MARKET ACCESSIBILITY AND ADOPTION OF IMPROVED INDIGENOUS CHICKEN AMONG SMALL-SCALE FARMERS IN ELGEYO MARAKWET COUNTY: THE CASE OF KEIYO NORTH SUB-COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

DECLARATION

I hereby declare that this thesis is my work and has not been submitted for a degree award in any other institution of higher learning.

SIGNATURE…….
DATE……

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RECOMMENDATION

This thesis has been submitted for examination with our approval as university supervisors.

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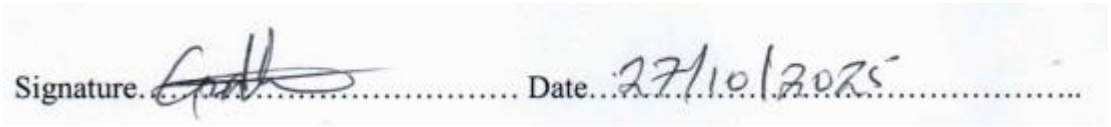

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ABSTRACT

Improved indigenous chicken (IIC) is increasingly regarded as a sustainable agricultural enterprise with notable social, economic, and environmental benefits. It is considered a promising strategy for improving food and nutritional security, fostering gender inclusion, and reducing poverty in rural Kenya, particularly in counties such as Elgeyo Marakwet. Due to their adaptability, low input requirements, and cultural acceptability, IC are well-suited for smallholder farmers. However, market access for IIC products remains fragmented and transient. This study evaluated the accessibility of IIC markets and adoption levels among smallholder farmers in Elgeyo Marakwet County, focusing on Keiyo North Sub-County across three topographic zones. A cross-sectional survey design was employed, targeting 816 farmers, with 371 sampled using stratified sampling. Data were collected through structured questionnaires and analyzed using descriptive statistics, Principal Component Analysis (PCA) and regression analysis. The findings revealed that 76% of respondents had access to breed information, and adoption was significantly associated with factors such as education, gender, household size, and agriculture-based income. While most farmers practiced regular feeding, the high cost of commercial feeds (reported by 68.1%), disease burden, and limited veterinary access constrained productivity. Only 45% had direct contact with poultry buyers, and market prices varied significantly by location and season. PCA results demonstrated a strong relationship between market access and the adoption of improved IIC practices, underlining the role of structured markets and extension services in enhancing uptake. Economic Resources ($\beta = 0.314$) had the strongest positive influence, suggesting that farmers with greater financial capacity, land, and education were more likely to adopt improved practices. Production Practices ($\beta = 0.278$) and Market Access ($\beta = 0.211$) also had significant positive effects, emphasizing the importance of technical knowledge and access to reliable markets. Disease Control ($\beta = 0.167$), though relatively weaker, remained a significant factor, highlighting the need for enhanced veterinary extension and vaccination programs. Despite the potential of IIC farming to boost household income, nutrition, and resilience to climate shocks, barriers such as unstructured markets, limited access to market information, and inadequate disease control reduce its effectiveness. The study recommends that county governments intensify extension outreach, support local feed formulation, improve veterinary services, and structure poultry markets to scale adoption and maximize the socio-economic benefits of improved indigenous chicken farming.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASALs: Arid and Semi-Arid Lands

ECTAD: Emergency Centre for Transboundary Animal Diseases

FAO: Food and Agriculture Organization

GDP: Gross Domestic Product

IC: Indigenous Chicken

IIC: Improved Indigenous Chicken

PCA: Principal Component Analysis

USAID: United States Agency for International Development

WSPA: World Society for the Protection of Animals

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OPERATIONAL DEFINITION OF TERMS

Improved Indigenous Chicken: A breed or variety of indigenous chicken that has been selectively bred or enhanced through interventions to increase productivity, disease resistance, or adaptability while maintaining some traditional characteristics.

Smallholder Farmers: Individuals or households engaged in agriculture on a small scale (less than 3,000 chicken) typically with limited land and resources, and primarily for subsistence or local markets.

Market Accessibility: The ease with which farmers can reach and utilize markets to sell their products, including factors such as transportation infrastructure, market location, and financial services.

Socio-Economic Characteristics: Attributes related to the social and economic status of individuals, including income level, education, occupation, and household size.

Indigenous Chicken Husbandry: The practices and methods used by farmers to rear and manage indigenous chicken breeds, including feeding, housing, breeding, and disease management.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter presents the background information of the study, statement of the problem, objectives of the study, research questions; justification of the study, significance, and scope of the study.

1.2 Background Information

Agriculture is the backbone of the Kenyan economy with great potential for growth and transformation. It contributes about 33% of the total Gross Domestic Product (GDP). The sector contributes an additional 27% of the GDP through linkages to other sectors such as manufacturing, distribution, and services (Wambua et al., 2022). The sector employs more than 40% of the total population and about 70% of the rural population. Poultry farming is one of the major economic activities being undertaken by small-scale farmers. Poultry products significantly contribute to human nutrition, clothing, labor, and research. Chicken (*Gallus gallus domesticus*) production plays an important role in the livelihoods of most rural families. Three-quarters of chickens are indigenous chickens (FAO, 2023). IC breeds are highly resilient to harsh weather, poor housing, and local disease challenges, unlike exotic broilers and layers that require controlled environments and high-level veterinary care (Wambua et al., 2022; Kiptoo et al., 2023). IC can thrive on minimal feed (often scavenging or being fed household remains) and require less capital to raise, making them ideal for low-resource rural farmers (Mutua et al., 2024).

Improved indigenous chicken farming is a sub-sector within poultry farming, and it plays a significant role in many families worldwide. It has potential for the provision of meat, eggs, feathers, and manure (Githinji & Mutua, 2023). Improved chicken has proved to be more productive in terms of eggs, meat production, fast growth rate, and attaining market weight much earlier than local chicken (Nyaga et al., 2021). Thus, improved chicken has the potential for food security, income generation, health, poverty reduction, social ceremonies, and ornaments (Chege et al., 2023). In addition,

chicken manure improves crop production. For instance, composting chicken manure from improved indigenous chickens has been used in gardens and farms to supply nitrogen, potassium, and phosphorus (Mutombo, 2022)Notably, chicken manure is superior to most other livestock manure in terms of nutrient content, as it contains higher concentrations of essential macronutrients - especially nitrogen - making it more effective in enhancing soil fertility and promoting faster crop growth compared to cow, goat, or sheep manure (Odhiambo et al., 2023).

Globally, the production of indigenous chicken accounts for 30% of all white meat consumed (FAO 2020). Indigenous chicken (IC) production forms part of the local assets owned by people living in the rural areas of developing countries (Nduthu, 2021). The IC exhibits low production, late maturity, broodiness, delayed growth, and high mortality rates. Their management, however, is characterized by extensive scavenging, lack of disease control programs, and increased risk of predators (Bushra, 2018). The global population of IC is estimated at 16.2 billion with 71.6% being in developing countries.

In Africa, the indigenous chicken (IC) subsector contributes over 70% of poultry products and 20% of animal protein intake (Anyona et al., 2023). Indigenous chickens are well-adapted to local environments and possess traits that make them suitable for small-scale farming systems in Africa. Indigenous chicken holds cultural and traditional value in African societies. They are often used in ceremonies, rituals, and social gatherings, symbolizing wealth, hospitality, and cultural identity. Additionally, IC farming practices are passed down through generations, preserving cultural heritage and knowledge. In East Africa, over 80% of the human population lives in rural areas, out of which over 75% keep indigenous chickens (Mujyambere et al., 2022). Despite their significance, IC production faces various challenges in Africa. These include low productivity, high mortality rates, limited access to improved breeds and veterinary services, and vulnerability to diseases and predators. However, these challenges also present opportunities for interventions and improvements in indigenous chicken breeding, management practices, disease control, and market access (Adhiaya & Cheruiyot, 2021).

Kenya is home to 22 million indigenous chickens (Mutua, 2018) and their demand has been increasing as they possess unique attributes such as distinct flavor, leanness, and colour (Anyona et al., 2023). In Kenya, chicken is estimated to be 98% of the poultry population with 2% making the other types of poultry like geese, ostrich, dove, quail, turkey, and guinea fowl. Chicken dominates in the poultry sector with indigenous chicken constituting 70% of the total poultry population. Production of indigenous chicken helps to mitigate food insecurity and reduces poverty levels in developing countries.

Improved Indigenous Chicken (IC) is increasingly recognized as a viable option for enhancing food and nutritional security, income generation, and poverty reduction in rural Kenya, including Elgeyo Marakwet County. Their adaptability to harsh climates, disease resistance, and low input requirements make them ideal for smallholder farmers. IC farming is accessible to women, youth, and marginalized groups due to its low capital and space needs, while also offering regular income from egg and bird sales. Their manure improves soil fertility, enhancing crop productivity. This makes IC a strategic, gender-inclusive, and climate-resilient livelihood option for rural households (Wambua et al., 2022).

Indigenous chicken products are generally preferred as compared to exotic breeds. The preferred attributes of IC products (meat and egg) include: leanness, and tasty products and are recognized as organic products. Moreover, Okello et al., (2020) affirmed that there is high demand for improved indigenous chicken (IC), as consumers prefer their tastier and more nutritious meat over that of exotic breeds. This consumer preference translates into higher market prices for IC, making them more profitable for smallholder farmers. Their ability to fetch premium prices, particularly in niche and urban markets, enhances their potential as a sustainable income source. Combined with their resilience and low production costs, IC offers a competitive advantage over exotic breeds, reinforcing their role in poverty alleviation and food security in rural Kenya.

Despite the capacity of IC to contribute to the economy and reduce poverty levels among poor rural households, the enterprise is constrained by low productivity (Kamau et al., 2018). Improved Indigenous Chicken (IC) outperform traditional breeds

in several measurable ways, making them a viable strategy for food security and poverty reduction in rural Kenya. On average, improved IC lay 180–220 eggs annually compared to 40–80 from unimproved breeds, and they reach market weight (1.5–2.0 kg) faster, within 16–20 weeks. Their eggs are larger (50–60g vs. 35–45g), and they command higher market prices (KES 800–1,200 per bird). Mortality rates are also lower (10–20%) under good management. These advantages, coupled with their adaptability and feed efficiency, position improved IC as a strong candidate for economic empowerment and nutritional improvement. This would enhance the intensification of IC production among smallholder farmers in Kenya (Mutombo, 2022).

In Kenya, despite the rising demand for improved indigenous chickens, their productivity remains hampered by frequent disease outbreaks, suboptimal feeding practices, limited genetic improvement, and poorly structured marketing systems (Magothe et al., 2021). These constraints reduce their overall performance and hinder their ability to significantly support rural livelihoods. Nonetheless, improved IC possess untapped potential to contribute meaningfully to food security, income diversification, and women's economic empowerment.

The chicken are kept under scavenging production systems where management interventions are limited, with a view to improving flock productivity. Often causes of low productivity are diseases, lack of proper housing, and lack of feed (Siyaya & Masuku, 2022). The same constraints were reported earlier by Habte et al., (2021) that poor management, lack of food supplementation; lack of disease control measures and inappropriate housing have constrained indigenous chicken production.

However, information on the impact of selected social, economic, and institutional factors that are hypothesized to affect technology adoption, production, and market participation among smallholder indigenous chicken farmers is still limited (Mohamud et al., 2023). Although the indigenous production system possesses enormous potential for improving livelihoods, its marketing systems are not well-defined and are variable. Furthermore, the influence of prices on market engagements is frequently assumed. While farmers complain of poor farm gate prices for indigenous chicken offered by

middlemen, volumes of sale are also an important drawback to market participation (Mathiu, 2021).

Improved indigenous chicken production is a source of food security and income among smallholder farmers in Elgeyo Marakwet County especially in high-potential areas and semi-arid lands. About 80% of the population living in the rural set-up in Keiyo North sub-county depend on the rearing of improved indigenous chicken as a source of livelihood which they sell in the transient market for exchange of money. Keiyo North Sub-County, located in Elgeyo Marakwet County, is ecologically diverse and divided into three distinct topographic zones: the Highlands, the Escarpment (Hanging Valley), and the Kerio Valley.

These zones are demarcated by the prominent Elgeyo Escarpment, a steep fault scarp that stretches across the region. The Highlands lie at altitudes above 2,400 meters above sea level (masl), characterized by cool temperatures and high rainfall, suitable for crop and dairy farming. The Escarpment ranges between 1,800–2,400 masl with moderate rainfall and mixed farming systems. The Kerio Valley lies below 1,800 masl, experiencing hot, dry conditions ideal for drought-tolerant crops and indigenous poultry. According to Jaetzold et al., (2007), this altitudinal gradient defines the agro-ecological zones (AEZs) in Elgeyo Marakwet, influencing agricultural potential, farming systems, and food security strategies across the sub-county.

A transient market refers to an informal and unstable marketplace that lacks structure, consistency, and predictability. In such markets, sellers - like small-scale improved indigenous chicken farmers - cannot rely on fixed prices, regular buyers, or established selling points. Unlike other livestock such as cattle or goats that often have designated markets or auction days, chicken farmers in Keiyo-North Sub-County face uncertainty because poultry products do not follow any organized marketing channel. Farmers must sell at home, by the roadside, or through middlemen who dictate prices. This means a farmer may have chickens ready for sale but be unable to sell them immediately due to lack of access to a dependable market.

1.3 Statement of the Problem

Improved indigenous chicken farming has emerged as a promising avenue for enhancing livelihoods among households in developing countries. However, the transient nature of indigenous chicken markets has long posed a challenge, necessitating ongoing initiatives and programs to improve marketing strategies. In Kenya, there is a growing demand for products derived from improved indigenous chicken breeds, particularly due to their unique taste and high nutritional value (Mohamud et al., 2023). Indigenous chicken meat and eggs serve as preferred choices for consumers, offering both dietary benefits and income opportunities for small-scale farmers. This translates into broader implications for long-term national development and improved living standards, particularly in rural areas.

In Elgeyo Marakwet County, where poverty rates among smallholders remain persistently high, improved indigenous chicken farming has been identified as a significant intervention. However, concerns persist regarding the effectiveness of this intervention, particularly regarding market access challenges. The lack of a defined pricing system for improved indigenous chicken products often leaves small-scale farmers at the mercy of local transient markets or middlemen, who dictate prices arbitrarily (Kiprop et al., 2019). This dynamic has further marginalized smallholders, raising questions about the sustainability and success of indigenous chicken farming initiatives in the region.

Against this backdrop, this study aimed to evaluate the accessibility of transient markets among improved indigenous chicken smallholder farmers in Keiyo-North Sub-County, Elgeyo Marakwet County. Adoption of improved indigenous chicken (IIC) farming in the region has been growing, driven by its potential to offer higher productivity, better resilience, and improved returns compared to local breeds. However, despite its promise, farmers face persistent challenges in fully realizing these benefits due to limited and inconsistent market access. The study specifically focused on identifying the key factors influencing market access and assessing the viability of IIC farming as a poverty reduction intervention.

1.4 Objectives of the Study

1.4.1 General Objectives

The general objective of this study was to evaluate the relationship between the markets accessibility and adoption of improved indigenous chicken by smallholder farmers in Keiyo North Sub-County, Elgeyo Marakwet County, Kenya.

1.4.2 Specific Objectives

i. To describe the socio-economics characteristics of smallholders for the adoption of IC along the three topographic zones of Keiyo North Sub-County, Elgeyo Marakwet County.
ii. To describe indigenous chicken husbandry and production practices by smallholder farmers along the three topographic zones of Keiyo North Sub-County, Elgeyo Marakwet County.
iii. To determine the relationship between the accessibility of the chicken market and the levels of adoption of improved indigenous chicken in Keiyo North Sub-County, Elgeyo Marakwet County.
iv. To evaluate the potential of improved indigenous chicken husbandry as a poverty reduction intervention along the three topographic zones of in Keiyo North Sub-County, Elgeyo Marakwet County.

1.5 Research Questions

i. What are the socio-economics characteristics of smallholders for adoption of IC as a poverty intervention strategy along the topographic zones of Keiyo North Sub-County, Elgeyo Marakwet County?
ii. How are the indigenous chicken husbandry and production practices by smallholder farmers along the three topographic zones of Keiyo North Sub-County, Elgeyo Marakwet County?
iii. What is the relationship between the accessibility of the chicken market and the levels of adoption of improved indigenous chicken in in Keiyo North Sub-County, Elgeyo Marakwet County?

iv. What is the potential of improved indigenous chicken husbandry as a poverty reduction intervention along the three topographic zones of Keiyo North Sub-County, Elgeyo Marakwet County?

1.6 Justification of the Study

Improved indigenous chicken rearing is vital in the Kenyan poultry sub-sector due to its contribution to smallholder farmers in the country. Market access needs to be improved to enhance rural-scale production and increase household income. The results of the study is of great significance to government agencies (ministries and departments), non-governmental organizations, and other relevant stakeholders in informing decision-making and designing effective interventions to improve access to competitive and dependable markets for improved indigenous chicken (IC). These findings offer evidence-based guidance for developing inclusive market systems that can replace the current transient, unpredictable, and exploitative market environment. Addressing the limitations of the existing transient market structure is critical for enhancing IC production, improving incomes for smallholder farmers, ensuring sustainability, and positioning IC as a viable poverty reduction and food security strategy in rural Kenya.

1.7 Significance of the Study

The findings of this study contributes to the development of the agricultural sector, particularly in the poultry industry. Understanding the accessibility challenges faced by smallholder farmers informs the formulation of policies, interventions, and strategies to improve market access for indigenous chicken farmers. This will lead to increased productivity, income generation, and overall agricultural development in the region. Improved accessibility to transient markets has a direct positive impact on the livelihoods of smallholder farmers. By enhancing their ability to sell their products and generate income, farmers improve their standard of living, invest in education, healthcare, and other essential needs, and reduce poverty levels within the community.

The study's focus on how improved indigenous chicken farming aligns with the principles of sustainable development. Promoting sustainable agricultural practices,

such as indigenous chicken farming, contributes to environmental conservation, biodiversity preservation, and the promotion of resilient farming systems within a climate-changing environment. Enhancing the accessibility of transient markets for improved indigenous chicken farmers can contribute to improved food security at the local and regional levels. By increasing the availability of nutritious poultry products, the study aids in alleviating malnutrition and ensuring a stable food supply in the Keiyo North Sub-County. Understanding the challenges and opportunities related to market accessibility empowers smallholder farmers to make informed decisions.

