Participatory Assessment of the Efficacy of Indigenous Chicken Value Chain Practices Among Smallholder Farmers in Kericho County, Kenya

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ABSTRACT

Indigenous chickens play a vital role in rural livelihoods, particularly in developing countries. However, their productivity faces challenges such as poor feeding, housing, healthcare, and inadequate husbandry practices. While research has explored these issues using qualitative and quantitative methods, underlying contextual factors are often overlooked. Guided by the Value chain model and Grounded theory, this study evaluated indigenous chicken value chain (VC) through a contextual lens, emphasizing context-specific knowledge. The objective was to assess the efficacy of the indigenous chicken VC practices in Kericho County, Kenya, through a participatory approach. A community-based participatory action research design was employed, with samples drawn using purposive and multistage sampling techniques. Based on Yamane's sample size formula, a sample of 398 farmers was drawn from among rural-based indigenous chicken farmers. 15 key stakeholders also participated in the study. Data collection focussed mostly on qualitative approaches, using participatory rural appraisal tools like focus group discussions, observation during transect walks and community workshops. Quantitative data were collected using interview schedules. Data were analyzed using Grounded theory methods and descriptive statistics. The study identified five segments in the VC: breeding for eggs, incubation and hatching, chick brooding and rearing, flock management, and marketing. However, the chain lacked processing segment, with most products reaching consumers through intermediaries. There was weak integration of actors within the VC. In conclusion, producers' practices contributed to efficacies in the indigenous chicken VC through: genetic diversity preservation, resilience-building, rational decision-making, self-sufficiency, bio-economy, complementary healthcare, and market embedded practices. Challenges included economic constraints, epistemic limitations, weak institutional support, weak infrastructure, and risk aversion. To enhance the productivity of the VC, community financing models, capacity-building, formation and strengthening of producer organizations, cooperative marketing, and partnerships with local government for infrastructure development are recommended.

Keywords: Community Based Participatory Action Research, Grounded Theory Analysis, Indigenous Chicken, Participatory Rural Appraisal Tools, Value Chain Segments

I. INTRODUCTION

Indigenous chickens have important roles to play among rural households. However, its productivity continues to face many challenges, some of which have been documented broadly using different analytical approaches (Bett *et al*., 2014; Afolabi *et al.,* 2019; Kimenchu *et al*., 2024). Qualitative and quantitative approaches have been applied to understand the challenges in indigenous chicken value chain. Poor feeding and predation at production node have been reported as impediments to productivity, high chicken mortalities and diseases have been blamed too (Bett *et al*., 2014). Diseases, poor nutrition and inadequate husbandry management thus appear to contribute to low efficacies in the smallholder farmers' practices, yet indigenous chicken have crucial socioeconomic roles, particularly in resource limited households (Tenza *et al.,* 2024). The indigenous chicken, however, is naturally efficient at disease resilience, heat tolerance and ability to utilize poor quality scavenged foods, attributes that smallholders can leverage on for productivity.

The productivity and sustainability of the indigenous chicken value chain can be assessed by evaluating the effectiveness of practices at each segment of the value chain. While an ideal value chain operates efficiently and benefits all actors equitably (Zamora, 2016), the degree of effectiveness in reality varies depending on geographical context and

livelihood strategies of households and communities. Studies on the indigenous chicken value chain have highlighted challenges that compromise the effectiveness of practices and processes in promoting productivity and sustainability. At the primary production stage, challenges such as high cost of feeds, poor healthcare and high mortality rates have been reported (Wambua *et al.*, 2022). Additionally, infrastructural issues including inadequate roads, energy, housing, water supply and markets further constrain productivity (Kirori, 2015).

At the marketing stage, however, the demand for indigenous chicken products remains high. Indigenous chicken also has the advantage of being able to scavenge for food with minimal food supplementation. This low-input livelihood strategy offers significant opportunities, especially for poor and marginalized populations (Abbasi *et al.*, 2023). To effectively enhance productivity and sustainability, activities and processes must be tailored to the specific socioeconomic and demographic conditions of the context. This study investigates the indigenous chicken value chain through the lens of contextualism, emphasizing the generation of context-specific knowledge that aligns with local conditions.

1.1 Statement of the Problem

Indigenous chickens play a significant role in the livelihoods of rural households in Kenya, particularly among the resource-poor, by providing food, income, and economic resilience (Tenza *et al.*, 2024). Their adaptability to low input farming and their high market demand makes them an important asset for smallholder farmers. However, despite their potential, productivity remains low due to a combination of technical and socioeconomic constraints along its value chain. Major challenges include poor nutrition, diseases, and poor husbandry practices among producers (Wambua *et al.*, 2022). Additionally, weak market linkages further hinder productivity and sustainability of the livelihood strategy among smallholder farmers. Despite these challenges, indigenous chicken farming has notable strengths, such as its ability to thrive in resource-constrained environments and its growing consumer demand (Abbasi *et al.*, 2023). The challenges and opportunities that have been documented, however, vary across different geographical locations and socio-economic contexts. While previous studies have predominantly documented these factors using quantitative and qualitative surveys, a deeper, context-specific understanding is needed to develop effective interventions.

