. Tropical Animal Health and Production, 44 (6), 1279-1287.

Okeno, T. O., Magothe, T. M., Kahi, A. K., and Peters, K. J. (2012c). Breeding objectives for indigenous chicken: Model development and application to different production systems. Tropical Animal Health and Production, 45 (1), 193-203.

Okonjo, J. O. (2013). Convergence between Mobile telecommunications and financial services: implications for regulation of mobile telecommunications in Kenya. LLM Thesis, University of Nairobi.

Oloo, J. (2010). Food Safety and Quality Management in Kenya: An Overview of the Roles Played by Various Stakeholders. African Journal of Food Agriculture Nutrition and Development, 10(11): 4379-4397.

Omiti, J. M., & and Okuthe, S. O. (2009). An overview of the poultry sector and status of Highly Pathogenic Avian Influenza (HPAI) in Kenya: Background Paper. International Food Policy Research Institute (IFPRI).

Omwansa, T., & and Waema, T. (2014). The impact of pure mobile micro-financing on the poor: Kenya's Musoni experience. Institute for Money, Technology & Financial Inclusion (IMTFI), Working Paper, 2.

Onono, J. O., Alarcon, P., Karani, M., Muinde, P., Akoko, J. M., Maud, C., & and Rushton, J. (2018). Identification of production challenges and benefits using value chain mapping of egg food systems in Nairobi, Kenya. Agricultural systems, 159, 1-8.

Onyango, C. A., Ochanda, S. O., Mwasaru, M. A., Ochieng, J. K., Mathooko, F. M., & and Kinyuru, J. N. (2013). Effects of malting and fermentation on anti-nutrient reduction and protein digestibility of red sorghum, white sorghum and pearl millet. Journal of Food Research, 2(1), 41.

Otiang, E., Thumbi, S. M., Campbell, Z. A., Njagi, L. W., Nyaga, P. N., & and Palmer, G. H. (2021). Impact of routine Newcastle disease vaccination on chicken flock size in smallholder farms in western Kenya. Plos one, 16(3), e0248596.

Pym, R. A., Guerne Bleich, E., and Hoffmann, I. (2006). The relative contribution of indigenous chicken breeds to poultry meat and egg consumption in the developing countries of Africa and Asia. In Conference Proceedings of the XII European Poultry Conference, (pp. 10-14).

Republic of Kenya (2011). National Food and Nutrition Security Policy. Ministry of Agriculture, Livestock and Fisheries, Nairobi.

Republic of Kenya (2012). National Agribusiness Strategy: Making Kenya's Agribusiness Sector a competitive driver of growth. Agricultural Sector Coordination Unit, Nairobi.

Republic of Kenya (2016). Agricultural Policy: Food: Our Health, Wealth and Security. Ministry of Agriculture, Livestock and Fisheries, Nairobi.

Republic of Kenya (2017a). National Trade Policy: Transforming Kenya into a Competitive Export-Led and Efficient

Domestic Economy. Ministry of Industry, Trade and Cooperatives, State Department for Trade, Nairobi.

Republic of Kenya. (2008). National Livestock Policy, Sessional paper No2 of 2008. Nairobi: Ministry of Livestock Development.

Republic of Kenya. (2010). Agriculture Sector Development Strategy. Ministry of Agriculture, Livestock and Fisheries, Nairobi.

Republic of Kenya. (2017b). The National export development and promotion strategy for Kenya 2017-2022. Nairobi: Ministry of Industry, Trade and Cooperatives, State Department for Trade.

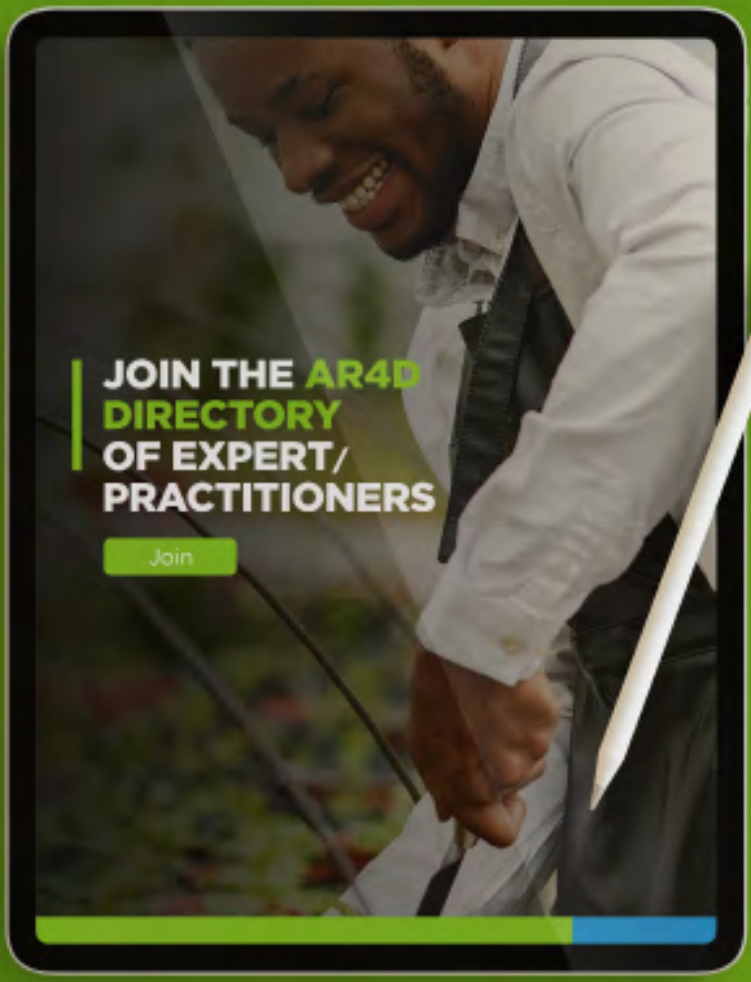
Said, N. & and Mbugua, P. (2005). Present Situation of Compounded Feeds in Kenya and Perspectives for Better Use of Local Feed Resources.

Samtiya, M., Aluko, R. E. & and Dhewa, T. 2020. Plant food anti-nutritional factors and their reduction strategies: an overview. Food Prod Process and Nutr 2, 6 (2020). https://doi.org/10.1186/s43014-020-0020-5

Trend Economy 2020. https://trendeconomy.com/data/h2/Kenya/0207; accessed on 25/1/2022

Vernooij, A., Masaki, M. N., & and Meijer-Willems, D. (2018). Regionalisation in poultry development in Eastern Africa (No. 1121). Wageningen Livestock Research.

World Bank. (2020). World Bank Doing business 2020 note. The World Bank.



Are you an AR4D expert
and want to be part of
the continental pool of
Agricultural experts ?

CLICK HERE TO

REGISTER

Forun For Agricultural Research In Africa
Headquarters 12 Anmeda Street, Roman Ridge
PMB CT 173, Accra, Ghana
Tel +233 (0) 302 772823 / 779421
Fax +233 (0) 302 773676
Email info@faraafrica.org
www.faraafrica.org

ISSN: 2590-9657