The study's findings provide farmers with valuable insights into market dynamics, enabling them to develop effective marketing strategies, negotiate better prices, and strengthen their position in the value chain. The study's outcomes can serve as a basis for evidence-based policy recommendations and interventions. Policymakers, agricultural extension services, and relevant stakeholders utilize the findings to design and implement targeted programs that address the specific needs of improved indigenous chicken farmers, thereby fostering the growth and sustainability of the poultry sector.

1.8 Scope of the Study

This study sought to evaluate the relationship between the markets accessibility and adoption of improved indigenous chicken by smallholder farmers . The study was conducted specifically in in Keiyo North Sub-County, Elgeyo Marakwet County of Kenya. The sub-county's boundaries and its three topographic zones serve as the geographical scope for data collection and analysis. The study focused on improved indigenous chicken farmers who are smallholder farmers in the Keiyo North Sub-County. The research examined their accessibility to transient markets. The study considered various variables related to the socio-economic characteristics of the farmers, indigenous chicken husbandry practices, agricultural production practices, market accessibility, and the potential of improved indigenous chicken farming as a poverty reduction intervention.

1.9 Limitations of the Study

This study was limited to Keiyo North Sub-County in Elgeyo Marakwet County, and therefore its findings may not be representative of other regions in Kenya. To address this concern, the study sampled households across the three topographic zones of the sub-county so as to capture variations in farming and market conditions, thereby strengthening the internal validity of the results. Market accessibility was also influenced by factors such as infrastructure, seasonal variations, and economic fluctuations, which are often difficult to capture comprehensively within the timeframe of a single study. To mitigate this, data were collected across different market days and seasons, enabling the study to reflect more accurately the prevailing market dynamics. Another limitation arose from the reliance on self-reported data provided by smallholder farmers. Such information is prone to recall bias or exaggeration, which could compromise the accuracy of the findings. This challenge was addressed by triangulating the data with direct field observations, secondary information from local agricultural offices, and insights obtained from key informant interviews, which helped to validate farmer responses. Additionally, the study faced difficulty in accurately assessing the impact of climate change on indigenous chicken husbandry because of the unpredictable and variable nature of weather patterns. To address this, long-term data from the Kenya Meteorological Department were used and cross-checked with seasonal trends reported by farmers, ensuring that the findings were consistent with observed climatic conditions.

Data collection also presented practical challenges, especially in reaching farmers located in remote or hard-to-access areas. This was overcome by engaging local research assistants who were familiar with the terrain and community networks, which made it easier to reach respondents and build trust. Flexible scheduling was also applied to accommodate farmers' availability and encourage maximum participation. These measures collectively reduced the impact of the limitations and enhanced the credibility of the study's findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature on the accessibility of transient markets by improved indigenous chicken smallholder farmers. It specifically reviews the literature on the socio-economic characteristics of improved indigenous chicken smallholder farmers; indigenous chicken husbandry and other agricultural production practices by smallholder farmers; the relationship between the accessibility of the chicken market and the levels of adoption of improved indigenous chicken and lastly the potential of improved indigenous chicken husbandry as a poverty reduction intervention in a climate-changing environment.

2.2 Status of Poultry Production in Kenya

The production of indigenous chickens has grown in significance to the economic and social life of resource-poor households. It is practiced wherever there are people, and it is economically strong and low-cost in production for resource-poor rural households. It is resilient to conditions in scavenging systems (harsh, nutrient-poor, and/or parasitic conditions) (Magothe et al., 2021). Due to its increased popularity, the demand for IC fresh meat is increasing, relative to the exotic breeds, due to perceived leaner meat. Contrarily, there are reports of a declining productivity trend, especially in free-range production systems, leading to a reduction in IC farming production levels into the market (Kryger, Thomsen, Whyte & Dissing, 2020).

In Africa, poultry production is undertaken by farmers who experience troubles with skyrocketing prices of feed’s raw materials such as maize and soyabeans, insufficient extension or advisory services, and poorly developed infrastructure such as roads (Nkukwana, 2018). In Kenya, although demand is increasing; the productivity of chickens is constrained by high incidence of disease, inadequate nutrition of the birds, low genetic ability, and poor marketing channels, which in turn affects their contribution to rural development (Magothe et al., 2021). Chickens are kept under scavenging systems of production, with limited possibilities to apply management

interventions to improve the productivity of chickens in the flock. However, the productivity of these chickens is typically low, even with constraints such as diseases, inadequate housing, and insufficient feed (Siyaya & Masuku, 2022). Similar limitations were found Habte et al., (2021) that poor management, insufficient supplementary feeding, lack of disease control strategies, and inadequate housing were limiting indigenous chicken production. It is worth noting, however, that the literature is limited on the influence of specific social, economic, and institutional factors that are inferred to affect technology adoption, production and market participation among smallholder indigenous chicken farmers.

2.3 Socio-economic characteristics of improved indigenous chicken smallholder farmers

Agriculture represents at least 23% of Kenya's gross domestic product (GDP), and smallholders predominantly produce the agriculture in the country (Republic of Kenya (RoK), 2022). Smallholder farmers in Kenya are associated with subsistence production with low productivity on fragmented pieces of land. The smallholders cultivate local crop varieties and animal breeds despite improved crop varieties and animal breeds being introduced. Nevertheless, smallholder farmers are expected to contribute significantly to agricultural products for subsistence use. In general, smallholder farmers account for 80% of total national poultry production in Kenya (MoLFD, 2019). Improved indigenous chicken smallholder farmers are a critical part of agricultural systems in many settings, especially in country contexts where they exist in developing nations. Importantly, smallholder farmers contribute to rural economies, food security, poverty alleviation, and sustainable development. Understanding their social-economic characteristics has implications for interventions and policy design to support their livelihoods.

Compared to farmers worldwide, smallholder farmers in developing nations are marked by poverty, low productivity, low incomes, and often face food insecurity (Kidanemariam et al., 2022). Rearing Indigenous Chicken (IC) provides food security and has an economic base for at least 80% of households in developing nations, while alleviating poverty and malnutrition (Moreki et al., 2020; Okello et al., 2020; Sadya, 2018). Moreover, IC contributes an estimated 30% of white meat in the world, as well

as, in Kenya which produces 47% of eggs and 55% of meat (FAO 2018; Kingori et al., 2020). More so, the introduction of Improved Indigenous Chicken (IIC) has the ability to improve the livelihoods of the populations in the developing nations of the world. In the last decade alone, white meat and related products have seen increasing demand from consumers, together with population growth, urbanisation and increased per capita disposable income (USAID, 2020). In addition, there are untapped opportunities for marketing IC in many urban and peri-urban contexts where smallholders are located (WSPA, 2018).

Additionally, consumers who are mindful of their health have a predilection for IC meat, which they consider to be low in fat, nutritious, appetizing and tasty (King'ori et al. 2020). Accordingly, consumers are willing to pay premium prices for IC meat and eggs (Bett et al., 2019). It can be concluded, then, that while there are IC markets, IC production among smallholder farmers is low. The production of IC is primarily undertaken as a free range system by smallholder farmers who are resource constrained (Aboki et al. 2022). This production system involves allowing IC an outdoor range, which exposes them to contaminated feeds and it is potential sources of disease for IC. In addition, smallholder farmers will experience losses of IC to predators and missed eggs which have not been collected in open fields. Disease transmission in non-intensive poultry types is common in the free-range system as IC exhibit frequent interactions and may result in flock loss (Yitbarek et al. 2022).

IC farmers are facing restricted access to quality inputs for production and rely on improvised technology or in many cases do not utilize technology in their production systems (Awuni, 2022; FAO, ECTAD, 2019). The inputs include access to veterinary services and sufficient number of IC chicks, farmers accessed during government provision of extension services before privatization. The effect is that IC farmers have insufficient skills on the production of IC for commercial gain, thereby limiting most smallholder farms on subsistence production (Hossen, 2020). Furthermore, these smallholder farmers also have found it difficult to be competitive compared to exotic chicken producers who have a commercialized operation of IC production (Menge et al., 2021; FAO, -2018; King'ori et al., 2020). This intermittent production means that few of the smallholders can continually supply IC to the urban and peri urban markets

in Kenya (Kahi et al., 2018; Kandia, & Kitalyi, 2018). Additionally, IC farmers are also suffering losses of IC from diseases and injuries sustained during transportation to the more distant urban markets (Bwalya & Thomson, 2019).

2.4 Indigenous chicken husbandry and other agricultural production practices by smallholder farmers

Indigenous chicken husbandry and other agricultural production practices by smallholder farmers play a crucial role in ensuring food security, poverty reduction, and sustainable development in many regions (Aboki et al., 2022). These practices involve a combination of traditional knowledge and improved techniques to enhance productivity and income for smallholder farmers. Smallholder farmers often engage in selective breeding to improve the genetic characteristics of indigenous chicken breeds. They identify and prioritize desirable traits such as disease resistance, growth rate, egg production, and mothering ability. This practice helps in maintaining locally adapted breeds and improving their performance over generations. Smallholder farmers provide basic housing and shelter facilities for their indigenous chickens. These structures can range from simple backyard coops to more elaborate designs that protect the chickens from predators, adverse weather conditions, and diseases. Farmers use locally available materials to construct these shelters (Reta 2019; Moreki et al. 2020).

Indigenous chickens are typically scavengers and are known for their ability to forage and find food on their own. Smallholder farmers supplement their diet with locally available feed resources such as kitchen scraps, agricultural by-products, and grains. Proper nutrition is essential for the growth, health, and productivity of the chickens (Magothe et al., 2021). Smallholder farmers employ various disease prevention and management practices to protect their indigenous chickens. This includes regular vaccination, deworming, and quarantine measures to prevent the spread of diseases. Farmers also use herbal remedies and traditional practices to address common ailments. Smallholder farmers allow indigenous chickens to breed naturally, and they manage the mating process to ensure genetic diversity. Some farmers practice controlled breeding by selectively pairing chickens with desired traits. They also provide nesting areas for hens to lay eggs and incubate them naturally or using simple methods like broody hens (Kidanemariam et al., 2022).

Smallholder farmers often practice mixed farming, combining indigenous chicken husbandry with crop cultivation. They grow a variety of crops such as maize, beans, vegetables, and fruits for household consumption and sale (Aboki et al., 2022). Crop residues also serve as valuable feed resources for the chickens. Smallholder farmers integrate trees, crops, and livestock in their farming systems through agroforestry practices. They plant trees on their farms, which provide shade, fodder, and additional sources of income through timber and non-timber forest products. Agroforestry enhances soil fertility, biodiversity, and resilience to climate change.

Smallholder farmers employ various water management techniques to ensure a steady supply for their agricultural activities. This includes rainwater harvesting, construction of small ponds or tanks, and efficient irrigation methods such as drip irrigation or water-conserving techniques. Smallholder farmers implement soil conservation practices to prevent soil erosion and maintain soil fertility. These practices include terracing, contour plowing, cover cropping, and organic matter incorporation (Aboki et al., 2022). Conservation agriculture techniques promote sustainable land management and enhance agricultural productivity. Smallholder farmers often diversify their agricultural activities to reduce risks and enhance income. They may engage in beekeeping, dairy farming, small-scale processing, or other income-generating activities that complement their indigenous chicken husbandry and crop cultivation (Reta 2019; Moreki et al. 2020).

2.5 Accessibility of the chicken market and the levels of adoption of improved indigenous chicken

The accessibility of the chicken market and the levels of adoption of improved indigenous chicken can significantly impact the socio-economic outcomes of smallholder farmers. The geographic proximity of smallholder farmers to the chicken market is a crucial factor in determining their access to buyers and consumers (Magothe et al., 2021). Farmers located closer to urban areas or major transport routes may have better market access, as they can easily transport their chickens to buyers or wholesale markets. In contrast, farmers in remote or rural areas may face challenges in reaching the market, resulting in limited selling opportunities. Adequate infrastructure and transportation facilities play a key role in improving market access

for smallholder farmers (Aboki et al., 2022). Well-maintained roads, storage facilities, and cold chain infrastructure enable farmers to transport their chickens safely and maintain product quality. Lack of proper infrastructure can lead to higher transportation costs, longer travel times, and increased post-harvest losses, affecting farmers' profitability. Access to timely and accurate market information is crucial for smallholder farmers to make informed decisions about when, where, and how to sell their chickens. Information on current market prices, demand trends, and consumer preferences allows farmers to plan their production and marketing strategies effectively. Reliable sources of market information, such as agricultural extension services, mobile applications, and farmer networks, can empower farmers and improve their market access (Reta 2019; Moreki et al. 2020).

The level of adoption of improved indigenous chicken practices depends on the awareness and knowledge of smallholder farmers regarding the benefits and availability of improved technologies (Kidanemariam et al., 2022). Awareness campaigns, training programs, and farmer-to-farmer knowledge sharing can help disseminate information about improved chicken breeds, housing, feeding, and disease management practices (Magothe et al., 2021). Access to agricultural extension services and research institutions can also play a vital role in promoting adoption. The availability and affordability of inputs required for improved indigenous chicken production influence the adoption rates. This includes access to improved chicken breeds, quality feed, vaccines, medicines, and other necessary inputs (Aboki et al., 2022). If these inputs are not readily available or are prohibitively expensive, smallholder farmers may face challenges in adopting improved practices.

Capacity-building initiatives and support services are crucial in promoting the adoption of improved indigenous chicken practices. Training programs on improved husbandry practices, entrepreneurship, record-keeping, and market linkages can enhance farmers' skills and confidence (Reta 2019; Moreki et al. 2020). Access to credit, input subsidies, and technical assistance can further encourage farmers to adopt improved practices by reducing the financial and knowledge barriers. Socioeconomic factors such as household income, land ownership, and social networks can influence the adoption of improved indigenous chicken (Aboki et al., 2022). Farmers with higher incomes and

larger landholdings may have more resources to invest in improved practices. Additionally, the presence of strong social networks and farmer organizations can facilitate knowledge sharing and peer learning, encouraging the adoption of improved practices (Magothe et al., 2021).

2.6 Potential of improved indigenous chicken husbandry as a poverty reduction intervention in a climate-changing environment

Poultry can be a useful tool for food security and livelihood significance, largely in poor countries, for several reasons. Village poultry has not only a high share of the meat supply in developing countries but is also a common traditional activity in most of these countries (Sodjinou 2019). Indeed, more than 80% of the world's poultry population is found in traditional family-based poultry production systems and contributes up to 90% in some countries to poultry products (Alabi & Aruna 2017; Sodjinou 2019). When landless people are many or people who have very limited formal skills to practice and participate in other income-generating activities, village poultry production creates a substantial role in income generation and poverty alleviation (Aklilu et al. 2018; Sodjinou, 2019). A study in Mozambique demonstrated village poultry's contribution to the local economy and their potential to improve food security, help alleviate poverty, and mitigate HIV/AIDS's negative economic impacts among rural populations (Harun and Massango 2019; Alders et al. 2017; Sodjinou 2019).

A study of Alders and Pym (2019) on village poultry - still important to millions - 8,000 years after domestication supports the fact that households that are experiencing a shortage of able-bodied workers, such as those affected by HIV/AIDS or households that have a disabled family member, village poultry provide a source of high-quality protein and income without requiring much in the way of labor or financial inputs. Poultry projects have been successful in South Africa and Swaziland in terms of assisting families affected by HIV/AIDS (Alders 2019). Alders et al. (2017) also mentioned the fact that since sick people are cared for by women, chickens play a significant role in providing substantial additional resources to support households affected by HIV/AIDS. In most developing countries, among poor households, village chickens play a major role in the improvement of households' food security and

poverty alleviation (Adongo 2019; Moreki et al. 2020). Village poultry provides the owners of the chicken with nutritional and economic benefits with very minimal use of inputs or without any inputs. They provide their owners with economic and nutritional benefits with little or no input (Reta 2019; Moreki et al. 2020). The village poultry provides a source of high-quality eggs and meat which provides high-quality protein to many rural households (Aganga et al. 2020; Aklilu et al. 2017, Alders et al. 2017; Moreki et al. 2020).

In particular, eggs are an important source of nutrition and quality protein and supply various vitamins stored for days under village conditions (Moreki et al. 2020). In areas where most farmers produce only energy-giving food crops, livestock, particularly chickens are the major source of proteins available to households (Muchadeyi et al. 2019). Iron and vitamin A deficiencies, the most commonly scarce nutrients for both adults and children, can be easily obtained from poultry eggs and meat (Piwoz and Preble 2020; Moreki et al. 2020). Even in some areas of Africa, farmers were able to secure their food base from chickens through the provision of meat and eggs (Muchadeyi et al. 2019).

In most economies of the developing countries, poultry cannot be overemphasized because it has become the main enterprise for the smallholder farmers that have a great contribution to the economy of these countries (Adebayo & Adeola 2021). The authors mentioned that in Nigeria, poultry has great importance in providing job opportunities and improving animal food production. A study by Okonkwo and Akubuo (2019) noted that about 10% of the Nigerian population are involved in poultry production, mostly on subsistence and small or medium-sized farms. However, studies on socio-economic factors affecting poultry farmers in Nigeria showed that it needs national support especially in finance and input for substantial improvement in contribution of the poultry industry to household food production and improving the economic wellbeing of the poor farmers (Adebayo and Adeola 2021).

They provide readily harvestable animal protein to rural households and in some parts of Africa; chicken production is important to fulfill the obligation of hospitality to guests. According to Hailemichael et al. (2016), in a study on the characterization of

smallholder poultry production and marketing system in some parts of Ethiopia, there are fewer religious or social taboos associated with poultry keeping and consumption and it has symbolic importance within the context of socio-cultural and religious functions. For example, in northern Ethiopia, poultry are used for strengthening marriage partnerships.

According to Aklilu et al. (2018) in the local culture, particularly in remote areas, women who can provide men with food like the Ethiopian chicken stew (doro wot) are considered to contribute to a stable marriage. Serving doro wot is also a demonstration of respect to guests (e.g., in-laws), thus strengthening social relationships which is especially important for poor households (Aklilu et al. 2018). In Zimbabwe, the chosen taste of chicken meat is made available and reserved for special guests or at ceremonial gatherings (i.e. marriage feast, weddings, or funerals) (Muchadeyi et al. 2019).