To address this gap, a participatory assessment involving key actors along the value chain, based on the value chain model, is essential. By actively engaging farmers and other stakeholders, this study aims to generate insights that will inform the development of a context-specific framework for upgrading the indigenous chicken value chain. The findings are expected to contribute to enhanced productivity and sustainability of indigenous chicken farming in the study area.

1.2 Research Objectives

This study was guided by the following specific objectives:

i. To conduct a participatory mapping of the indigenous chicken value chain
ii. To assess through participatory methods the challenges affecting the efficacy of indigenous chicken value chain practices
iii. To identify, through participatory assessment, opportunities for upgrading the indigenous chicken value chain

II. LITERATURE REVIEW

2.1 Theoretical Review

In the practice of social science research, a problem is often considered within different perspectives necessitating the application of different methods of collecting and analyzing data in order to obtain the truth about a research problem or phenomena. In research philosophy, the concept of epistemology is concerned about what counts as legitimate knowledge (Braun & Clarke, 2013). Uwe (2017) argues that what counts as knowledge determines how meaningful knowledge can be generated. There are two broad epistemological positions; positivism and constructivism. But then there is a third epistemological position in the social sciences that sits between the two; contextualism (Uwe, 2017). The present study is one concerned with social and organizational phenomena requiring both objective and subjective techniques. These techniques fall on an overall paradigm that sits between positivism and constructivism; an epistemological position of contextualism. This study was therefore guided by the pragmatic position of contextualism which integrates qualitative and quantitative approaches. According to Bryman (2012) as cited by Chiamjinnawat (2017) research philosophy shapes the approaches to research and guides the researchers' actions and therefore plays an important role in the design of the study.

In the social sciences, a theoretical framework refers to a structure that guides research by drawing on formal theories (Grant & Onsaloo, 2014). It provides theoretical assumptions that inform data analysis and interpretation (Kivunja, 2018). This study was guided by the value chain model and Grounded theory. The value chain model employs an analytical approach to trace product flows from inception through a series of nodes where value is added at each

stage to the ultimate consumer (Fabe *et al*., 2014). In this study, the model was used to track indigenous chicken production from inputs to the final consumer. Grounded theory, on the other hand, is a research methodology that generates theoretical constructs from data provided by study participants. The researcher interprets and constructs meaning from the data (Corbin, 2011). In Grounded theory analysis, qualitative data are deconstructed into components through coding and re-coding based on relationships to form overarching categories (Braun & Clarke, 2013). Grounded theory aligns well with participatory research methods.

2.2 Empirical Review

Rural poultry rearing is a common practice worldwide, particularly in developing countries (Ahuja, 2013). In Kenya, indigenous chickens account for over 75% of the total poultry population (Magothe *et al*., 2012). The indigenous chicken value chain involves several actors, both direct and indirect. At the production level, it serves as a vital source of income, particularly for youth and women (Wambua *et al*., 2022). However, in many developing countries, indigenous chicken farming suffers from low productivity (Bett *et al*., 2014; Afolabi *et al.*, 2019). For example, egg-laying performance as low as six eggs per clutch has been recorded, despite a potential of over 24 (Bett *et al.*, 2014). In Kenya, under good management, local chickens can lay between 80 and 100 eggs per year (Wambua *et al.*, 2022). Yet, studies indicate suboptimal performance, with some reporting averages as low as 53 eggs annually (Cheruiyot & Adhiaya, 2021). Although indigenous chickens are well adapted to their environments, their scavenging nature, fluctuating nutrition, poor health management, poor housing and inadequate husbandry practices compromise their productivity and profitability (Food and Agriculture Organization [FAO], 2018; Ipara *et al.*, 2023).

Several studies have examined the constraints and opportunities within the indigenous chicken value chain. However, many have relied on survey methods, which, while useful for broad insights, often lack the depth to capture context-specific challenges and opportunities as shaped by environmental and socioeconomic factors. Constraints are diverse. A baseline survey by Tarus *et al.* (2016) found that most farmers relied on locally available feeds, such as kitchen leftovers, without considering nutritional quality, potentially affecting productivity. Similarly, Nyanja (2016), using a descriptive survey identified marketing as a major challenge to indigenous chicken farming. Other constraints, documented in a cross-sectional descriptive survey, include high cost of inputs, lack of capital, poor access to extension services, and poor access to knowledge (Anyona *et al.*, 2023). There are, nonetheless, some opportunities to mitigate these challenges.