In Kenya, chickens are useful in several social, cultural, and spiritual activities such as entertainment, gifts, funeral rites, and spiritual cleansing (Njenga 2021; Magothe et al. 2018). Chicken production helps the smallholders in generating incomes, as a source of gifts, can be used in religious sacrifices, and provides off-farm employment (Sonaiya 2020; Dessie and Ogle 2019; Guèye 2022). Jacques (2018) in his study on the contribution of poultry farming to the socio-economic development of Rwandan rural areas, supports the literature that village poultry are significant for their nutritional and/or economic value, and also play a significant role in society through their contribution to the cultural and social life of rural people. The serving of a chicken dish is often - in many parts of Africa - a way of welcoming high-status visitors or honoring affinity and kinship (Jacques 2018). Village poultry is a useful tool for helping poor rural households recover from disasters and provides a practical and effective first step towards alleviating abject rural poverty (Sodjinou 2019).

Studies indicated that the role of poultry in the overall economy of the nations and its importance in strengthening the income and nutritional status of many landless and smallholder farmers has been well recognized in the last decades (Kitalyi 1998). However, due to the lack of measurable indicators demonstrating the contribution of the rural poultry in the national economy, made the sector a low priority (Dolberg,

2022; Dolberg 2017; Hailemichael et al., 2016). A study by Mengesha (2022) in Ethiopia on the biophysical and the socioeconomics of chicken production reviewed the socio-economics of poultry production to deliver summarized and synthesized information for the beneficiaries. Mengesha (2022), in his study, mentioned that poultry production and consumption are progressively growing in the world and it accounts for about 33% of global meat consumption and is expected to grow at 2–3% per year in the world.

The same author indicated that even though there exists a prediction which favors the intensification of poultry production in many developing countries, village poultry is still a profitable business, which has no market problem and plays a key role in alleviating poverty. It is universally known that family poultry is an entry point to address the problems of malnutrition, food insecurity and poverty for the rural poor (Nchinda et al., 2019). Particularly Gawande et al., (2017), Dei et al., (2019) and Nchinda et al., (2019) argued that family poultry is a profitable venture. Thus, poultry is considered as a tool for improving livelihoods and alleviating poverty (Fasina et al., 2017; Kamaldeep et al., 2017). This indicated that the support in promoting family chicken husbandry was meant to improve the livelihood of the poor smallholder farmers.

Climate change has resulted in increased arid land areas and altered systems of production used in agriculture within the world, which in turn affects smallholder livelihoods. Livestock production has been adopted in most arid areas as a coping mechanism and as a source of income and food security in arid lands. Therefore, most households in arid and semiarid lands rear indigenous livestock breeds including cattle, camel, donkeys, and poultry. However, crop production in these lands is constrained by water scarcity and resource constraints among smallholders, which leads most households to adopt livestock for food security, income, draught power, and insurance. Moreover, IC forms the ground for the acquisition of other herds of livestock for the resource-poor households (Moreki & Dikeme, 2019). Indigenous chicken is preferred in most of the households in the arid and semi-arid areas in developing countries like Kenya. Smallholder farmers prefer IC to other types of chicken due to disease

resistance, adoptability to arid climates, their ability to utilize low-quality feeds, and diverse IC markets (Mengesha, 2018).

Further, IC is hardy, good adapters, and survives well in harsh conditions of feed fluctuations with a low cost of production, King'ori et al., 2020. Hence, the production of IC is mainly done for subsistence use by smallholder farmers and a few commercial producers who have adopted IIC, Okello et al., 2020. On the other hand, the production of exotic chicken is mainly commercial with large scale production and good market links, Kandia & Kitalyi, 2018. Erratic climate changes have exacerbated food security in Africa at large and particularly in Kenya, where households in arid and semi-arid lands are exposed to food insecurity, GOK, 2017.

Consequently, the ecological conditions surrounding most of the smallholder farmers hinder optimal or maximum production from arid and semi-arid lands Aboki et al., 2022. Smallholders in the Arid and Semi-Arid Lands (ASALs) may require coping mechanisms, such as irrigation facilities or adoption of improved chicken breeds, to increase production Adomako et al., 2020. Consequently, the adoption of improved crop variety and animal breeds is expected to result in improved incomes and food security in households Kummar et al., 2022. However, most of these smallholder farmers have not yet adopted the IIC, which is adaptable to ASAL areas with higher production compared to the IC.

2.7 Theoretical Framework

In traditional market theory, producers' decisions to participate in a market are based on the binary utility maximization model, which assumes a competitive market with full information and rational decision-makers. In this study, however, market participation by indigenous chicken (IC) farmers occurs in transient and imperfect markets, characterized by asymmetric information, limited access, and price volatility. These conditions necessitate a departure from pure market theory and the adoption of Behavioral Economics and Institutional Economics perspectives.

These theories account for market imperfections and the influence of informal norms, institutions, and social networks on decision-making. According to Deb et al., (2017), the stochastic utility model can still apply, but the utility function must incorporate constraints such as access barriers, risk perception, and transaction costs. The decision to sell in a specific market channel, therefore, is not purely based on price maximization, but on risk aversion, trust in buyers, and social embeddedness. This expanded theoretical lens better reflects the context of Keiyo North Sub-County, where transient markets dominate and farmers often make trade-offs between accessibility, reliability, and returns.

Principal Component Analysis (PCA) is a statistical technique used to reduce the dimensionality of a large dataset while retaining the most important information. It helps in identifying patterns and relationships within the data by transforming the variables into a new set of uncorrelated variables called principal components.

2.8 Conceptual framework

Figure 2.1 shows the conceptual framework for this study. It shows the relationship between the dependent variables and independent variables.

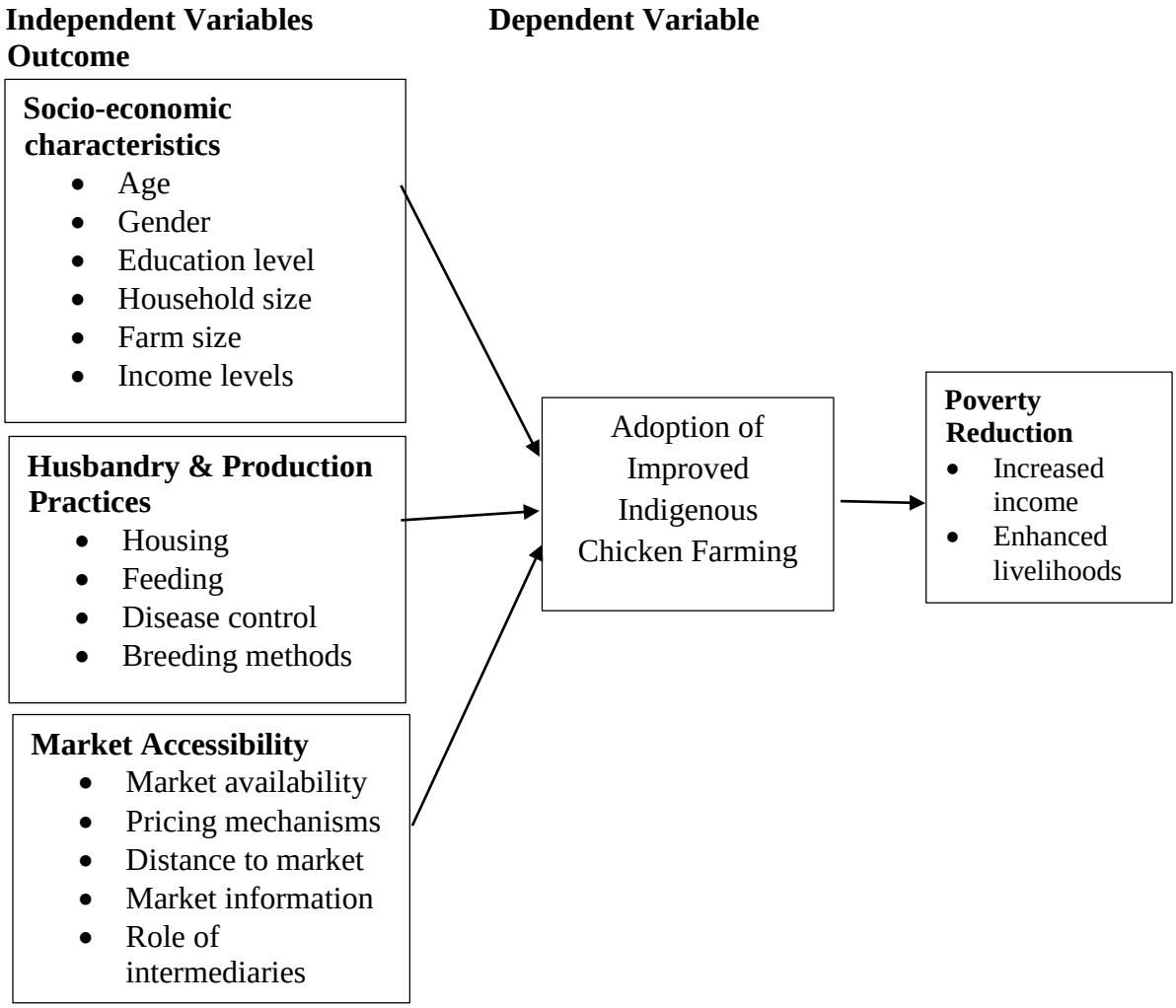

Figure 2.1 Conceptual framework

Source: Researcher (2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology that was adopted in the study. It explains the research design, study area, target population, sample size and sampling procedures, data collection instruments, data collection procedures, and data analysis procedures.

3.2 Study Area

Elgeyo Marakwet County lies in Kenya's former Rift Valley Province, covering approximately 3,029.8 square kilometers. The county is predominantly rural, where agriculture - crop and livestock farming - forms the backbone of livelihoods for most residents. The county has four sub-counties: Marakwet East, Marakwet West, Keiyo South, and Keiyo North. Keiyo North is the smallest in area (~541 km²) but has among the highest population densities in the county - about 168 persons per km² as per the 2019 census (Figure 3.1). Population growth is estimated at around 2.7-2.8% annually. The average household size is about 5 members. Nearly half of the county's population lives below the national poverty line (57%), which exceeds Kenya's average (46%). Poverty is particularly severe in the Kerio Valley and Escarpment zones (up to ~67%), while the Highlands fare better (~47%) though still below national ideals. Topographically, the county is divided into three agro-ecological zones: Highlands (approx. 2,700–3,350 m asl, reliable rainfall between 1,200-1,500 mm/year), the Escarpment zone, and the Kerio Valley (lower altitude, hotter climates, rainfall 1,000-1,400 mm/year). Within Keiyo North, the Highlands correspond to wards such as Kamariny and Lelmokwo/Ngechek; the midland or Escarpment include parts of Kapchemutwa and Emsoo; the lowland or Kerio Valley zone covers Sambirir and Kapchemutwa wards.

Regarding agricultural production: in the Highlands, staple crops such as potatoes, maize, wheat, beans, and horticultural produce thrive due to fertile soil and cooler climate. Areas with tea growing are less common in Keiyo North but feature elsewhere in the county. In the Kerio Valley and Escarpment, agriculture is more marginal, with

maize, sorghum, and drought-tolerant legumes dominating; livestock - cattle, goats, sheep - and poultry are more important. Beekeeping also contributes in some highland zones. Poultry (including indigenous and improved indigenous chicken) is practiced across all zones. Food insecurity is significant, especially in the Kerio Valley and Escarpment. Over 100,000 people in Elgeyo Marakwet were reported to face starvation during a recent drought in the lowland wards (e.g. Emsoo, Sambirir) due to failed harvests and water scarcity. Malnutrition indicators are high; for example, stunting, underweight, and poor dietary diversity are concerns, particularly among children under five. Keiyo North was selected as the focus of this study because it exhibits high population density, diverse agro-ecological zones, both favourable and marginal farming areas, and a mix of access to infrastructure and market potentials. Its topographic variation offers natural contrasts for analysing how improved indigenous chicken adoption and market access differ across environments.

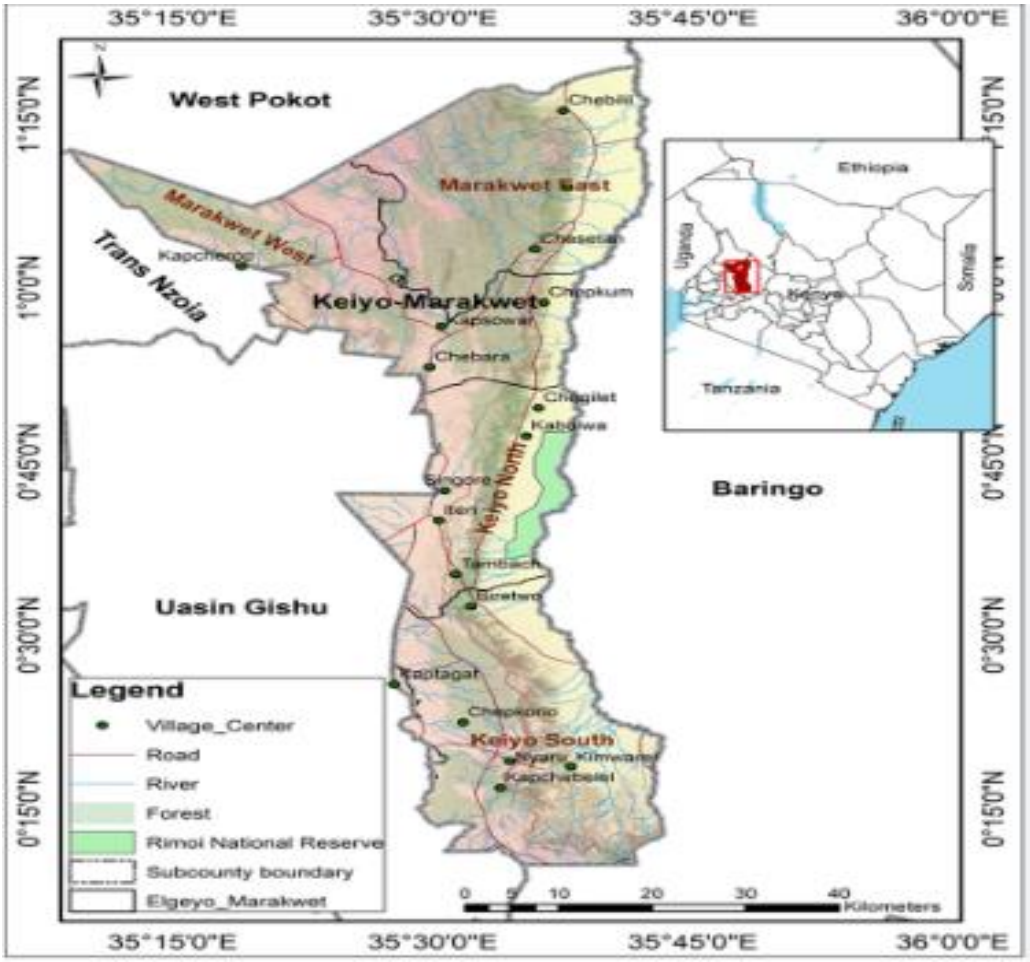

Figure 3.1 Map of Study Area

3.3 Research design

This study employed a cross-sectional survey design. This design was appropriate for this study because it enabled the researcher to collect data in a single period without manipulating the environment. It also enabled the researcher to describe, analyze, and interpret the variables under study more appropriately. This was also the most efficient design that a researcher uses to easily obtain the data using an interview schedule (Sedgwick, 2019). Since this study aimed to evaluate the accessibility of transient markets by improved indigenous chicken smallholder farmers, collecting data from a large sample size efficiently was crucial. Conducting a cross-sectional survey enabled the researcher to gather information from different farmers in a single period, thus saving time and resources compared to the longitudinal designs. As the study focused on evaluating the accessibility of transient markets, a cross-sectional survey design was cost-effective. It eliminated the need for long-term follow-up, which could have been expensive and resource-intensive. By collecting data at one point in time, the researcher obtained valuable insights into the current state of the market accessibility and its relationship with the adoption of improved indigenous chicken.

3.4 Target Population

The target population of this study was smallholder indigenous chicken farmers from the three topographic zones in the Keiyo-North Sub-County.

Table 3.1 Target Population

Topographical region	Target Population
Highlands	253
Escarpment/hanging valley	319
Kerio Valley	244
Total	**816**

Source: Ministry of Agriculture – Elgeiyo Marakwet County (2023)

3.5 Sample Size and Sampling Procedures

The sample size for households was calculated using statistical formulae provided by Role (2022);

$$n = \frac{N}{1 + Ne^2}$$

n = sample size

N = population size = 816

E = margin of error (e=0.05)

Sample size = 371

Therefore, the sample size for the survey was 371 smallholder indigenous chicken farmers.

Table 3.2 Sample Size

Topographical region	**Target Population**	Procedure	Sample size
Highlands	253	253/816*371	115
Escarpment/hanging valley	319	319/816*371	145
Kerio Valley	244	244/816*371	111
Total	**816**		**371**

Source: Ministry of Agriculture – Elgeiyo Marakwet County (2023)

To ensure representativeness across agro-ecological zones, proportionate stratified sampling was used. The population was stratified into three topographical zones: the Highlands, Escarpment/Hanging Valley, and Kerio Valley. The sample for each stratum was proportionally allocated based on the population size in each zone (Table 3.2). This approach ensured equitable representation of smallholder farmers based on the agro-ecological diversity and varying levels of IC adoption and production conditions across the zones. After stratification, systematic random sampling was used to select individual farmers from each zone. The sampling frame (list of registered smallholder indigenous chicken farmers) was obtained from sub-county agricultural

extension offices and ward agricultural officers. A sampling interval was computed for each zone, and every nth farmer was selected after a random start.

3.6 Data collection instruments

Structured questionnaires were used to collect data from smallholder indigenous chicken farmers. This tool was chosen because it allowed for the systematic collection of comparable data from a large number of respondents, making analysis more straightforward. Questionnaires offer a cost-effective and time-efficient means of gathering information, particularly when administered in the field by trained enumerators (Brick, 2016). The structured format ensured that all respondents were asked the same questions in the same order, enhancing data reliability and minimizing interviewer bias. Additionally, questionnaires facilitate the collection of both quantitative and qualitative information within a single instrument. The design incorporated mostly closed-ended questions for ease of coding and analysis, along with a few open-ended questions to capture additional insights from the farmers. Questionnaires also offered a degree of privacy, as respondents could share their perspectives in a structured and non-intimidating setting, which encouraged more accurate responses on sensitive topics such as income and market challenges.

3.7 Data Collection Procedure

Trained enumerators administered the questionnaires to the selected farmers through face-to-face interviews. Before starting, enumerators explained the purpose of the study and obtained informed consent from each participant. Data collection visits were conducted at farmers' households or farms at prearranged times to minimize disruption to their daily activities. The enumerators read the questions aloud, recorded the farmers' responses, and clarified any questions when necessary to ensure accuracy and completeness. To maintain data quality, enumerators underwent training on questionnaire administration, ethical considerations, and respondent engagement. Regular supervision and spot checks were carried out during fieldwork to ensure adherence to protocols. After collection, completed questionnaires were checked for errors or missing responses before being entered into a data management system. Data cleaning procedures were then undertaken to correct any inconsistencies, detect

outliers, and prepare the dataset for analysis. Data collection period covered between April and May, 2025.

3.8 Data Analysis

Once the data had been collected and cleaned, the following steps were followed for data analysis: The socio-economic characteristics of the improved indigenous chicken smallholder farmers was analyzed using descriptive statistics such as frequency distributions, means, and percentages. This helped characterize the farmers in terms of their demographic and economic attributes. The data collected on indigenous chicken husbandry practices and other agricultural production practices was analyzed to identify similarities and differences among the three topographic zones. This analysis involved comparing means, proportions, or frequencies using appropriate statistical tests. The accessibility of the chicken market and the levels of adoption of improved indigenous chicken was analyzed to determine the relationship between them. This analysis involved correlation analysis or regression analysis to assess the strength and direction of the relationship.

The potential of improved indigenous chicken husbandry as a poverty reduction intervention was evaluated by assessing its impact on the socio-economic status of the farmers. This involved comparing the income levels or poverty indicators of farmers practicing improved indigenous chicken husbandry with those who do not. The findings from the data analysis were interpreted and discussed in light of the study objectives. Conclusions were drawn regarding the accessibility of the transient markets by improved indigenous chicken smallholder farmers in the Keiyo-North Sub-County and the potential of improved indigenous chicken husbandry as a poverty reduction intervention in a climate-changing environment. Principal Component Analysis (PCA) is a multivariate statistical technique used to reduce a large set of correlated variables into a smaller set of uncorrelated components, while retaining most of the variation present in the original dataset (Jolliffe & Cadima, 2016). In this study, PCA was applied to socio-economic characteristics and husbandry practices of smallholder indigenous chicken farmers to identify the most influential factors underlying variations in production and market access. By summarizing the data into principal

components, the method provided a clearer understanding of patterns and interrelationships that may not have been revealed through descriptive statistics alone. PCA was chosen because it simplifies data analysis by addressing multicollinearity among variables, improves interpretability, and highlights the variables that contribute most to differences among farmers. This is particularly useful in agricultural socio-economic studies where numerous interrelated variables - such as education, household size, years of farming experience, market access, and production practices - can complicate direct analysis

CHAPTER FOUR

RESULTS PRESENTATION

4.1 Introduction

This chapter presents the findings of the study based on data collected through a structured questionnaire administered to smallholder indigenous chicken farmers across the three topographic zones in Keiyo North Sub-County. The results are organized in accordance with the study objectives and research questions. The first section presents descriptive statistics, particularly respondents' socio-economic characteristics, while the second section discusses the inferential statistical findings relating to the research objectives.

4.2 Descriptive Statistics

This section outlines the descriptive statistics of the respondents' socio-economic characteristics. The variables analyzed include gender, relationship with the household head, age, education level, employment status, household size, and sources of household income and expenditure.

4.2.1 Questionnaire Return Rate

A total of 371 questionnaires were administered to smallholder indigenous chicken farmers from the three topographic zones in the Keiyo-North Sub-County and a total of 357 questionnaires were returned. The return rate therefore translated to 96.2 percent.

4.2.2 Response by Gender

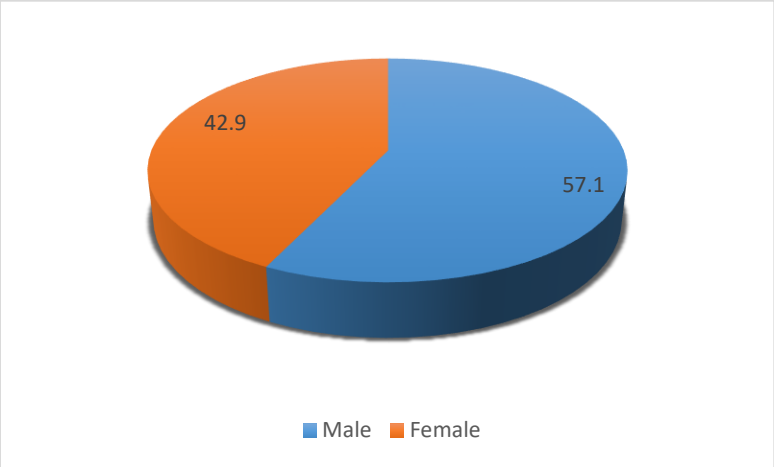

Figure 4.1: Distribution of Respondents by Gender

Out of the 357 respondents, 204 (57.1%) were male, while 153 (42.9%) were female (Figure 4.1). While men tend to dominate in strategic decision-making and external marketing, women are more engaged in daily husbandry tasks, such as feeding, egg collection, and brooding. The involvement of both genders highlights the inclusive nature of poultry farming and underscores the need for gender-sensitive interventions. Policies and training programs should therefore consider the differentiated roles played by men and women to improve productivity and ensure equitable benefits from indigenous chicken production.

4.2.3 Relationship with Household Head

Table 4.1: Relationship with Household Head

Relationship	Frequency	Proportion (%)
Household Head	242	67.8
Spouse	73	20.4
Other Family Members	42	11.8
Total	357	100.0

Among the 357 respondents, 242 (68%) identified as household heads, while 73 (20.4%) were spouses, and 42 (12%) were other family members, such as adult children or dependents (Table 4.1). This distribution showed that a significant proportion of the responses were drawn from individuals directly responsible for

household-level decision-making. The high number of household heads as respondents enhances the reliability of the information collected on income allocation, farming strategies, and market access. Moreover, the inclusion of spouses and other family members enriched the data by reflecting the collaborative and shared responsibilities in poultry production. These findings support the view that poultry farming is a household enterprise rather than an individual activity.

4.2.4 Household Head Gender and Year of Birth

Out of the 357 households surveyed, 258 (72%) of household heads were male, while 99 (28%) were female (Table 4.2). The average year of birth was 1975, corresponding to an average age of 49 years. This age profile suggests that indigenous chicken farming in the region is primarily practiced by mature and experienced individuals. These farmers are likely to possess accumulated traditional knowledge on poultry husbandry. However, their age may pose challenges in adapting to new technologies or digital marketing channels. The gender imbalance also points to structural inequalities, with women often playing supportive roles rather than being primary decision-makers.

Table 4.2 Gender and Year of Birth of Household Heads

Household Head Gender	Frequency		Proportion (%)	
Male	258		72.3	
Female	99		27.7	
Total	357		100.0	
Year of Birth (Avg.)	Age (Avg.)	SD	Min	Max
1975	49 years	7.3	1955	1990

4.2.5 Years in Farming and Education Level

Respondents reported an average of 18 years of experience in farming. In terms of education, 98 (28%) had no formal education, 112 (31.4%) had primary education, 96 (27%) had secondary education, and 51 (14%) had attained tertiary education (college/university) (Table 4.3). These results reveal a relatively well-experienced but moderately educated farming population.

Table 4.3 Years in Farming and Education Level of Respondents

Education Level	Percentage (%)
No Formal Education	27.5
Primary Education	31.4
Secondary Education	26.9
Tertiary (College/University)	14.3
Total	100

4.2.6 Employment Status and Sector

Of the 357 respondents, 108 (30%) were formally employed, while 249 (70%) were not. Among those employed, 67 (62%) worked in the public sector and 41 (38%) in the private sector (Table 4.4). The average commuting distance to their workplace was 6.3 kilometers. Formal employment provided supplementary income for some households, enabling them to invest in poultry production inputs such as feeds, vaccination, and improved housing. However, long working hours and distances might reduce available time for direct involvement in daily poultry activities. On the other hand, the majority of respondents who are not formally employed depend fully on farming and off-farm activities, making poultry farming a critical component of their livelihood.

Table 4.4: Employment Status of Respondents

Employment Status	Frequency	Proportion (%)
Formally Employed	108	30
Not Formally Employed	249	70
Total	357	100.0

4.2.7 Household Size and Composition

The average household size was 6.2 members. Among these, children below school age averaged 1.3, those in primary school were 2.1, in secondary school 1.4, and in

college/university 0.7. Other household members such as relatives or dependents averaged 0.7. These numbers reflect a typical rural family structure in Kenya, where households are relatively large and often multi-generational. Larger household sizes can be advantageous for poultry production due to available labor for day-to-day tasks. However, high dependency ratios also imply more financial pressure on food, education, and healthcare, possibly limiting the funds available for reinvestment in poultry or other agricultural ventures. Family size thus significantly shapes household economic strategies.

4.2.8 Household Expenditure

The average weekly household expenditure was KES 3,950, while the estimated annual expenditure was KES 205,400. Weekly expenditure primarily covered food, transport, and small household needs, whereas annual spending included school fees, farming inputs, and medical costs. These figures indicate a modest but active economic lifestyle among rural households. Households with higher expenditure levels may have greater purchasing power to invest in improved indigenous chicken breeds, veterinary care, and access distant markets. Conversely, those with lower expenditure levels might rely on traditional methods and local markets.

4.2.9 Sources of Household Income

Households reported that income sources were distributed as follows: Agriculture (53%), Off-farm business (19%), Formal employment (17%), and other family support or remittances (11%). This distribution indicates that agriculture remains the primary source of livelihood in Keiyo North Sub-County, especially indigenous chicken farming. Off-farm business ventures such as kiosks or boda-boda services offer supplementary income, while formal employment provides stability for a smaller group. Remittances, though less frequent, act as a safety net. This diversified income portfolio reflects resilience strategies employed by rural households, though it also points to the need for strengthening agriculture through better extension services, financial access, and improved market connectivity.

4.2.10 Household Spending Patterns

Respondents reported that average annual household spending was: KES 63,800 on agriculture, KES 76,200 on education, and KES 65,400 on other needs such as healthcare, housing, and transport. These patterns suggest that education is a top priority for rural households, followed closely by agricultural investment. High spending on education implies aspirations for upward mobility and a better future for children. Agricultural spending reflects the importance of farming, including indigenous chicken rearing, as a livelihood source. Spending on health and other needs also highlights the financial burden rural households are facing.

4.2.11 Socio-Economic Characteristics of Respondents

The study involved 357 respondents from Keiyo North Sub-County engaged in improved indigenous chicken farming. The majority were male (57.1%), while females comprised 42.9%, highlighting active participation of both genders in poultry farming, although their roles differed across the value chain. A total of 242 respondents (67.8%) were household heads, with spouses and other family members making up the rest, reflecting the household-based nature of poultry farming. This indicates that mature, experienced individuals dominate indigenous chicken production. Respondents had an average of 18 years in farming, suggesting significant practical knowledge. However, education levels varied, with 27.5% having no formal education, 31.4% attaining primary education, 26.9% secondary, and 14.3% tertiary education. This pattern shows a moderately educated farming population with potential challenges in adopting digital tools or modern poultry practices.

In terms of employment, 30.3% were formally employed, mostly in the public sector (62%), while 69.7% depended entirely on farming and informal sources. Among the employed, the average distance to the workplace was 6.3 kilometers, which could affect their ability to manage daily poultry operations. These characteristics reflected a population that was demographically diverse, relatively experienced in farming, but constrained by varying education levels and limited formal employment opportunities.

Table 4.5: Comparative Socio-Economic Characteristics

Category	Subgroup	Mean Age	Mean Years in Farming	% with Tertiary Education	% Formally Employed
Topographic Area	Escarpment	52	21	12%	25%
	Highland	48	18	18%	35%
	Valley	46	14	11%	31%
Gender of HH Head	Male	50	19	44%	35%
	Female	47	16	31%	18%
Education Level	No Formal Education	52	20	0%	12%
	Primary Education	49	18	0%	26%
	Secondary Education	47	17	0%	33%
	Tertiary (College/University)	45	15	100%	60%
Distance from Tarmac	Less than 2 km	45	15	22%	42%
	Between 2–5 km	48	18	14%	29%
	More than 5 km	52	20	9%	20%

Across topographic zones, farmers in the escarpment were older and more experienced (mean age 52, farming experience 21 years) compared to those in the highland and valley areas. However, tertiary education and formal employment were more prevalent in the highland zone, suggesting better access to education and job opportunities. In terms of gender, male-headed households were generally older, more experienced in farming, and had a higher share of tertiary education and formal employment than female-headed households, reflecting underlying gender disparities in access to resources and opportunities. Educational attainment strongly correlated with socio-economic outcomes. Respondents with tertiary education were younger, less experienced in farming, but much more likely to be formally employed (60%). Conversely, those without formal education were older, more experienced in farming, and less likely to access formal jobs. Proximity to tarmac roads significantly influences socio-economic status. Households closer to roads (<2 km) tend to have younger members, higher education levels, and more formal employment. This indicates the role of infrastructure in facilitating access to schools, markets, and employment. These

findings point to structural inequalities that must be considered in planning interventions. Policymakers should adopt area-specific, gender-sensitive, and education-aware strategies to enhance inclusivity and productivity in indigenous poultry farming.

4.3 Chicken Rearing Information

Out of the 357 respondents, 317 (89%) reported having reared chickens at some point, while 40 (11.2%) had never practiced poultry farming. Among those who had reared chickens, 291 (92.0%) were currently involved in chicken rearing, while 26 (8.0%) had discontinued. For those no longer rearing chickens, the most cited reasons included lack of capital, disease outbreaks, theft, and predation. Among the 40 respondents who had never reared chickens, 14 (35%) reported prior attempts that were unsuccessful, with the highest number of chickens ever owned ranging from 5 to 80 birds. The remaining 26 (65%) had never considered poultry farming due to lack of interest, limited space, or competing income-generating activities (Table 4.6).

Table 4.6 Chicken Rearing Information

Question/Response	Percentage (%)
1. Ever reared chicken	
Yes	89.0%
No	11.0%
If YES, currently rearing chickens	
Yes	92.0%
No	8.0%
2. If NO to Q1, ever reared chickens in the past	
Yes	35.0%
No	65.0%
3. Highest number of chickens ever owned	—
4. Reasons for not currently rearing chickens (n = 26)	
Lack of capital	35.0%
Disease outbreak	23.0%
Predation/Theft	19.0%
Lack of interest	23.0%
5. Reasons for never considering chicken farming (n = 26)	
Lack of space	31.0%
No interest	39.0%
Other income activities preferred	31.0%

Chicken rearing participation varied significantly across gender, education levels, and topographic zones. Male respondents were more likely to be actively involved in poultry farming, while women, despite managing daily husbandry tasks, reported higher dropout rates due to limited access to capital and competing responsibilities. Farmers in highland areas had the highest continuity rates, benefiting from better infrastructure and veterinary services, while those in the valley faced challenges like predation and disease outbreaks. Education also played a key role, with tertiary-educated farmers more likely to treat poultry as a business, manage risks effectively, and recover from setbacks. Among the 40 non-rearers, previous failures, lack of space, disinterest, and competing activities were cited. These patterns suggest that gender-sensitive, education-focused, and location-specific interventions are essential to enhance sustainable participation in poultry farming across Keiyo North Sub-County.

A key factor in improving information exchange, knowledge sharing, and involvement among agricultural stakeholders is the implementation of improved indigenous chicken (IIC) practices. Effective communication affects not only awareness and learning but also the adoption of new technologies and market integration in rural development contexts, especially in smallholder farming systems. Despite its significance, the degree of IIC approach adoption is still uneven and is primarily influenced by the socioeconomic traits of farmers and the institutional support systems in place. Designing focused interventions that support fair information distribution and innovation diffusion thus requires an understanding of the factors that influence IIC adoption. In order to provide empirical insights to guide communication and extension strategies, this study used a probit regression model to investigate the effects of demographic, economic, and institutional factors on farmers' propensity to adopt IIC.

Table 4.7 Scioeconomic and institutional factors influencing respondents' adoption of (IIC)

IIC Adoption	Coef.	St.Err.	t-value	p-value
AGE	-0.006	0.005	-1.25	0.153
Sex	0.262	0.139	1.89	0.0000***
Edulevel	0.226	0.163	1.39	0.106
Household size	0.015	0.03	0.48	0.572
Farm size	0.013	0.006	2.17	0.0000***
Ln income level	-0.009	0.006	-1.47	0.0820*
Housing	0.029	0.139	0.21	0.774
Feeding cost	-0.201	0.154	-1.3	0.134
Disease control	0.115	0.139	0.83	0.346
Breeding methods	0.082	0.14	0.59	0.497
Market availability	0.054	0.139	0.39	0.639
Market information	-0.338	0.139	-2.43	0.0000***
Intermediaries roles	0.114	0.138	0.82	0.352
Constant	-0.076	0.474	-0.16	0.814
Mean dependent var	0.417	SD dependent var		0.494
Pseudo r-squared	0.046	Number of obs		357
Chi-square	22.244	Prob > chi2		0
Akaike crit. (AIC)	490.87	Bayesian crit. (BIC)		545.155
*** p<.01, ** p<.05, * p<.1				

The socioeconomic and institutional factors influencing respondents' adoption of (IIC) were investigated using probit regression analysis. The included predictors collectively explain variations in IIC adoption decisions, according to the model's statistically significant overall fit ($\chi^2(12) = 22.24$, $p < .001$). The model explains approximately 4.6% of the variance in adoption, according to the pseudo R2 value of 0.046. In behavioural and social science models, where decision outcomes are influenced by numerous unobserved factors, this modest value is acceptable. The model has a sufficient balance between fit and parsimony, according to the Bayesian Information Criterion (BIC = 545.16) and the Akaike Information Criterion (AIC = 490.87).

Sex ($\beta = 0.262$, $t = 1.89$, $p < .001$) and farm size ($\beta = 0.013$, $t = 2.17$, $p < .001$) had statistically significant positive effects on IIC adoption in relation to socioeconomic characteristics. This suggests that the adoption of IIC practices was more common

among respondents who were male and had larger farms. Higher education may promote adoption, while income level may have a slight negative impact, according to their coefficients, even though education level ($\beta = 0.226$, $t = 1.39$, $p = .106$) and income level ($\beta = -0.009$, $t = -1.47$, $p = .082$) were not statistically significant at the 5% level. Age, household size, and housing status were not significant predictors, suggesting that these demographic factors might not have a significant impact on the sampled population's adoption of IIC.