In regard to opportunities, Cherotich and Sakaja (2018) explored the role of interactive participation in sustaining indigenous chicken farming as a livelihood strategy and concluded that farmer engagement significantly contributed to productivity, suggesting that indigenous chicken can leverage on collaboration and partnerships for productivity enhancement. In another descriptive survey, Too *et al.* (2019) highlighted the influence of market factors on the commercialization of indigenous chicken farming. Additionally, Njuguna *et al*. (2017) found that membership in farmer groups significantly improved access to credit and profitability in indigenous chicken farming. Beyond Kenya, a cross-sectional survey by Manzvera *et al.* (2023) in Zimbabwe revealed a link between market participation and food and nutrition security. In the Philippines, a study guided by a value chain model (Relucio, 2021) identified farmers, middlemen, and retailers as primary actors in the indigenous chicken value chain. The study further revealed that profits were disproportionately distributed in favour of middlemen. Prices were neither fixed nor based on standard measures, suggesting an opportunity existed to promote fair trading practices.

In summary, most studies on indigenous chicken farming rely heavily on quantitative and qualitative surveys. Participatory methods remain limited, and where applied, they often focus on specific nodes within the value chain, such as marketing. Even when the value chain model is used, non-participatory approaches such as quantitative methods are predominant (e.g. Relucio, 2021). This study focuses on integrating the value chain model with a participatory methodology to provide a more comprehensive understanding of indigenous chicken farming. What research design is suitable for this study?

III. METHODOLOGY

3.1 Study Design

The study adopted a Community Based Participatory Action Research design (CBPAR). In this design, participation plays a central role in the research process. In this methodology the subjects are participants in the creation of context specific knowledge (Franz *et al.*, 2010). The participatory research combines local insights of community members with technical expertise of researchers to explore mutual interests and issues (Huffman, 2017). The research process is democratic and non-hierarchical in approach, in the sense that power is shared among the researchers and participants (Franz *et al.*, 2010). The CBPAR design incorporates the active participation of farmers and their advisors, and works in the context of farmers own farming practices (Carberry, 2010).

3.2 Location of Study

The study was conducted in the rural areas of Kericho County, located in the Rift valley region of Kenya (Figure 1). The county is one of 14 in the region, situated between longitude 35^0 02' and 35^0 40' East and between the equator and latitude 0^0 23' South. It encompasses a variety of agro-ecological zones ranging from upper midlands to lower midlands and spans an area of 2,479 km^2 (County Government of Kericho, 2014). Administratively, the county is divided into six sub counties, three of which were purposively selected for the current study.

Figure 1
Map Showing Study Location

3.3 Target Population and Sampling

The target population for this study was all the rural based indigenous Chicken farmers of Kericho County which has six Sub counties. Purposive and Stratified random sampling techniques based on geographical location and agro-ecological zones were used to select three study locations in three sub counties. The study sites were selected based on a set of criteria including; Agro-ecological zones, intensity of indigenous chicken population, socioeconomic infrastructure to cover for both weak and strong infrastructure and resource poverty levels to cover for both endowed and less endowed populations. Whereas quantitative research is guided by the desire to select a random sample, qualitative research is guided by the desire to saturate the data; to gather data from as many rich sources as possible until no new information is forthcoming (Kumar, 2019). This study employed a predominantly qualitative approach to gather data.

According to Kenya National Bureau of Statistics [KNBS] (2019) estimates, 71,678 households in Kericho County practiced indigenous chicken rearing, with about 61,278 based in rural areas. To determine a suitable sample size for qualitative and quantitative data collection, the Yamane formula was applied: $n = N/ (1+N (e)^2)$, Where: n = sample size, N = target population, e = margin of error (.05). Based on the target population of 61,278 rural households, the calculated sample size was 398. Additionally, 15 other key stakeholders participated in the study. This article is based on a broader thesis that employed a mixed methods approach. This particular study achieved its objectives through focus group discussions with an average of 30 participants per Sub County, selected based on socio-demographics and geographical locations and engaged using Participatory Rural Appraisal tools.

3.4 Data Collection Instruments

An agricultural value chain analysis involves identifying and assessing activities, processes and stakeholder inputs that contribute to value creation, from the conception of a production idea to the delivery of the product to the ultimate consumer (Fabe *et al.*, 2014). Various tools are available for this assessment, including value chain mapping, market analysis, economic analysis, stakeholder analysis, technology tools such as mobile applications, scenario planning tools, and participatory tools (Donovan *et al.*, 2015).

Participatory tools include focus group discussions and Participatory Rural Appraisal (PRA) techniques (Bammann, 2007). This study focussed on the use of participatory tools, particularly focus group discussions and PRA methods, to conduct value-chain mapping, identify segments within the indigenous chicken value chain, and engage stakeholders in identifying challenges and opportunities within the chain. These tools were employed as part of a broader philosophy-guided design of Community Based Participatory Action Research (Kumar, 2019). An interview schedule was used to collect individual household data and an observation checklist was used to gather data during transect walks.