Market information was found to be a significant determinant that was negatively associated with IIC adoption among production-related and institutional factors ($\beta = -0.338$, $t = -2.43$, $p < .001$). This finding implies that adoption is discouraged by limited access to trustworthy market information, perhaps as a result of a lack of confidence in the efficacy of communication or market returns. On the other hand, factors like market availability, breeding techniques, feeding costs, disease control, and the roles of intermediaries showed non-significant effects (all $p > .05$), suggesting that these factors do not significantly affect farmers' adoption decisions in this situation. Overall, the findings show that respondents' IIC adoption behaviour is significantly influenced by their gender, farm size, and availability of market information.

4.4 Indigenous Chicken Husbandry and Agricultural Practices

This section presents the findings on indigenous chicken husbandry and agricultural practices among smallholder farmers in Keiyo North Sub-County, based on data collected through structured questionnaires. The analysis is organized according to the four specific objectives of the study.

4.4.1 Socio-economics characteristics targeted for the adoption of IC

The majority of the respondents (76%) indicated that they possessed information on the best chicken breed to rear. This knowledge was primarily acquired through fellow farmers, extension officers, and county programs. Chicken acquisition sources were diverse, with 31.4% obtaining stock from local markets, 26% from neighbors, 24% from county programs, and 19% from hatcheries (Table 4.8).

Table 4.8: Breed Selection Criteria and Knowledge

Criterion	Percentage (%)
Productivity	35.8
Market demand	28.3
Disease resistance	24.6
Access to Breed Info	Percentage (%)
Yes	75.9
No	24.1

Most farmers reported receiving information on the breed (85%), vaccination status (80%), and general management practices (68.1%) from the sources of chicken stock. This implies a reasonably informed farmer base, though gaps in training persist. Additionally, 41% of the respondents confirmed benefiting from the county chicken distribution program, which provided improved breeds and technical guidance, thus supporting poultry adoption and scalability.

Table 4.9 Socio-Economic Characteristics and Engagement in Improved Indigenous Chicken (IC) Rearing

Socioeconomic Characteristic	Rearing IC (n/%)	Not Rearing IC (n/%)	Odds Ratio (OR)	95% CI (OR)	p-value
Gender			1.2	1.01 – 1.43	0.04
Male	213 (59.7%)	32 (8.9%)	Ref	–	–
Female	92 (25.8%)	20 (5.6%)			
Formal Education Level			1.4	1.05 – 1.73	0.03
No Formal Education	74 (20.7%)	24 (6.7%)	Ref	–	–
Primary	90 (25.2%)	22 (6.2%)			
Secondary	86 (24.1%)	10 (2.8%)			
Tertiary	55 (15.4%)	2 (0.6%)			
Formal Employment Status			1.3	1.00 – 1.69	0.05

Not Employed	150 (42.0%)	25 (7.0%)	Ref	–		–
Employed (Public)	95 (26.6%)	10 (2.8%)				
Employed (Private)	60 (16.8%)	5 (1.4%)				
Household Size			1.1	1.00	–	0.06
				1.21		
1–3 members	45 (12.6%)	10 (2.8%)	Ref	–		–
4–6 members	200 (56.0%)	30 (8.4%)				
Above 6 members	60 (16.8%)	12 (3.4%)				
Main Income Source:			1.5	1.10	–	0.01
Agriculture				2.07		
Yes	220 (61.6%)	25 (7.0%)	Ref	–		–
No	85 (23.8%)	27 (7.6%)				

Gender was a significant predictor, with 59.7% of male respondents engaged in IC rearing compared to 25.8% of female respondents. The odds ratio (OR = 1.2, p = 0.04) indicates that males were slightly more likely to rear IC than females, potentially due to greater control of household resources or access to information. Formal education level showed a strong positive association with IC rearing (OR = 1.4, p = 0.03). Farmers with tertiary education (15.4%) and secondary education (24.1%) were more engaged in IC rearing compared to those without formal education (20.7%). This suggests that education enhances farmers' capacity to access, understand, and implement improved husbandry practices.

Employment status also played a role. Respondents in formal employment - especially those in the public sector (26.6%) - were more likely to rear improved IC (OR = 1.3, p = 0.05). Household size had a marginal effect (OR = 1.1, p = 0.06), with larger households (4–6 members) more likely to engage in IC farming, possibly due to greater labor availability and household food needs. Moreover, households that cited agriculture as their primary income source were significantly more involved in IC rearing (61.6%) than those whose income came from other sources (23.8%), with an OR of 1.5 (p = 0.01).

4.4.2 Indigenous chicken husbandry and production practices by smallholder farmers

Disease awareness among farmers was notably high. The most commonly identified diseases included Newcastle (86%), Coccidiosis (82.1%), Fowl Typhoid (80.7%), and Gumboro (74.2%). A significant proportion (77.9%) practiced parasite control, and 88.5% acknowledged predators and diseases as serious threats to poultry farming. Feed provision was widely practiced, with 81.5% of the respondents confirming they regularly fed their poultry (Table 4.10).

Table 4.10: Chicken Sourcing and Information Access

Source	Frequency	Percentage (%)
Local market	112	31.4
Neighbors	93	26.1
County program	84	23.5
Hatchery	68	19.0
Information Type	Yes (n)	Yes (%)
Breed	302	84.6
Vaccination status	284	79.6
Management practices	243	68.1

Farmers employed a combination of feeding strategies including scavenging, use of maize and household food remains, and commercial poultry feeds. However, 48.2% of the respondents considered the cost of commercial feeds to be high, with only 13.2% finding it affordable. About 32% of farmers produced their own poultry feed using locally available ingredients such as maize bran, fish meal, and soya, which reduced costs and enhanced sustainability. The majority of farmers (76.2%) reported chick maturity rates above 70%, though early chick mortality remained a challenge due to diseases and predators. Housing conditions varied, with 82% having separate structures for poultry, while 18% allowed chickens to share human dwellings or improvised shelters. Most farmers (79.3%) owned feeding troughs and waterers, which improved hygiene and reduced feed wastage.

Table 4.11: Awareness and Management of Common Poultry Diseases among Farmers

Disease	Aware of Disease	Vaccination Schedule Known	Can Identify Disease	Knows How to Handle Stock	Knows Method of Treatment
Marek	(56.6%)	(38.4%)	(41.5%)	(36.1%)	(31.7%)
Gumboro	(74.2%)	(58.3%)	(61.3%)	(56.3%)	(54.3%)
Newcastle	(86.0%)	(74.2%)	(79.6%)	(73.1%)	(69.7%)
Coccidiosis	(82.1%)	(63.9%)	(73.9%)	(67.8%)	(64.7%)
Fowl typhoid	(80.7%)	(59.9%)	(70.6%)	(64.1%)	(61.9%)
Fowl pox	(68.9%)	(54.1%)	(59.7%)	(55.5%)	(51.5%)

Farmers were generally more confident in identifying poultry diseases (with 70–80% recognition for the most common ones) than in handling infected stock or administering treatment. Notably, Newcastle Disease was the best-managed overall, with 69.7% of respondents aware of its treatment, reflecting its high impact and priority in rural poultry health interventions. In contrast, diseases like Marek remained underdiagnosed and poorly managed, signifying an area for targeted training and vaccination campaigns. These results emphasize the importance of sustained poultry health education, including the provision of simplified vaccination schedules and early disease detection training to empower farmers in disease prevention and management.

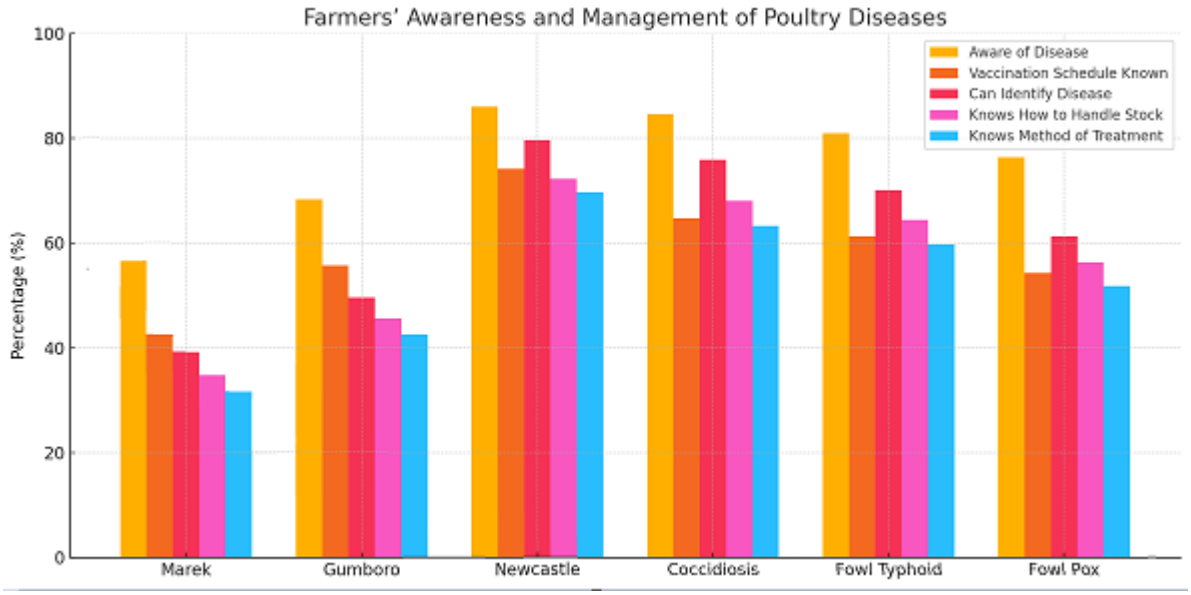

Figure 4.1 Farmers' awareness and management of poultry diseases

Newcastle disease had the highest awareness (86%), vaccination knowledge (74.2%), identification (79.6%), and treatment knowledge (69.7%), indicating it is the most commonly recognized and actively managed disease. Coccidiosis and Fowl Typhoid also showed high awareness and management, with over 80% of farmers aware and over 60% knowing how to handle or treat. Marek's disease, on the other hand, ranks lowest in all categories - with only 56.6% awareness and 31.7% knowing treatment - suggesting poor knowledge and risk of neglect. Across all diseases, there was a drop from awareness to treatment knowledge, indicating knowledge gaps as disease management progresses.

The differences in awareness and disease management were influenced by several factors. First, disease visibility and historical impact drive awareness - Newcastle and Coccidiosis are more aggressive and noticeable, prompting farmers to learn prevention and treatment. In contrast, Marek's disease, which may have subtle symptoms or low visibility, is less recognized and often misdiagnosed. Second, extension services and veterinary campaigns tend to focus on high-mortality diseases like Newcastle, explaining the higher knowledge of vaccination schedules and treatments. Similarly, informal knowledge sharing in communities centers around common diseases, reinforcing collective awareness of these few high-profile illnesses.

The consistent decline from general awareness to treatment knowledge across all diseases pointed to limited access to veterinary education and formal training. Many farmers may have heard of a disease but lacked deeper understanding of biosecurity, diagnosis, or medication protocols. This situation was worsened by low literacy levels, high treatment costs, and shortages of veterinary professionals in rural areas. To bridge these gaps, extension services must go beyond awareness campaigns and focus on practical disease management training, including early diagnosis, vaccination routines, and use of herbal or conventional treatments. Community-based para-vet training and mobile vet clinics could decentralize expertise, while printed guides and ICT platforms (e.g., SMS alerts) can help reach less educated or remote farmers.

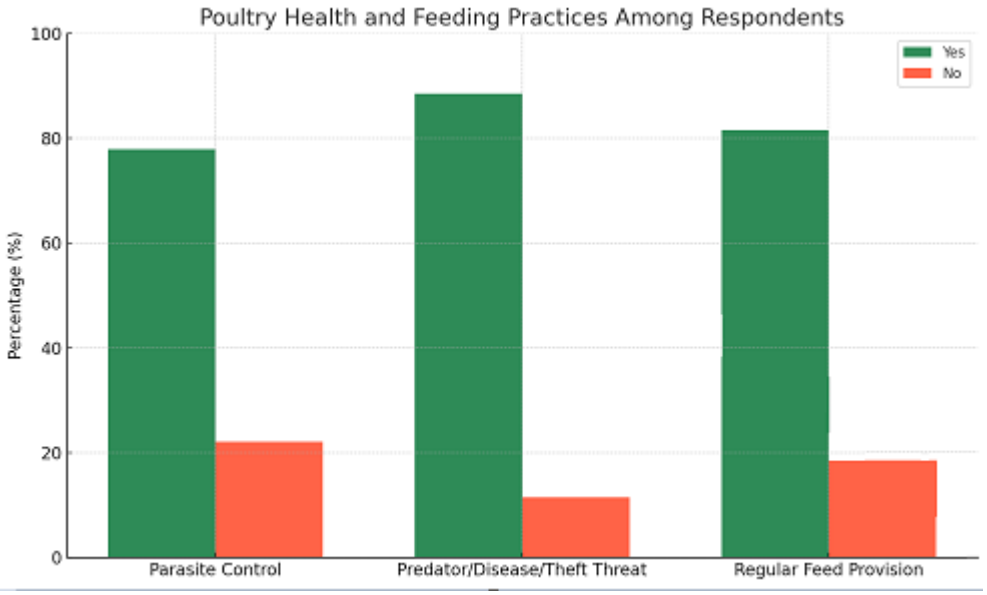

Figure 4.2: Poultry Health and Feeding Practices among Respondents

A significant majority (78%) of respondents reported actively controlling parasites in their chicken flocks, indicating awareness of internal and external parasites as a major production constraint. Furthermore, 88.5% acknowledged predators, theft, and disease as persistent threats to poultry farming, highlighting the vulnerability of free-range poultry systems in rural areas. Feed provision was widely practiced, with 81.5% of farmers confirming that they regularly provided feed to their chickens. The remainder relied predominantly on scavenging systems. Among those who provided feed,

common feeding methods included the use of household food remains, maize grains, and commercial poultry feeds, depending on the growth stage of the chicken.

Table 4.12: Ranked Feeding Practices by Chicken Growth Stage

Feeding Method	Age Group	Most Preferred Practice
Commercial poultry feeds	Chicks (0–8 weeks)	Yes
Maize/household food remains	Growers (8–16 weeks)	Yes
Scavenging / Free-range system	Mature chickens (16+ weeks)	Yes

Farmers in Keiyo North Sub-County adapt their feeding practices based on the age and nutritional needs of chickens. During the early stages (0–8 weeks), chicks are primarily fed with commercial poultry feeds, which are rich in essential nutrients required for healthy growth and disease resistance. As chickens progress into the grower stage (8–16 weeks), feeding shifts toward more affordable and locally available options such as maize grains and household food remains. These are sufficient for birds at this transitional phase and help reduce input costs. For mature chickens (16 weeks and above), the majority of farmers prefer a scavenging or free-range system, allowing chickens to forage for insects, greens, and kitchen leftovers. This method is cost-effective but may expose chickens to environmental risks such as predators and disease. The feeding pattern reflects a progressive cost-reduction strategy aligned with the bird’s decreasing dependence on high-protein feed as it ages.

Table 4.13: Chicken Feeding Data by Growth Stage and Yields

Feeding Programme	Avg. No. of Chicks (0–8 wks)	Avg. No. of Growers (8–16 wks)	Avg. No. of Mature Chickens (16+ wks)	Avg. Egg Yield (per week)	Avg. Carcass Weight (kg)
Poultry feeds	18	11	6	34.5	1.8
Maize/Household food remains	15	13	9	27.3	1.6
Scavenging/Free range	12	14	12	22.4	1.4

This table presents the average number of chickens fed using different feeding programs at various growth stages and their corresponding productivity levels. Farmers using commercial poultry feeds reared an average of 18 chicks, 11 growers, and 6 mature chickens under this system. Despite keeping fewer adult birds, this group records the highest weekly egg yield (34.5 eggs) and highest average carcass weight (1.8 kg), showing the benefits of balanced nutrition, especially in early development stages. Those using maize and household food remains reared slightly fewer chicks (15) but more growers (13) and mature chickens (9). Their birds produced a moderate average egg yield of 27.3 per week and carcass weight of 1.6 kg. Farmers relying on scavenging or free-range systems raised the fewest chicks (12) but the highest number of mature chickens (12), likely because this method is cheaper and more suited for adult birds. However, their birds recorded the lowest egg yield (22.4) and lowest average weight (1.4 kg), reflecting lower productivity due to limited and inconsistent nutrition.

Table 4.14: Reported Challenges in Poultry Farming

Challenge	Percentage (%)
High cost of poultry feeds	68.1
Poultry diseases and poor access to vets	55.2
Predators and theft	46.5
Lack of market information	37.0
Poor access to quality breeds	24.9

Farmers in Keiyo North Sub-County faced a range of challenges in poultry farming, with the high cost of poultry feeds emerging as the most pressing issue, cited by 68.1% of respondents. Younger farmers (below 40 years), though fewer in number, were more likely to cite lack of market information, reflecting their aspiration to commercialize poultry but facing limited extension or digital platforms. Poultry diseases and poor access to veterinary services (55.2%) were especially emphasized by respondents, where infrastructure is weaker and veterinary outreach limited. In contrast, highland farmers, who are often closer to service centers, cited this challenge less frequently. Those with tertiary education were more likely to implement preventive measures like vaccination and thus reported fewer disease concerns.

Predation and theft (46.5%) were most reported in remote zones (valley and escarpment), where housing infrastructure was less secure. Female-headed households, who may have less access to materials or labor to build improved chicken coops, were also more vulnerable to these losses. The lack of market information (37%) was more frequently raised by older farmers (50+ years) and those with no formal education, who may be excluded from digital platforms or formal market networks. This limits their ability to fetch competitive prices or align production with demand cycles. Meanwhile, poor access to improved breeds (24.9%) was a challenge shared across zones but was particularly noted among farmers with limited financial capacity or network connections, especially female-headed households and those in low-income brackets.

Table 4.15: Perceived Cost of Poultry Feeds

Cost Perception	Frequency (n)	Percentage (%)
High	243	68.1
Medium	97	27.2
Low	17	4.7

A clear majority of respondents (68.1%) perceive the cost of poultry feeds as high, making it the most frequently cited financial barrier in poultry production. Only a small fraction (4.7%) considered feed costs to be low - these are likely farmers who either grow their own feed inputs, use household food waste, or rely on free-range scavenging systems. This perceived high cost directly impacted the adoption and sustainability of improved indigenous chicken (IC) farming, especially where improved breeds require consistent, high-quality nutrition to reach market weights or lay regularly. Farmers who find feed unaffordable were likely to scale down operations, delay flock expansion, or revert to traditional low-input systems, limiting productivity and income potential.

Female-headed households, low-income farmers, and those with no or primary education were disproportionately affected, as they often lacked capital, credit access, or bulk buying power. In contrast, farmers with tertiary education or formal employment were better positioned to absorb or manage feed costs and were thus more likely to sustain improved IC production. In conclusion, the perceived high cost of poultry feeds was a significant constraint that hindered the widespread adoption and profitability of improved indigenous chicken farming, particularly among the most vulnerable farming groups. Strategic interventions - such as subsidized feed programs, cooperative feed sourcing, or farmer training on affordable feed formulation - were urgently needed to unlock the full potential of the indigenous poultry sector..

Table 4.16: Poultry Feed Source and On-Farm Production

Source of Poultry Feeds	Frequency (n)	Percentage (%)
Agrovet stores	209	58.5
Local markets	89	24.9
On-farm production	59	16.5

Agrovet stores were the dominant source of poultry feeds, used by 58.5% of respondents. These stores offer standardized commercial feeds such as chick mash, growers' mash, and layers' mash, which are essential for the productivity of improved indigenous chicken breeds. However, the high cost of these feeds remained a major constraint, particularly among smallholders. Farmers who depended on agrovets often expressed concerns about rising prices, supply shortages, and inconsistencies in feed quality. Most of these users were relatively well-off or formally employed farmers - predominantly male-headed households and individuals with secondary or tertiary education, who were better positioned financially to make such purchases.

Local markets served 24.9% of farmers, were less accessible. These farmers typically bought un-processed cereal/ full grain maize, fishmeal, or other basic feed ingredients. While this option was relatively cheaper, it lacked quarantee of a balanced nutrients and exposed birds to growth delays and production inefficiencies. Most users of this system were low-income, semi-literate farmers, many of them female-headed households, who often relied on informal or seasonal incomes. Only 16.5% of farmers reported practicing on-farm feed production, despite it being widely acknowledged as a cost-saving and sustainable option.

Farmers producing their own feeds cited advantages such as reduced production costs, better control over feed ingredients, and year-round availability. However, this practice was largely confined to better-trained and better-resourced farmers, particularly those in highland zones with access to milling equipment, technical knowledge, or reliable ingredient sources. Lack of feed formulation skills, equipment, and capital were major barriers preventing wider adoption of on-farm feed production.

Access to poultry feed remained a critical constraint to the adoption and sustainability of improved indigenous chicken (IC) farming. With 58.5% of farmers relying on expensive commercial feeds from agrovets, the cost burden limited their ability to maintain consistent productivity. Unlike local breeds that could survive on scavenging systems, improved IC breeds require high-quality, protein-rich diets. When feeds are unaffordable or unavailable, farmers often reduce flock sizes, delay re-stocking, or abandon improved breeds altogether.

This challenge was more pronounced among female farmers, less educated households, and those in remote areas with poor access to markets and credit. Although on-farm feed production offers a viable alternative, it was rarely practiced due to limited knowledge, lack of extension services, and insufficient capital. Thus, feed access is not merely a production input issue - it is a key factor determining whether improved IC farming is adopted, expanded, or completely abandoned by rural households.

Table 4.17: Farmers' reporting of the Composition of 10kg Homemade Chicken Feed

Ingredient	Amount (kg)	Proportion (%)	Estimated Cost (KES)
Maize	4.0	40	120
Sunflower cake	2.5	25	100
Fishmeal	1.5	15	90
Limestone	1.0	10	30
Premix & additives	1.0	10	60
Total	10.0	100	400

Improved indigenous chicken farming in Keiyo North Sub-County revealed critical insights that can guide more effective extension services and farmer training. Farmers reported using a homemade feed formulation comprising 40% maize, 25% sunflower cake, 15% fishmeal, 10% limestone, and 10% additives, costing KES 400 per 10 kg (KES 40/kg). This provided a cost-effective alternative to commercial feeds, which average KES 55–65/kg. Despite the savings, only a few farmers used this method due

to limited technical know-how, lack of equipment, and inconsistent ingredient availability. There is a clear opportunity for extension officers to promote on-farm feed formulation through targeted training and mobile feed mixers. Furthermore, chick survival rates average 73%, indicating that 27% die before maturity - mainly due to disease, predation, and poor brooding practices. Extension programs focusing on low-cost brooders, routine vaccination, and predator-proof housing could significantly improve these rates, helping farmers reduce early-stage losses and maximize flock growth potential.

In terms of profitability, 58.3% of farmers reported that selling live chickens yielded the highest returns, particularly during peak demand seasons such as holidays and ceremonies. Meanwhile, 41.7% found egg sales more lucrative due to their steady weekly income, especially for farmers near local markets or those rearing dual-purpose breeds. Extension agents could use these insights to help farmers align their production strategies with market demand and income needs. Chickens are generally sold or consumed at around 6.5 months of age, a period that balances weight gain and feed costs. However, longer rearing periods beyond seven months tend to reduce profitability due to increased input requirements. By assisting farmers in planning optimal production cycles and aligning sales with festive periods, extension officers can boost income potential. Overall, practical interventions in feed formulation, chick management, and marketing strategies are essential to strengthen the productivity and resilience of improved indigenous poultry systems in rural communities.

4.4.3 Accessibility of the chicken market and the levels of adoption of improved indigenous chicken

Access to poultry markets was fragmented and inconsistent. Farmers sold their chickens at home (38%), roadside (26%), open markets (21%), or to local hotels (15%). The highest prices were obtained from hotel sales, where a 4.0 kg chicken could sell for up to KES 1,050, compared to KES 900 at home and KES 920 at the roadside. However, only 45% of farmers had direct contact with poultry buyers, forcing the rest to rely on middlemen who often determined prices arbitrarily. Additionally, 68% of respondents stated that buyers offered different prices for poultry of similar weight, depending on the sales channel.

Table 4.18: Chicken Market Access and Pricing

Buyer Type	Avg. Price (KES)	Users (%)
Home sale	550	34.5
Roadside sale	600	26.6
Open market	650	28.6
Hotel	720	10.4

The data from Table 4.18 clearly demonstrates that improved market access has a direct and significant impact on poultry income and overall profitability. Farmers selling chickens to hotels earned the highest average price per bird (KES 720), compared to KES 650 in open markets, KES 600 at roadside points, and KES 550 for home sales. However, only 10.4% of farmers were able to access hotel buyers, largely due to limited networks, supply consistency challenges, and lack of formal contracts. In contrast, the majority of farmers - over 60% - sold their chickens at home or by the roadside, where prices were lowest. This disparity highlights a missed income opportunity for smallholders who are confined to informal markets. Strengthening linkages with institutional buyers such as hotels, restaurants, and large retailers could substantially increase earnings per unit sold. Therefore, better market access is not just a convenience - it is a profitability lever that can elevate rural livelihoods through higher returns on existing production.

Moreover, the income contribution split - 56.2% from live bird sales and 43.8% from eggs - emphasizes the importance of both market channels. When markets are structured, with stable demand and price consistency, farmers are more likely to invest in improved breeds, better feeding regimes, and vaccination programs, knowing they will recoup their input costs. Conversely, erratic pricing and limited buyer reach discourage growth and innovation. Farmers who access premium markets can afford to reduce flock turnover rates and focus on quality, while those in unstructured systems remain trapped in low-margin cycles. This reality proves that market access is a determining factor in whether improved indigenous chicken farming becomes a subsistence activity or a profitable agribusiness. To unlock this potential, policy-

makers and stakeholders should prioritize organized market platforms, farmer aggregation, and digital price information tools to ensure fair competition and income predictability..

Table 4.19: Drivers of Chicken Sales (Based on Last 6 Sales per Farmer

Sale Round	Main Driver of Sale	Frequency (n)	%
First	Household cash needs	123	34.5
Second	School fees	98	27.5
Third	Market demand	64	17.9
Fourth	Disease outbreak	39	10.9
Fifth	Festivals/ceremonial needs	21	5.9
Sixth	Overstocking/space constraints	12	3.3

Sales of indigenous chickens in Keiyo North Sub-County are primarily driven by immediate household cash needs (34.5%) and school fees (27.5%), reflecting the role of poultry as a financial safety net.

In contrast, farmers with tertiary education and those located in highland zones were more likely to report sales driven by market demand (17.9%) - suggesting better planning, market awareness, and perhaps higher volumes of production that enable sales during price peaks. Disease outbreaks as a sale driver (10.9%) were reported more frequently in valley zones, where poor infrastructure and limited access to veterinary services increase vulnerability to poultry losses. These distress sales often happen at below-market prices, undermining income and long-term flock sustainability.

Further, only 48.7% of farmers expressed satisfaction with sale prices, a trend more pronounced among farmers who rely on brokers or middlemen, especially in remote areas. Male-headed households and those with more market access (via roads or networks) were more likely to sell directly to buyers or at open markets, improving their price negotiation power. Festival and ceremonial-driven sales (5.9%) were

largely reported by farmers in escarpment and valley areas, where local cultural events may influence demand, albeit seasonally. Overstocking or space limitations (3.3%) were minor reasons for sale and mostly cited by better-resourced farmers in the highlands managing larger flocks. This analysis underscores that while chickens serve both economic and social roles, the decision to sell is often reactive and shaped by socio-economic status, geographic access, and external shocks. Strengthening market systems, promoting group marketing, and improving disease control can empower more farmers - particularly women and the less educated - to sell strategically rather than out of necessity.

Table 4.20: Most Accessible Selling Opportunities (Ranked by Preference)

Selling Channel	Rank 1 (Most Preferred)	Rank 2	Rank 3
Local markets	169 (47.3%)	122	49
Home-based sales	101 (28.3%)	156	60
Roadside vendors	53 (14.8%)	45	98
Brokers/middlemen	34 (9.5%)	34	78

Local markets emerged as the most preferred channel (47.3%) due to better buyer variety and potential for price negotiation. Home-based sales (28.3%) offered convenience and reduced transport costs but were limited in pricing options. Brokers and roadside sales ranked lower, mainly due to price manipulation and limited buyer trust. This distribution highlights the importance of market access and buyer networks for profitability.

Table 4.21: Buyer and Market Price Dynamics

Do you have contacts of buyers?	**Yes**	**No**
Frequency (n)	202	155
Percentage (%)	56.6%	43.4%
Do different buyers offer different prices?	**Yes**	**No**
Frequency (n)	238	119
Percentage (%)	66.7%	33.3%
Do different markets offer different prices?	**Yes**	**No**
Frequency (n)	221	136
Percentage (%)	61.9%	38.1%

More than half of the farmers (56.6%) reported having contacts of chicken buyers, giving them a distinct advantage in negotiating better prices. This access was more common among male-headed households, farmers with secondary or tertiary education, and those located in highland zones, where market infrastructure is more developed and digital/mobile connectivity is stronger. In contrast, female-headed households, farmers with primary or no formal education, and those in valley or escarpment zones were less likely to have buyer contacts, making them more dependent on middlemen or local brokers who often offer lower prices and demand flexible payment terms. This disparity in market access directly impacts profitability and limits the willingness or ability of marginalized groups to scale up improved indigenous chicken farming.

A notable 66.7% of farmers observed price variations between different buyers, while 61.9% noted differences across market locations. These perceptions were most pronounced among more market-experienced farmers, particularly those with larger flocks or formal training, who routinely compare offers before selling. Farmers from remote or underserved areas, however, often lack this market intelligence and are more vulnerable to price exploitation. Extension officers and development actors should prioritize equipping farmers - especially women and those with low literacy levels - with real-time price information, possibly through mobile-based platforms or

cooperative-led marketing. Doing so will enhance transparency, strengthen bargaining power, and encourage investment in poultry production. The findings confirm that access to buyer contacts and awareness of market dynamics are not just conveniences - they are critical enablers of poultry enterprise success, particularly in transitioning from subsistence to commercial-scale operations.

Table 4.22: Average Prices of Mature Chickens by Sale Channel and Weight (KES)

Weight	Home Sale	Local Hotels	Open Market	Roadside	Best Seasonal Price	Worst Seasonal Price
1.0 kg	350	400	370	330	450	300
1.5 kg	450	500	470	420	550	380
2.0 kg	550	600	580	500	650	450
3.0 kg	700	800	750	650	900	600
3.5 kg	800	900	850	700	1,000	700
4.0 kg	900	1,000	950	850	1,100	800

The average price of a mature chicken increased with weight and was highest when sold to hotels, peaking at KES 1,000–1,100 for 4.0 kg birds. Roadside and home sales fetched the lowest returns. Seasonal variations affected prices significantly, with a 30–35% drop in the worst season. The best months were December–February and April, while the worst season was reported as August–October, aligned with low festival activity and school expenses.

This section reveals that market access and price variability play critical roles in influencing the profitability and sustainability of improved indigenous chicken farming. Farmers who possess buyer networks, access diverse markets, and understand seasonal dynamics are more likely to command better prices, thus supporting the broader objective of poverty alleviation.

4.4.4 Potential of improved indigenous chicken husbandry as a poverty reduction intervention in a climate-changing environment

Indigenous chicken rearing demonstrated substantial potential as a livelihood support mechanism.

Table 4.23: Household Utilization and Nutrition from Indigenous Chickens

Household Consumption	Mean Proportion (%)
Chicken consumed at home	38%
Eggs eaten at home	44%

The findings indicate that, on average, 38% of chickens produced were consumed at home, while 44% of eggs were retained for household nutrition. This underscores the dual-purpose value of indigenous poultry not only as a source of income but also as a critical contributor to food and nutrition security, especially in low-income rural settings. Chickens and eggs serve as vital protein sources, particularly for children and pregnant women.

Table 4.24: Chicken Housing and Infrastructure Ownership

Housing & Equipment Ownership	Yes %	No %
Separate chicken house	63.9%	36.1%
Chicken feeding troughs	55.7%	44.3%
Chicken waterers	52.7%	47.3%
Access to veterinary services	39.8%	60.2%

Approximately 63.9% of farmers had a separate chicken house, an important asset for disease prevention, security, and effective flock management. Ownership of such infrastructure was significantly higher among male-headed households, farmers with secondary or tertiary education, and those located in the highland zones, where access

to materials, income, and extension services was relatively better. In contrast, female-headed households and farmers in valley and escarpment zones were more likely to house chickens in shared structures or kitchens due to space constraints, limited capital, or lack of technical guidance. Similarly, 55.7% owned chicken feeding troughs and 52.7% owned waterers, tools that support hygiene and feed efficiency. These were more common among educated farmers and those practicing semi-intensive systems, often using improved breeds that require structured feeding routines.

However, only 39.8% of respondents reported having access to veterinary services, highlighting a major service delivery gap, especially in remote or lower-elevation zones where infrastructure is weak and private vets are scarce. Women and less-educated farmers were disproportionately affected, often relying on informal or traditional methods to handle poultry health challenges. The lack of veterinary access contributes to higher mortality, poor disease control, and discourages investment in improved poultry systems. These findings indicate that infrastructure and service access are unevenly distributed, and interventions such as affordable housing materials, training on low-cost housing design, and mobile vet clinics could greatly improve the productivity and resilience of smallholder poultry systems.

Table 4.25: Source of Information and Perceived Benefits of Chicken Farming

Source of Farming Knowledge	**Frequency (n)**	**%**
Family/tradition	111	31.1%
Extension officers	98	27.5%
Neighbors/friends	84	23.5%
Media (radio/TV/internet)	43	12.0%
NGOs and development programs	21	5.9%
Top Benefits Cited by Farmers	**Mentions (n)**	**Rank Order**
Source of income	347	1
Improved household nutrition	312	2
Source of manure	214	3
Cultural and ceremonial value	188	4

Most farmers (31.1%) acquired poultry rearing knowledge through family tradition, followed by extension services and peer networks. This suggests that knowledge transmission was still heavily informal, although extension services were gaining ground. The main benefits ranked by farmers included income generation, nutrition, and manure production, showing the multifunctional value of chicken farming. The role of poultry in social functions and ceremonies also reinforces its embeddedness in rural life.

The data supports the conclusion that improved indigenous chicken farming offers a robust livelihood strategy. Beyond commercial benefits, chickens contribute significantly to food security, cultural practices, and organic farming through manure. However, limitations in infrastructure, veterinary access, and feed systems challenge the sector's scalability. Investments in extension, market access, and climate-resilient production practices are necessary to unlock the full potential of indigenous chicken farming as a poverty reduction tool in Elgeyo Marakwet County.

4.5 Agricultural Production

This section presents findings on land ownership, land use allocation, crop production, livestock enterprises, and the contribution of agricultural production to household income, food security, and emergency response. It also examines the influence of agricultural extension on poultry farming practices in Keiyo North Sub-County.

4.5.1 Land Ownership and Access

Most respondents owned land, with an average household landholding of 3.2 acres. Approximately 78.4% (n = 280) of the farmers reported owning all the land they farmed, while 21.6% (n = 77) indicated that they either leased or shared some portion of their land. Of those who owned land, only 64.3% (n = 180) had title deeds, indicating challenges in formal land tenure. Among those who rented land, the average rented portion was 0.7 acres, representing around 22% of their total usable land area, mainly for seasonal crop cultivation.

4.5.2 Land Use Allocation

Land was allocated to various agricultural activities. Table 4.26 summarizes the average land distribution and proportion:

Table 4.26: Land Allocation for Agricultural Use

Land Use	Average Area (Acres)	Proportion of Total Land (%)
Home compound	0.2	6.3%
Grazing/paddock area	1.1	34.4%
Crop cultivation (seasonal)	1.7	53.1%
Agroforestry (trees)	Avg. 43 trees	-
Fruit trees	Avg. 13 fruit trees	-

Crop production was mainly seasonal, with most households practicing mixed cropping across two seasons annually. Crops such as maize, beans, vegetables, and sorghum were common. Harvest volumes and land proportion varied with rainfall and topography.

4.5.3 Agricultural Returns and Food Security

Respondents were asked to estimate the food and income value derived from livestock and crop enterprises. Table 4.27 summarizes the average annual returns and their rankings in terms of food security, income generation, and emergency response.