The focus group discussion guides were used as primary tools for data collection. The focus group discussion involved interviews of small groups of people; about six to eight on a specific topic as recommended by Uwe (2017). Focus group discussions are methods where data are collected from multiple participants at the same time and therefore some interaction among group members is central (Braun & Clarke, 2013); in the current study PRA tools were used to foster the interactions among participants. The social interaction is what distinguishes focus group discussion from other methods such as interviews or survey questionnaires. The focus group discussion guide was structured so as to capture the practices upstream, mid-stream and downstream in tandem with value chain analysis protocols (Chengappa, 2018). It was designed so as to capture the participants' views on what the current practices are, why they are done that way, what the results are, what the challenges are and what improvements are required, and the opportunities that remain unexploited. A broader question sought to understand which practices worked well (efficacies) in the value chain and which ones presented challenges. Potential opportunities for upgrading the value chain were sought by asking the participants to discuss the practices that present the biggest opportunity for improvement of the value chain.

3.5 Data Analysis

The grounded theory linked constant comparative analysis methodology (Kolb, 2012) was employed to generate categories on the efficacies, challenges, and opportunities in the indigenous chicken value chain. In grounded theory analysis, qualitative data is broken down into themes through a hierarchical and logical process. Raw data is deconstructed into smaller components through open coding. These open codes are then grouped based on their relationships into broader categories known as axial codes. Finally, an overarching category is developed from the axial codes, through a process of selective coding (Braun & Clarke, 2013). The resultant selective codes are higher level concepts that comprehensively describe the phenomenon being studied (Braun & Clarke, 2013). Descriptive statistics such as frequencies have also been used; to a limited extend, to aid in full description of the variables in this study.

IV. FINDINGS & DISCUSSION

4.1 Practices along the Value Chain and their Efficacies

The value chain approach to analyzing indigenous chicken productivity was introduced to the participants as part of a broader participatory research analysis during a community workshop. A learning-by-doing approach was adopted. The facilitator explained the concept of value creation, tracing it from the acquisition of inputs for chicken production to the point when the consumer accesses the product for ultimate use. The participants were then asked to outline the main activities of the indigenous chicken value chain as it applied to their community.

Through focus group discussions and consensus-building, the participants developed a value-chain map which is shown in Figure 2. The segments identified included breeding for egg production, egg incubation and hatching, chick brooding and rearing, flock management, and marketing. Each segment was then discussed in relation to the farmers' practice. The following sub-section provides a discussion of the outcome.

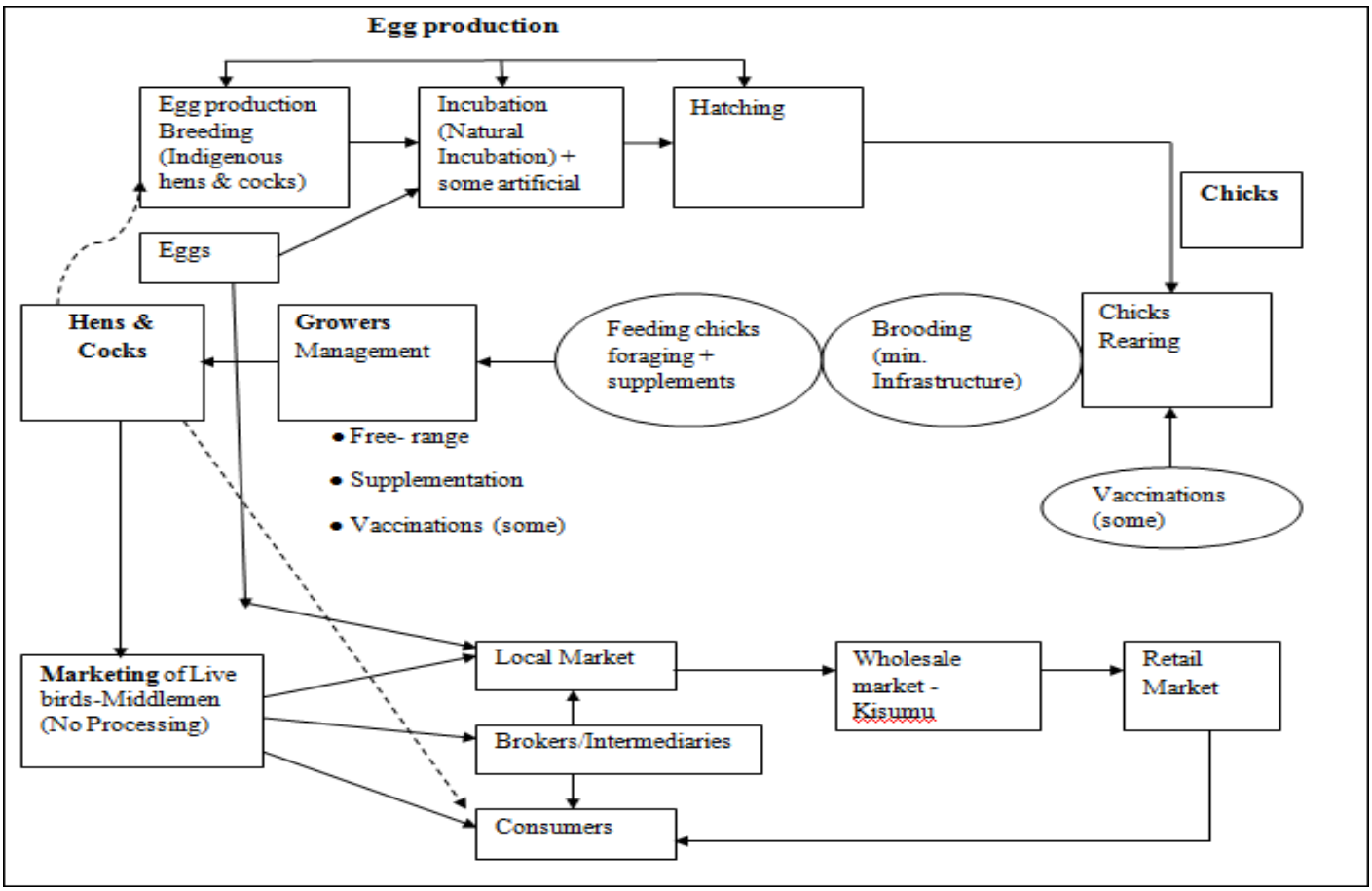

Figure 2

Indigenous Chicken Value-Chain segments as identified by the Participants

4.1.1 Breeding for Egg Production

During the focus group discussions it was revealed that breeders were selected based on their "*foraging habits and resistance to diseases"*. The pullets were mainly kept outdoors to forage freely, scavenged feeds was supplemented with kitchen waste, including maize flour crumbs and vegetables. One participant observed, "*The pullets have the energy to scavenge and find plenty of feed compared to the chicks and hens*". The pullets were only confined at night. Pullets were selected for breeding based on their feeding behaviours and the performance of their parents. As one participant stated, "*We select those that are aggressive during feeding because they tend to grow faster and are more likely to lay more eggs*".

The participants further noted that the selection of indigenous chickens for breeding is primarily based on productivity. One group observed: "*we select the hen that takes good care of the chicks for breeding",* while another mentioned, "*we choose chickens that are good at foraging, and such hens are often good layers and grow quickly"*. These views suggest that production performance was a key trait in the traditional selection of the breeding flock.

The selection of breeding flock based on perceived egg-laying potential align with those reported in Ethiopia by Bekele *et al.* (2020), where most farmers prioritized egg production traits when selecting their breeding flock. Additionally, body weight and plumage colour were other criteria considered in their study. Tunsisa and Reda (2022) similarly reported that farmers mostly selected for breeding based on body weight and reproductive performance. Desta and Wakeyo (2024) observed a similar behaviour amongst producers who selected breeding hens based on maternal instincts and laying performance. These practices align with FAO (2004) recommendations for natural incubation where large body size for breeding hens is a desirable trait.

When asked why improved breeds were not common, participants explained that "*improved breeds are more susceptible to diseases*" and "*require higher levels of management*". These responses indicate a preference for resilient breeds that are less resource-demanding. Traditional breed selection practices among these rural communities focused on key aspects of productivity and adaptability, attributes that seemed effective in promoting sustainability. However, the reliance on experiential knowledge passed down through generations, without support from technical knowledge in genetics and breeding, limited their potential to achieve an optimal sustainable livelihood strategy (Bekele *et al*., 2020; Kanyama *et al*., 2024).

The view that cross-bred chickens require higher levels of management indicates a certain level of resistance to change, reflecting some reluctance to invest further in this livelihood strategy. On the positive side, this behaviour has

the advantage of preserving the genetics of the indigenous chickens. As argued by Demissu and Ebisa (2024), genetic diversity and preservation is vital for the sustainable utilization and advancement of indigenous chickens. This view is emphasized in Kpomasse *et al.* (2023).

On chicken housing, simple wooden structures were the most common chicken houses observed during transect walks across villages. Some of these structures lacked adequate ventilation and many were rarely cleaned, resulting in the accumulation of chicken waste. Quantitative data from cross-sectional surveys confirmed that only a few farmers cleaned their chicken houses regularly; 5% reported cleaning 'always' while about 50% cleaned "sometimes". This suggests that insufficient cleaning may have contributed to the high prevalence of chicken diseases reported by participants. Munazir *et al.* (2024) points out that chicken house cleaning and disinfection is important in poultry farm bio-security and a major contributor to prevalence of infectious diseases in developing countries.

Regarding housing design, one participant commented, "*No one has given us the right design for chicken houses".* This suggests a dual challenge: a knowledge gap and a tendency for producers to expect knowledge to be provided, rather than actively seeking it; an information seeking behaviour issue. Another participant noted, "*We construct chicken houses based on the skills of our local artisan*". This indicates that chicken houses were constructed based on the carpenters previous experiences without technical specifications from animal production experts.

The current findings suggest that indigenous chicken producers in the study area paid insufficient attention to the design and maintenance of chicken houses in line with best practices. Similar findings have been reported in Milkias *et al.* (2019) where chicken housing was reported as the second most important challenge after diseases. Neglected housing conditions lead to the proliferation of external parasites. Providing suitable housing for indigenous chickens to protect them from adverse weather conditions, theft and predators (Tenza *et al.*, 2024) is crucial for enhancing productivity and ensuring the sustainability of this livelihood strategy. In another study conducted in Zambia, Chebo *et al.* (2024) observed that some indigenous chicken producers allowed their chickens to rest in designated areas within family houses and kitchens. This practice similarly reflects a lack of attention to proper housing requirements for the chickens, likely attributable to limited resources and knowledge gaps.