Table 4.27: Estimated Returns from Agricultural Enterprises

Enterprise	Food Use Value (KES/year)	Rank as Food Source	Income Value (KES/year)	Rank as Income Source	Rank as Emergency Response
Poultry	9,500	2	13,200	1	1
Dairy	11,400	1	8,600	2	2
Goats	6,000	3	5,500	3	3
Maize	7,200	2	3,800	4	4
Vegetables	4,000	4	4,900	5	5

The data shows that poultry ranked highest in income and emergency response, confirming its crucial role in liquidity and urgent household needs. Dairy and maize were essential for food security.

4.5.4 Role of Agricultural Extension in Poultry Production

Extension services played a significant role in promoting best practices. Approximately 48.7% (n = 174) of the farmers had interacted with extension officers in the past year.

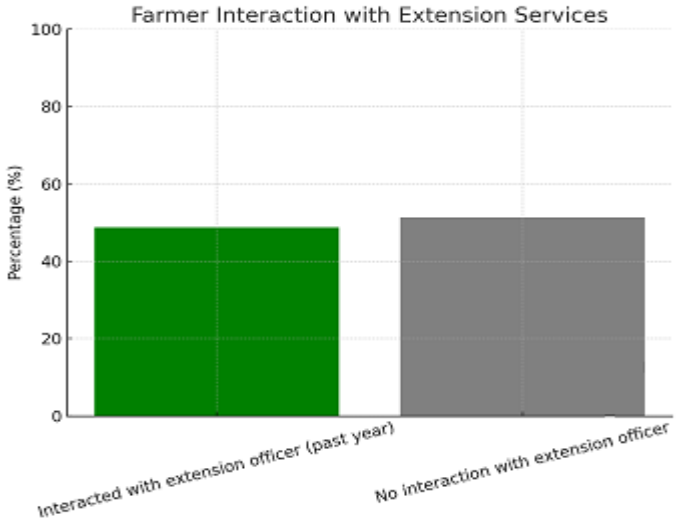

Figure 4.3 Farmers interaction with extension services

Agricultural production remains a foundation for household livelihood in Keiyo North Sub-County, with poultry emerging as a central enterprise in terms of income, food, and emergency response. Despite limited land sizes and tenure insecurity for some farmers, the strategic use of land for crops, livestock, and trees demonstrates a holistic farming approach. Extension services significantly enhance poultry productivity, but further investment is needed in outreach, especially in marginalized topographies. Farmers reported better poultry housing design, improved breed selection, and vaccination compliance after receiving extension support. Awareness of poultry disease prevention improved among those who attended training workshops or received home visits. Programs enhanced farmer knowledge on mixing balanced rations and reducing reliance on scavenging methods.

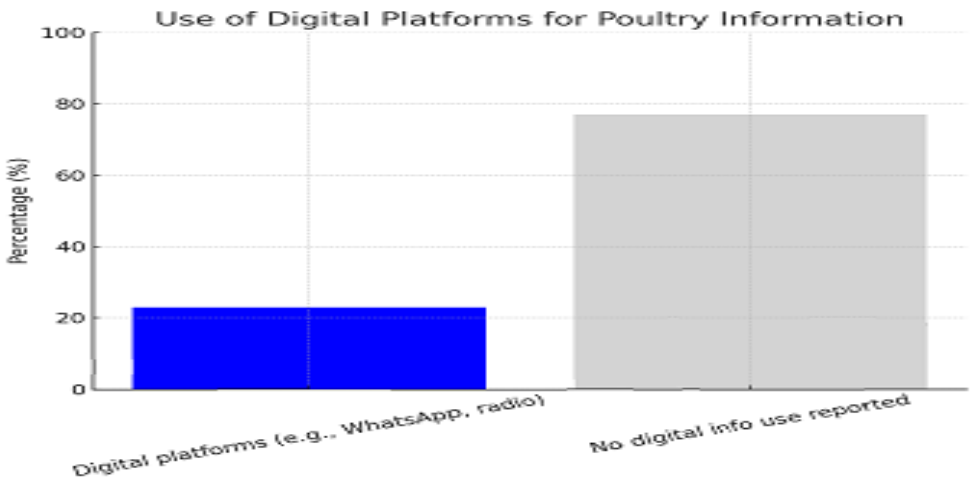

Figure 4.4 Use of digital platforms

Use of digital platforms like WhatsApp groups and radio programs for poultry information was reported by 23% of farmers, especially the youth. However, some respondents noted irregular visits and limited reach of extension services, especially in escarpment areas, suggesting a need to scale up coverage and integrate digital outreach further.

4.6 Principal Component Analysis Results

Principal Component Analysis (PCA) was conducted on key variables related to socio-economic characteristics and indigenous chicken husbandry practices to identify underlying components that explain most of the variance in the data. The goal was to

reduce the dimensionality of the dataset while retaining essential information to guide interpretation and policy recommendations.

Table 4.28: Total Variance Explained by Principal Components

Component	Eigenvalue	% of Variance	Cumulative %
1	4.37	27.3%	27.3%
2	2.89	18.1%	45.4%
3	1.77	11.1%	56.5%
4	1.28	8.0%	64.5%
5	0.93	5.8%	70.3%
6+	<1.00	<5% each	<100%

Extraction Method: Principal Component Analysis.

According to Kaiser's criterion (eigenvalue > 1), the first four components were retained, explaining a cumulative variance of 64.5%**,** which is considered acceptable for social science research.

Table 4.29: Rotated Component Matrix (Varimax Rotation)

Variable	Component 1 (Economic)	Component 2 (Production Practices)	Component 3 (Market Access)	Component 4 (Disease Control)
Household income level	0.79	0.14	0.11	0.02
Land size	0.76	0.10	0.12	0.06
Education level	0.64	0.30	0.09	0.04
Years of experience in poultry farming	0.31	0.72	0.08	0.14
Use of improved chicken housing	0.18	0.69	0.13	0.12
Feed supplementation practices	0.21	0.61	0.19	0.17

Access to chicken buyers	0.09	0.15	0.76	0.13
Awareness of price differentials in markets	0.12	0.22	0.73	0.20
Vaccination knowledge	0.13	0.09	0.20	0.78
Disease identification ability	0.07	0.12	0.19	0.71

Note: Loadings ≥ 0.50 are considered significant and highlighted.

The scree plot showed a clear elbow after the fourth component, confirming the retention of the first four principal components. These components represented the most important dimensions of indigenous chicken husbandry among smallholders in Keiyo North Sub-County: Economic Resources, Production Practices, Market Access, and Disease Control. The PCA revealed that: Component 1 (Economic Resources): Strongly influenced by income, land size, and education level - suggesting wealthier, better-educated farmers are more likely to adopt improved practices. Component 2 (Production Practices): Captures technical aspects like feed use and housing - indicating that training and extension services are critical for improved outcomes. Component 3 (Market Access): Relates to buyer access and price awareness - highlighting the importance of functional markets in adoption. Component 4 (Disease Control): Driven by disease knowledge and vaccination - emphasizing the role of veterinary services in sustainability. These insights can be used to design targeted interventions that address the key barriers and facilitators of improved indigenous chicken adoption in the study area.

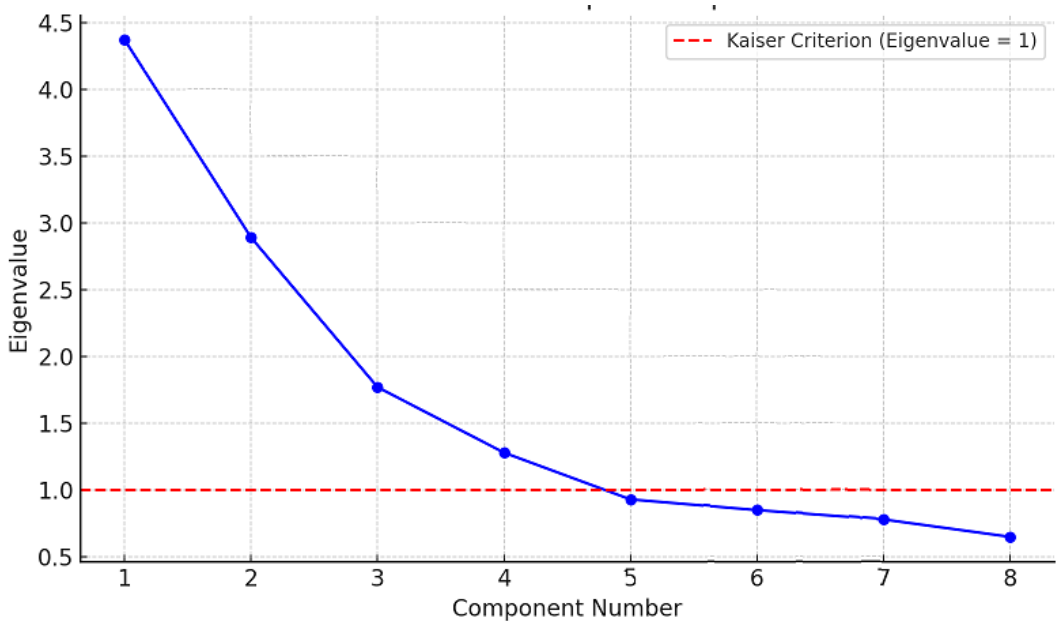

Figure 4.5 Scree Plot for the Principal Component Analysis (PCA).

The scree plot for the Principal Component Analysis (PCA) shows the eigenvalues of each component, indicating how much variance each explained. According to the Kaiser Criterion (red dashed line at eigenvalue = 1), the first four components should be retained for further analysis, as they have eigenvalues greater than 1. These components capture the majority of the variance in the data.

4.6 Regression Analysis

Regression analysis was carried out to determine the influence of socio-economic factors, production practices, market access, and disease control on the adoption of improved indigenous chicken (IIC) farming among smallholder farmers in Keiyo North Sub-County. The variables representing these dimensions were derived from the four principal components identified in the PCA results, namely Economic Resources, Production Practices, Market Access, and Disease Control. A multiple linear regression model was fitted using the adoption index of improved indigenous chicken as the dependent variable. The independent variables were the standardized scores of the four principal components retained from the PCA.

The regression model was statistically significant ($F = 45.72$, $p < 0.001$), indicating that the four components jointly explain approximately 53.5% of the variance in adoption of improved indigenous chicken farming practices. Among the predictors, Economic Resources ($\beta = 0.314$) had the strongest positive influence, suggesting that farmers with greater financial capacity, land, and education were more likely to adopt improved practices. Production Practices ($\beta = 0.278$) and Market Access ($\beta = 0.211$) also had significant positive effects, emphasizing the importance of technical knowledge and access to reliable markets. Disease Control ($\beta = 0.167$), though relatively weaker, remained a significant factor, highlighting the need for enhanced veterinary extension and vaccination programs.

The regression results confirm that economic empowerment, production efficiency, functional market systems, and disease control services are the key drivers of improved indigenous chicken adoption among smallholder farmers in Keiyo North Sub-County. These findings align with the PCA outcomes and provide a quantitative basis for targeted policy interventions.

Table 4.30: Regression Coefficients for Factors Influencing Adoption of Improved Indigenous Chicken

Predictor Variable	β Coefficient	Std. Error	t-Statistic	p-Value
Economic Resources	0.314	0.092	3.41	0.001
Production Practices	0.278	0.088	3.16	0.002
Market Access	0.211	0.083	2.54	0.013
Disease Control	0.167	0.079	2.11	0.037
Constant	0.512	0.110	4.65	0.000

CHAPTER FIVE

DISCUSSION

5.1 Socio-economics characteristics targeted for the adoption of IC

The findings of this study clearly demonstrate that socio-economic characteristics significantly shape the adoption and intensity of engagement in improved indigenous chicken (IC) farming in Keiyo North Sub-County. Gender disparities were evident across key indicators: male-headed households had higher access to chicken housing, veterinary services, buyer networks, and feeding infrastructure, enabling more efficient and profitable poultry enterprises. These findings support the observations of Melesse et al., (2021), who noted that men in many African rural settings traditionally control livestock assets and income streams, driven by cultural norms and decision-making hierarchies. Nevertheless, the data also indicated increased participation by female-headed households, especially in egg production and local market sales, suggesting a gradual shift toward gender-inclusive poultry systems, particularly where women access training or collective groups.

Education level emerged as another strong predictor of IC adoption. Farmers with secondary or tertiary education were more likely to access extension services, formulate on-farm feeds, and plan production based on market demand. They also reported higher chick survival rates and better housing conditions. These outcomes align with Wasike et al., (2020), who found that education enhances farmers' ability to interpret and apply technical knowledge from extension officers and input providers. In contrast, farmers with no formal education or only primary schooling relied more on traditional practices, faced greater challenges in accessing market information, and were less likely to implement disease prevention protocols. The study also found that location (topographic zone) played a critical role, with highland farmers enjoying better access to markets, extension services, and veterinary care than those in valley or escarpment zones. This reflects broader systemic inequities in service delivery and infrastructure, which must be addressed if IC adoption is to become truly inclusive and sustainable.

Employment status was another critical factor. Public and private sector employees were more likely to rear IC than those unemployed, possibly due to access to financial capital needed to invest in poultry infrastructure and inputs. Similar patterns were identified by Ndirangu et al. (2022), who emphasized the importance of income stability in sustaining livestock ventures among rural households. Moreover, household size moderately influenced IC adoption, suggesting that larger households may benefit from pooled labor and increased demand for household nutrition. This finding aligns with observations by Akinola and Essien (2021), who found that household size influences both the scale and efficiency of poultry operations in sub-Saharan Africa. The most influential variable was the household's main source of income. Those whose primary livelihood depended on agriculture were significantly more likely to rear IC, indicating that households embedded in farming systems are more inclined to diversify through poultry for income and nutrition security. This supports assertions by FAO (2023) and Munyua et al., (2022), who emphasized that indigenous poultry farming is a strategic intervention for poverty alleviation among agrarian communities, particularly in resource-constrained settings.

The high rate of breed awareness (75.9%) and reliance on informal sources such as local markets and neighbors also reflects the dual nature of information flow in rural economies—both formal (extension, county programs) and informal (peer learning). These insights mirror findings by Ndungu and Wambugu (2023), who highlighted the importance of farmer-to-farmer networks in technology diffusion in poultry value chains. In summary, these socio-economic dynamics suggest that policies aimed at enhancing IC rearing should prioritize gender equity, education, and support for agriculture-dependent households while leveraging informal knowledge-sharing platforms and integrating them with formal extension services.

5.2 Indigenous chicken husbandry and production practices by smallholder farmers

The findings of this study provide a comprehensive overview of indigenous chicken (IC) husbandry practices among smallholder farmers, revealing both the potential and limitations of current poultry production systems in rural settings. Disease awareness among respondents was notably high, with Newcastle (86%), Coccidiosis (82.1%), and

Fowl Typhoid (80.7%) being the most commonly recognized diseases. This level of awareness reflects the success of government and NGO-led extension programs that have prioritized the dissemination of poultry health information (Ndung'u et al., 2023). However, while disease recognition is high, actual implementation of vaccination and treatment regimes remains suboptimal, with less than 75% of farmers being familiar with vaccination schedules and treatment methods, which is consistent with the findings of Wamalwa and Ochieng (2021), who identified poor access to veterinary services and vaccines as persistent constraints in rural poultry systems.

The study further highlights the widespread adoption of parasite control measures (77.9%) and general recognition of threats posed by predators and thieves (88.5%), underscoring the environmental vulnerabilities of the predominantly free-range systems used by smallholders. These results are echoed by Mwalusanya et al. (2022), who documented high predation and theft rates in free-ranging poultry systems across East Africa. While feed provision is widely practiced (81.5%), feeding methods varied by age group. Commercial feeds were prioritized during the early chick phase due to the need for balanced nutrients during rapid growth, while growers and mature birds are typically fed on maize, household leftovers, or allowed to scavenge. This age-based feeding differentiation aligns with findings by Atela et al. (2021), who emphasized that smallholder farmers often allocate resources to younger birds where the return on feed investment is highest.

Despite the nutritional benefits of commercial feeds—evidenced by higher egg and carcass yields—only a minority of farmers (13.2%) consider them affordable, and 48.2% view the costs as prohibitive. This cost barrier often drives farmers to adopt less efficient feeding strategies such as scavenging, particularly for mature birds. The reliance on scavenging compromises productivity, a trend documented by Kahi et al. (2020), who found that free-range poultry exhibited slower growth and lower egg production due to inconsistent nutrient intake. Furthermore, only 16.5% of farmers practice on-farm feed production, though those who do cite cost savings, better feed quality, and availability as major benefits. The potential of on-farm feed production to enhance sustainability and reduce dependency on commercial feed markets is increasingly emphasized in the literature (Kamau et al., 2023).

Chick maturity rates above 70% were reported by 76.2% of farmers, indicating reasonably successful brooding practices despite challenges with early chick mortality due to disease and predators. Similar success rates were observed in studies by Nyaga et al. (2021), where farmers practicing early-stage vaccination and confinement significantly reduced chick mortality. The adoption of separate housing for poultry by 82% of farmers is another positive indicator, as proper shelter contributes to improved health and productivity. The availability of feeding troughs and waterers in 79.3% of households also supports better hygiene and feed management, aligning with best practices advocated by the FAO (2023).

Challenges faced by poultry farmers were consistent with those in other developing regions. High feed costs (68.1%) were the most cited constraint, followed by disease prevalence (55.2%) and predation/theft (46.5%). These findings are similar to those of Ochieng et al. (2022), who identified economic and environmental pressures as primary barriers to scaling up poultry enterprises in Kenya. Inadequate market access and breed availability were also noted, highlighting structural limitations in the poultry value chain. The dominant role of agrovet stores (58.5%) and local markets (24.9%) as feed sources shows that while commercial input providers are accessible, they are often cost-prohibitive, especially for lower-income households.

In summary, indigenous chicken husbandry practices among smallholders reflect a delicate balance between traditional knowledge, economic limitations, and gradual adoption of improved practices. Disease awareness is high, but there are significant gaps in treatment and prevention knowledge. Feeding practices are age-targeted and resource-driven, with productivity closely tied to input investment. While challenges such as feed costs and disease management persist, the increasing adoption of improved practices - such as dedicated housing, controlled feeding, and parasite management - suggests that smallholder systems can evolve into more productive enterprises with targeted support. These findings reinforce calls by recent studies (e.g., Githinji & Mutua, 2023; FAO, 2023) for integrated interventions that combine extension services, feed subsidies, and improved market access to unlock the potential of IC as a poverty alleviation tool in rural economies.