4.1.2 Egg Incubation and Hatching

The participants highlighted that the most common method of incubation is the natural method, where brooding hens sit on the eggs until they hatch. The nesting areas varied, ranging from well prepared nests in the chicken coop to the use of old car tyres surrounded by clothing and in some cases a secluded spot in the living room or kitchen. While a few participants owned electric incubators, these were primarily used for incubating eggs from improved cross-breeds (*Improved Kienyeji*), while indigenous chicken eggs were incubated using the natural method.

Using modern incubators for egg incubation initially seemed like a strange topic to the participants. One participant asked, "*Is that necessary for our indigenous chickens, which can brood their own eggs?"* The others generally agreed that it didn't seem necessary. However, one group member argued that electric incubators would allow more chicks to hatch because the hen could start a new laying cycle sooner with methods available to stop her broodiness. In the end, the group appeared convinced by this perspective. These observations suggest that many participants faced knowledge gaps regarding egg incubation and hatching methods beyond natural approach; a need for capacity-building.

In another study conducted in Ethiopia, Tunsisa and Reda (2022) reported 100% reliance on the natural incubation by hen. The incubation was timed to coincide with a period of feed availability, implying that the egg-brooding frequency was compromised. This suggests that the natural incubation had other associated challenges that adversely affected productivity.

4.1.3 Chick Brooding and Rearing Practices

During focus group discussions, the chick rearing segment of the value chain emerged as a critical area. One participant noted: "*This is the stage where we lose most of our poultry*"; indicating that mortalities were higher at this stage than any other. When asked for reasons, participants explained that '*young chicks are fragile and vulnerable to diseases and predators'*. This response suggests that diseases and predation were key factors affecting chick survival. The issues of diseases and predation were then probed further. Newcastle diseases and respiratory illness were cited as the most common diseases, with all participants appearing to agree. In another study, Macharia *et al.* (2022) similarly identified chicken diseases as the greatest impediment to productivity.

A question posed to the focus group about farmers' practices regarding vaccination against immunisable diseases such as Newcastle disease received varied reactions. A few reported following the recommended vaccination schedules. Others noted challenges such as "*sometimes vaccination schedules are due when we have no money to undertake the activity*". Some participants also complained that "*the vaccines are sold in doses of 100 birds, while we only need something like 20 doses*". These responses highlight several issues, first there were very few adopters of the recommended vaccination schedules; second, economic constraints hindered timely vaccination and third, there was a lack of social networking, which could otherwise enable farmers to collectively purchase and share 100-dose vaccine

packages. The third issue points to weak social capital within the rural communities studied, as argued in Cheruiyot and Kibett (2024). Could some of the chick mortalities be related to brooding management?

According to one focus group discussion, "*the hen provides the necessary warmth to the chicks, adequate for their survival."* Chick shelters were typically temporary structures, such as simple wooden frames and woven baskets. Some farmers also used wooden crates to protect the chicks from predators. Brooding was mainly done indoors at night and during bad weather. However, on warm sunny days, it was carried out out-doors in makeshift shelters. This frequent movement of chicks between locations required significant labour, but who does that? The task was largely managed by women and children.

Regarding improved brooding facilities such as the use of infra-red electric bulbs, participants agreed that they were rarely used for indigenous chicks. Such facilities were primarily adopted by a few farmers for brooding cross-breed, commercial layers, and broiler chicks. The natural warmth of a hen is more sustainable, for small scale indigenous chick-rearing but negatively impacts overall chicken productivity (Tunsisa & Reda, 2022).

A brooding hen focuses on raising chicks instead of laying eggs which could otherwise increase productivity if artificial brooders were used. Moreover during adverse weather conditions as reported by some participants, a hen may fail to provide adequate warmth to all chicks since the hen can only brood on limited number of chicks at a time. This practice is untenable for the commercialization of the indigenous chicken farming, particularly for medium and large scale production (Boleli *et al.*, 2016). This presents an opportunity to build the capacity of farmers, particularly those aiming to commercialize, by introducing contemporary chick brooding techniques to enhance sustainable productivity.

4.1.4 Flock Management

Chickens were housed in a variety of structures, including grass-thatched buildings with mud walls and houses constructed from timber. Some participants indicated that they sheltered their chickens in kitchens overnight, explaining that "*the kitchen is warm and helps prevent respiratory diseases in chickens*". Few farmers had constructed chicken houses according to recommended designs, citing reasons such as a "*lack of materials*", "*lack of skilled artisans*" and "*lack of knowledge*" about the proper designs. These observations suggest little attention was paid to the housing of the chickens. This challenge of housing conditions appears widespread; it has been reported widely in other studies (Abbasi *et al*., 2023; Ariffin *et al*., 2024; Chebo *et al*., 2024; Tenza *et al*., 2024).

During the day, chickens roamed freely in search of feed. Some were allowed to scavenge for the entire day, while others were confined for over half a day before being released in the afternoons to prevent them from "*straying into neighbours' farms*." Their diet was supplemented with kitchen wastes, and occasionally grains when available, particularly during the harvest season. During this time, surplus or discoloured maize unsuitable for human consumption was commonly used as a supplement. This observation suggests that maize shelling waste was a significant source of supplemental feed for free-range chickens.

Only a few farmers reported using commercially-formulated "*kienyeji mash*" feeds. For most, the chickens' diet primarily came from natural foraging, including insects, grains and greens. One innovative practice mentioned by participants involved "*partially covering cow dung with polythene sheets to encourage worm growth"*. When ready, the worms were uncovered and fed to young chicks.

In regard to pest control, the farmers reported that they cleaned their chicken houses to control pests such as fleas. However, the majority appeared unaware that chickens also required regular deworming. One participant remarked, "*So even chickens need deworming like cattle*?" This observation highlights a gap in awareness among some farmers regarding this practice. As for vaccinations, only a few farmers carried them out. Several others lamented poor access to vaccines, which were often sold in large doses suitable for 100 chickens, far more than their small flocks required. Consequently, disease outbreaks, such as Newcastle disease, sometimes decimated their flocks. These accounts point to significant losses in chicken productivity among rural communities and underscore the inefficacy of their current pest and disease management practices.

Some participants indicated that they relied on traditional herbs to treat common chicken diseases. One participant remarked, "*We take chances and use herbal remedies because we cannot vaccinate once they become infected*". This suggests that herbal medication was primarily used as a complementary treatment. However, the same participant noted, "*sometimes some recover, others do not",* highlighting the significant losses incurred despite the use of alternative remedies. Similar findings on use of herbal medications for chicken healthcare were reported in South Africa (Tenza *et al.,* 2024).

Some farmers coped with diseases by reducing flock sizes, as explained by another participant, "*We do not keep very many chickens because if diseases break out, the loss will be heavy*". This illustrates a strategy where farmers limit flock sizes to mitigate potential losses from anticipated disease outbreaks rather than investing in preventive measures such as vaccinations. This practice has direct implications on productivity.

Quantitative data further supports this observation, showing a prevalence of small flock sizes, with a mean of 26.1 ± 24.9 (mean ± standard deviation), and a high coefficient of variation of 95.3%. This high variability may partly

reflect risk-averse behaviour, as some farmers prefer smaller flocks to reduce potential losses. Additionally, it could also indicate differing purposes for keeping chickens, with commercial farmers tending to keep larger flocks compared to those raising chickens for home consumption.

The breeding system adopted by indigenous chicken farmers was characterized by random mating, where chickens mated freely within the flock. In most cases "*we have 2 to 4 cocks within a flock of up to 30 chickens*", observed one participant. However, this random mating included an element of selection. Participants noted that "*most farmers select fast-growing cockerels to be raised as roosters*", suggesting some degree of selective breeding. This practice likely contributed to maintaining genetic diversity within the indigenous chicken population.

Quantitative data revealed significant variation in the number of roosters kept by participants. Some farmers reported having one rooster for as many as 26 hens, while others maintained a ratio of 1 rooster to 8-10 hens. This wide variation likely reflects different farming objectives, including efforts to enhance genetic diversity and for market-driven motives. One farmer commented, "*Cocks grow faster and fetch more money during periods of high demand, such as Christmas*". This highlights a market-driven motive among farmers keeping many roosters, reflecting a degree of market embeddedness in their farming practices (Granovetter, 1985).

Maintaining a large number of roosters can lead to infighting, which negatively impacts egg fertilization. Conversely, too few roosters can also result in reduced egg fertility (Molapo & Kompi, 2015). Striking a balance in rooster-to-hen ratios is therefore crucial to achieving optimal fertility and productivity. A similar observation has been reported in Oyasere *et al.* (2020), recommending a cock: hen ratio of 1:10.

4.1.5 Marketing Practices

The indigenous chicken value-chain actors identified by the participants at the marketing segment included producers, middlemen and retail traders. The middlemen acted as intermediaries purchasing chickens and eggs from the farmers and selling them to retail traders and consumers mostly in urban centres. Some farmers sold their produce directly to traders in urban centres and consumers such as local hotels and individuals (Figure 2).

The middlemen seemed to play a crucial role.

> *"We usually sell them to middlemen who come to our door steps. This saves us the risk of transporting chicken for long distances, only to find that there are low prices at the market. You would rather negotiate for a better price when you are still at home".*

This account from a producer suggests that the farmers would rather off-load marketing risks to middlemen at farm gate than risk market losses exacerbated by transport costs incurred.