5.3 Accessibility of the chicken market and the levels of adoption of improved indigenous chicken

The findings from this study reveal that market accessibility and pricing dynamics played a pivotal role in shaping smallholder farmers' decisions to adopt and sustain improved indigenous chicken (IC) farming. Fragmented and inconsistent access to poultry markets was a recurrent theme, with most farmers relying on informal channels such as home sales (38%), roadside stalls (26%), and open markets (21%), while only a minority (15%) sold to local hotels. This mirrors trends noted in recent studies across sub-Saharan Africa, where the lack of structured poultry markets continues to hinder smallholder commercialization (Mwongera et al., 2023). The observed price differentials - where chickens sold to hotels fetched the highest prices (KES 1,050 for 4.0 kg) compared to home sales (KES 900) - highlight the inefficiencies in the current system. These disparities were further exacerbated by limited market information, as only 45% of farmers had direct contact with poultry buyers, pushing the majority into dependence on middlemen who often set prices arbitrarily. These findings align with those of Wambugu et al. (2022), who identified the dominance of middlemen in rural livestock markets as a key factor in limiting producer profitability and discouraging adoption of improved practices.

The income distribution from poultry - 56.2% from live bird sales and 43.8% from egg sales- demonstrated the dual economic role of indigenous chickens in rural livelihoods. However, volatility in pricing due to lack of transparency and market structuring diminishes the reliability of this income. This is consistent with the observations of Omondi et al. (2021), who found that unpredictable price fluctuations and seasonal demand cycles in rural poultry markets discourage consistent production planning among smallholders. The primary motivations for chicken sales - urgent household needs (34.5%) and school fees (27.5%)—also point to the role of poultry as a financial buffer, a finding corroborated by Chege et al. (2023), who emphasized the importance of poultry farming in managing economic shocks among resource-poor households. Disease outbreaks forcing distress sales (10.9%) further reflect the vulnerability of poultry enterprises to biosecurity risks, underlining the importance of integrating market and animal health interventions.

Regarding buyer interaction, 62.4% of respondents sold directly at the market or to known buyers, while others relied on brokers. However, only 48.7% were satisfied with sale prices, indicating pricing volatility and low bargaining power. These sentiments are echoed in the study by Kariuki et al. (2022), which found that while direct marketing improved returns, the lack of formal market structures and buyer cooperatives limited farmers' ability to negotiate better prices. Local markets (47.3%) were preferred due to a variety of buyers and perceived price flexibility, whereas home-based (28.3%) and roadside (lower preference) sales were viewed as more convenient but less profitable. This highlights a trade-off between access and income potential, with farmers balancing logistics against financial returns. Improved market networks and infrastructure, such as aggregation centers or farmer cooperatives, could significantly boost the effectiveness of IC enterprises by mitigating these trade-offs.

More than half of the farmers (56.6%) reported having buyer contacts, which enhanced their ability to negotiate better prices. However, 66.7% observed that different buyers offered varying prices for chickens of similar weight, and 61.9% reported price differences across market locations. These findings highlight significant gaps in price transparency, a barrier also identified by Nyaga et al. (2022), who noted that the absence of standardized pricing in rural livestock markets limits producers' ability to plan and invest in production. Seasonal fluctuations had a substantial impact, with prices dropping by up to 35% during the low season (August–October) and peaking in December–February and April during holidays and festivals. This seasonality underscores the need for cold storage facilities, transport solutions, and coordinated market access to stabilize prices and support income predictability, as supported by the work of Mutua and Oloo (2023).

The results also emphasized the critical role that market structure plays in the adoption of improved IC. Farmers are more likely to invest in better breeds, housing, feeding, and veterinary care if there is a guaranteed market offering fair and consistent returns. Conversely, price volatility, lack of direct buyer access, and seasonal dips in demand discourage long-term investment in improved practices. These challenges underscore calls by recent literature for public-private partnerships to develop poultry marketing cooperatives, introduce e-marketing platforms, and establish decentralized poultry

collection points (Kiptoo et al., 2023). Such interventions would enhance transparency, reduce reliance on middlemen, and encourage smallholders to scale up IC production. Ultimately, structured market access, supported by policy interventions, is essential to unlock the full potential of indigenous poultry farming as a viable livelihood and poverty reduction strategy.

5.4 Potential of improved indigenous chicken husbandry as a poverty reduction intervention in a climate-changing environment

The findings highlight the growing potential of improved indigenous chicken (IC) husbandry as a practical, climate-resilient poverty alleviation strategy, particularly in food-insecure rural communities. The dual-purpose nature of poultry, evidenced by the consumption of 38% of chickens and 44% of eggs at home, aligns with recent literature emphasizing the vital role of indigenous poultry in promoting both household nutrition and income security (Chege et al., 2023). In many Kenyan households, especially those with children or pregnant women, chicken and eggs are essential protein sources, serving as accessible and culturally accepted nutrition buffers. This supports the conclusions of Aila et al. (2023), who observed that households engaged in indigenous poultry rearing showed better dietary diversity and nutritional outcomes than non-poultry households. The presence of dedicated poultry housing among 63.9% of farmers further enhances the potential of IC systems by reducing exposure to predators, improving biosecurity, and preventing cross-contamination - factors essential for climate-adaptive poultry farming (Kiptoo et al., 2022).

However, limited access to veterinary services, with only 39.8% of farmers reporting routine contact with animal health professionals, remains a major impediment to productivity and resilience. Disease outbreaks, exacerbated by climate variability, can rapidly deplete flocks and erode household gains. Similar challenges have been identified by Mwangi and Wambugu (2022), who emphasize the need for improved animal health infrastructure and local veterinary support to sustain poultry-based livelihoods. Furthermore, the study reveals that poultry knowledge is still largely transmitted through family traditions (31.1%), indicating persistent gaps in formal technical training. Although extension services are gradually expanding, their reach remains limited. Strengthening these services could unlock significant productivity

gains, as seen in other parts of East Africa where targeted poultry extension programs have boosted flock sizes and income (Omondi et al., 2023).

Beyond nutrition and income, chickens were also valued for manure production and their role in social ceremonies, demonstrating their multifunctional utility in rural households. This multifunctionality, combined with low capital requirements and adaptability to climate stressors, positions improved IC rearing as a viable strategy for climate-resilient rural development. As highlighted by Mutua et al. (2024), indigenous poultry systems can buffer households against shocks when supported by targeted extension, improved housing, and veterinary access.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

This chapter presents a summary of the key findings in line with the study objectives and provides practical and policy-related recommendations, as well as suggestions for future research.

6.1 Conclusion

The study established that socio-economic factors such as gender, education, employment status, household size, and income source to influenced the adoption of improved IC. Farmers with higher education levels and those engaged in agriculture as a primary income source were more likely to adopt IC practices. The data suggested that men were slightly more involved in IC rearing, potentially due to access to resources and decision-making autonomy. Education empowered farmers to access and act on technical information, while formal employment provided capital for inputs. Households with larger family sizes had more labor for poultry management. These findings indicate that targeted interventions must be socio-economically inclusive to scale adoption effectively.

The majority of farmers were knowledgeable about major poultry diseases and practiced basic health and feeding protocols. Newcastle disease and coccidiosis were most commonly identified. Farmers used a mix of commercial feeds, household scraps, and scavenging, with feed cost cited as a major constraint. On-farm feed production was limited but recognized as beneficial. Chick mortality due to disease and predators remained a challenge. Housing practices varied, with most farmers owning poultry structures, though hygiene infrastructure like feeding troughs and waterers was not universal. The study concludes that while husbandry knowledge exists, improvements in disease control, feed access, and housing are necessary to boost productivity.

Market access for poultry farmers was fragmented and highly variable. Farmers sold chickens through informal channels such as home-based sales, roadside, and open markets. Prices were inconsistent across buyers and market locations, with hotel buyers offering better rates. Most farmers lacked direct buyer contacts, reducing their

negotiation power and exposing them to price exploitation by brokers. Egg and live bird sales were equally important revenue streams, though market volatility undermined predictable income. Adoption of improved IC was affected by these marketing constraints, highlighting the need for better market structuring, price transparency, and improved buyer networks to sustain farmer interest and profitability.

Improved IC husbandry demonstrated significant potential for poverty reduction in the rural settings. Poultry contributed both to income and household nutrition, with over 80% of farmers consuming some of their chickens and eggs at home. Manure for farming and poultry use in cultural practices added non-monetary value. However, constraints such as inadequate veterinary services, reliance on informal knowledge transfer, and limited investment in housing and equipment limited the full realization of benefits. Nonetheless, poultry's adaptability, low startup cost, and multifunctional use position it as a strategic resource for enhancing food security, nutrition, and livelihoods among smallholder households.

6.2 Recommendation

Based on the findings and discussions of this study, several practical and policy-level recommendations are proposed to promote inclusive and sustainable adoption of improved indigenous chicken (IC) farming in Keiyo North Sub-County and similar rural contexts.

Extension programs must be targeted and differentiated to reflect the socio-economic realities of smallholder poultry farmers. Women, youth, and farmers with lower education levels should be prioritized through inclusive training modules, mobile outreach, and vernacular-based materials. Strengthening farmer field schools and local agricultural training institutions can bridge knowledge gaps, particularly in disease prevention, feed formulation, and poultry housing design. Extension services should also promote gender-sensitive programming to enhance the agency of women and support their access to production inputs, training, and markets.

Access to veterinary services remains inadequate, especially in remote zones. County governments and agricultural extension agents should scale up mobile veterinary

services and provide subsidized vaccines and medications for indigenous chickens. Training should focus on early disease identification, low-cost housing innovations, and hygiene management to reduce chick mortality and improve productivity. Partnerships with agrovets, NGOs, and private sector actors should be fostered to improve farmer access to quality feeds, minerals, vaccines, and other inputs. Demonstration farms and farmer-to-farmer exchange platforms should be supported to foster peer learning and best practice adoption.

The high cost and inconsistent supply of poultry feed were identified as major constraints, especially for female and low-income farmers. County governments and development partners should support community-based feed processing units, training on local feed formulation, and bulk purchasing initiatives through cooperatives. Additionally, policies should incentivize the production of alternative feed ingredients (e.g., sunflower, black soldier fly, legumes) and provide start-up grants or microcredit for small-scale feed production ventures.

Unstable prices, limited buyer networks, and reliance on brokers hinder farmer profitability. Local authorities should facilitate the formation of poultry producer cooperatives to improve collective bargaining, market access, and price negotiation power. Investment in structured poultry markets, with proper storage, weighing, and transaction facilities, is essential. Digital platforms should be promoted to provide real-time market prices, verified buyer directories, and production planning tools, particularly targeting digitally literate youth. Encouraging direct linkages between farmers and institutional buyers (e.g., hotels, schools, traders) will help eliminate exploitative intermediaries and stabilize incomes.

Government and development agencies should recognize indigenous poultry as a strategic enterprise for food security, poverty reduction, and climate resilience. Policies should mainstream poultry into county agricultural investment plans, nutrition programs, and school feeding schemes, where eggs and poultry meat can serve as affordable protein sources. Investments in infrastructure (roads, market sheds, vet clinics) and inclusive financing mechanisms are necessary to unlock the full potential of smallholder poultry systems. Programs must deliberately support women’s

participation, youth enterprise development, and secure land tenure, ensuring that vulnerable groups are not excluded from the poultry value chain..

6.3 Recommendation for further study

i. Future research should explore gendered access to resources and information in IC rearing, and how this influences adoption at household level.
ii. More detailed studies are needed to assess the effectiveness of locally made poultry feeds on productivity and disease resistance.
iii. Further studies should evaluate digital market platforms and their impact on poultry market access, price fairness, and adoption of improved IC.
iv. There is need for longitudinal research on the long-term impact of improved IC rearing on household poverty, food security, and resilience to climate shocks.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

QUESTIONNAIRE ON AGRICULTURE & POULTRY HUSBANDRY

1. Enumerator Name _____ Date _____
2. Ward _____Village _____ Stratify level _____
3. Respondent Mob. No. _____ Name (optional) _____
4. Respondent gender _____ Relationship with household head _____
5. Household head gender _____ Year of birth _____
6. Years farming as adult _____ Last class in formal education _____
7. Formal employment status _____Sector _____ Distance _____
8. Household size _____ No. below school age _____ No. in primary _____
9. No. in Secondary _____ No in College and University _____ Others _____
10. Estimated weekly household spending _____ Estimated annual spending _____
11. Which proportion of household total annual income is from i). Agriculture _____%, Off-Farm Busines _____%, Formal employment _____%, Other family support _____%.

12. What is the estimated annual total spending on agriculture _____, Education _____ Others (specify) _____

B: CHICKEN REARING INFORMATION

1. Have you ever reared chicken? Yes [ ] No [ ] If YES, is the farmer rearing chicken? Yes [ ] No []
2. If NO, have you ever reared chicken? Yes [ ] No [ ]
3. If YES (to Q2 above), what was the highest number of chicken did you have? ---------

4. If NO, why are you not rearing chicken? ……
5. If NO, why have you never considered rearing chicken as an enterprise? ……

C: INDIGENOUS CHICKEN HUSBANDRY AND AGRICULTURAL PRACTICES

1. For those who rear chickens, how do you choose the best breed of chicken to rear? i) ……..….. ii) ……..……iii) …..……
2. Do you have information on the best breed to rear/keep? (YES) (NO) ……..
3. How do you get chicken for rearing? i) …… ii)……..……..iii) ……iv)……..
4. What is the advantage of where you source the chicken stock from each of the mentioned sources?……
5. Do you have any restrictions on the source of chicken stock on each of the mentioned sources? ……..……
6. Do the source where you get the chicken stock give information on the;-
   a Breed Yes [ ] No [ ]
   b Vaccination status Yes [ ] No [ ]
   c Management practices Yes [ ] No [ ]
7. Have you been a beneficiary of the county program on chicken distribution per household? Yes [ ] No [ ]
8. If YES, could you state the advantages?…….
9. Are you aware of the various poultry diseases that affect chickens? Yes [ ] No [ ]

Disease	Existence of disease Yes [ ] No [ ]	Vaccination schedule of disease	Identification of the disease	Handling the stock	Method of treatement
Marek					
Gumboro					
Newcastle					
Coccidiosis					
Fowl typhoid					
Fowl pox					

10. Do you control the parasites in chickens? Yes [ ] No [ ]

11. Are predators/thieves/diseases a threat to chicken farming? Yes [ ] No [ ]
12. Do you always provide feeds for your chicken? Yes [ ] No [ ]
13. If YES, how do you feed them? ……
14. Rank the main feeding practices that are commonly used

Feeding programme	Age of chicks	Growers	Mature chicken
Poultry feeds			
Maize and household food remains			
Scavenging			

Feeding programme	Number of birds	chicks (0-8 weeks)	Number of birds	Growers (8-16 weeks)	Number of birds	Mature chicken (6 weeks and above)	Average yields	
Poultry feeds							No. of eggs	Carcass weight
Maize and household food remains								
Scavenging/Free range								

15. What are the challenges of poultry farming?
16. How do you consider the cost of buying poultry feeds? High [ ], Medium [ ], Low [ ]
17. Where do you source your poultry feeds? ……..
18. Do you practice on poultry feed production? Yes [ ] No [ ]
19. If YES, what are the advantages?
20. What is the proportion of ingredients that you need to produce 10kgs?

Ingredients	Amount	Proportion	Cost

21. What proportion of your chicks reach maturity? (in percent)
22. What are the major causes of chick loss
23. What proportion makes more money? Eggs or chicken selling?
24. On average, at what age do you dispose of your chicken?
25. In the last six times, what were the drivers of sale of your chicken selling?

Selling	Driver of sale	Average cost	How did you get the buyer	Were you happy with the price?
Six				
Fifth				
Fourth				
Third				
Second				
First				

26. Which are the most accessible selling opportunities? (List and rank)
27. Do you have contacts of chicken buyers? Yes [ ] No [ ]
28. Do different buyers have different prices for poultry of the same size/weight? Yes [ ] No [ ]
29. What market opportunity do you have for your chicken?
30. Do different markets offer different prices for poultry of the same size? Yes [ ] No [ ]
31. On average what could be the price of a mature chicken in your nearest market?

Average weight	Sale from home (price in ksh)	Sale to local hotels (price in ksh)	Sale to the open market (price in ksh)	Sale by roadside (price in ksh)	The best price for the chicken in best season	Months /seasons Worst season
1KG						
1.5 KG						
2.0						
3.0						
3.5						
4.0						

32. What proportion of chicken is consumed at home for nutrition supply (%) and what proportion of eggs are eaten at home? (%)
33. Do you have a separate housing for chicken? Yes [ ] No [ ]
34. If NO, where do your chicken stay?
35. If Yes, what is the dimensions of your chicken housing?
36. Do you have chicken feeding troughs Yes [ ] No [ ] and chicken waterers Yes [ ] No [ ]

37. Do you have any veterinary officer that you conduct for poultry handling services? Yes [ ] No [ ]
38. Where did you get the idea of chicken farming?
39. What benefits of chicken farming can you list i) ……..
    ii) ……iii)
    ……iv)……
40. How do you rank the benefits listed above starting with the best?…….
    ……
    …..

AGRICULTURAL PRODUCTION

1. What is the estimated total size of the land you own _____ Acres
2. Do you own all the land (YES), (NO) _____ If, yes do you have the title deeds _____ (YES), (NO)
3. Do you rent any land _____ (YES), (NO) If, yes what acreage is rented _____ which proportions _____ percent
4. Land allocation to agricultural enterprises questions

Land allocations	Area allocated	The proportion of total land
Home compound		
Grazing area /paddock		

Number of trees _____ No. of fruit trees _____

	SEASON ONE			SEASON TWO		
CROPS	Area allocated	Proportion of all land	Amount harvested	Area allocated	Proportion of all land	Amount harvested
1.						
2.						
3						
4.						
5.						
6.						

Estimated Returns from Agricultural Enterprises

Enterprise	Household food use value (Kshs) year	Proportion	Ranking as food security (most as 1)	Income sources value (KShs) year	Proportion of total	Ranking as income (most important as 1)	Ranking as emergency response (most important =1)
Livestock							
1							
2							
3							
4							
5							
Crops							
1.							
2.							
3.							
4.							

Agriculture extension in poultry farming:

1. How do agricultural extension services influence the adoption of best management practices among small-scale poultry farmers?
2. What role does agricultural extension play in improving biosecurity measures to control disease outbreaks in poultry farms?
3. In what ways do extension programs enhance farmers' knowledge of poultry nutrition and feeding practices to increase production?

4. How effective are agricultural extension methods (e.g., farm visits, training workshops, and digital platforms) in promoting sustainable poultry farming in rural areas?

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