Another participant commented further that,

> "*Sometimes you get to the market and you find that it is like all the buyers have agreed on ceiling prices. A hen that would fairly be priced at about 800 shillings, you get an offer of 500 and all the potential buyers are offering the same, until you give up and just sell at the low price* "

This anecdote from a farmer in Ainamoi suggests the presence of market cartels at the trading centres. It indicates existence of a high degree of price-fixing behaviour among the middlemen in open markets that are expected to offer competitive prices. The price-fixing behaviour was said to be common during festive seasons when the demand for chicken is high, suggesting the middlemen intended to benefit maximally from the high demand at the expense of the producers by collaborating among themselves.

This marketing behaviour highlights significant inefficacies at the marketing segment of the value chain. Producers bear the brunt of these inefficiencies, with middlemen benefitting disproportionately. These low levels of understanding between actors indicate a weakness in the chain (Nguyen & Nguyen, 2021). To address this, farmers proposed formation of producer organisations. Forming and strengthening producer organizations enable collective bargaining and enhances producers' negotiation power.

This marketing behaviour where intermediaries dominate has been reported elsewhere in India (Chengappa, 2018). In another study, Zamora (2016) observed that in the value chain network, certain members hold more significant influence in shaping its structure, while others play smaller roles and are more influenced by the network itself. It is indicative of a weak value chain network similar to that reported in Abbasi *et al.* (2024). In the current context, farmers appear to be controlled by a network of middlemen within the value chain. The distribution of benefits seems to disproportionately favour marketing agents over producers.

4.1.6 Indigenous Chicken Produce Processing

The current study did not identify processors actively collaborating with producers and intermediaries. Nearly all live chickens and eggs were sold through intermediaries who in turn sold to, "*customers in towns, urban centres and to travelers in highways*". This contrasts with other regions where producers have established links with processors. For instance in India, Gulati and Juneja (2023) reported that consumers preferred freshly slaughtered meat from open or wet markets, indicating significant processing activity. However, fully processed chicken meat accounted for only 7-10%

of processed chicken market, wet markets dominated. The wet markets, however, posed challenges in hygiene and safety (Gulati & Juneja, 2023).

Findings from the current study suggest a lack of established links between indigenous chicken producers, intermediaries and processors. The ultimate buyers are predominantly local consumers, urban residents and travelers, excluding processors from the supply chain. The formation of cooperatives, as suggested by the participants, aligns well with key preconditions for smallholder producers to achieve economies of scale in many aspects, including capacity to process on their own; a producer-oriented model.

This producer-oriented business model, originating upstream in the chain, enhances access to broader markets and higher prices (Chengappa, 2018). Contract farming with processors is made possible and vertical relationships within the value chain enhanced, fostering a system where all actors benefit proportionate to their contributions. This will improve the value chain and place all the chain actors in an improved position (Bammann, 2007).

4.1.7 Summary

In summary, a community-based participatory process identified several farmers' practices that contributed to the long-term sustainability and productivity of indigenous chickens (Table 1). These practices, derived from the participants' perspectives, could be grouped into eight higher level concepts;

Genetic diversity preservation: Achieved through selection and random mating of breeders.

Resilience-building: Derived from adaptation to local conditions such as disease resistance through selection of resistant breeding flock.

Rational decision-making: evident in strategies to address resource constraints.

Productivity-orientation: Enhanced by diversifying diets using local resources.

Self-sufficiency system: Promoted through low reliance on external inputs and customizability, evident in the producers' ability to adapt by constructing chicken houses with locally available materials and tailoring designs with the help of local artisans.

Traditional Bio-economy: Evidenced by utilizing biological resources such as worm-culturing, minimizing wastes and addressing economic constraints.

Complementary healthcare: Implemented through traditional flock health management practices, such as use of herbal remedies.

Market embeddedness: Shown by the participant's' market-driven motives in raising fast-growing, heavier chicken breeds, to achieve better market prices.

Table 1

Open, Axial, and Selective Codes for Efficacies in Indigenous Chicken Rearing and Marketing Practices Based on Grounded Theory Analysis

	Practice (open codes)	**Axial codes**	**Selective codes**
1	Selection of breeding flock	Random flock mating	Genetic Diversity Preservation
2	Breeder selection based on foraging behaviour and Disease Resistance	Adaptation to local conditions	Resilience
3	Free foraging with little supplements from local resources	Low input system Cost-effectiveness	Rational Decision-making in response to resource constraints
4	Free foraging plus purchased commercial supplements	Higher input system	Productivity-orientation
5	Free foraging, kitchen waste, fermented grains for feeds	Diversified diet , Cost reduction strategies	Self-sufficiency system
6	Free foraging only	Low input -Low productivity, Knowledge gaps	*Epistemic challenges
7	Free foraging plus worm-culturing, termite culturing	Local resource-use innovations	Traditional Bio-economy
8	Disease management with herbal medications	Cultural flock health improvement Information-seeking behaviour	Complementary healthcare *Epistemic challenges for rigour
9	Low adoption of vaccination schedules	Knowledge gaps Economic constraints	*Epistemic challenges *Economic powerlessness
10	Egg incubation and hatching by use of broody hens	Knowledge gaps on alternatives Low input system	*Epistemic challenges *Economic powerlessness
11	Chick brooding by hens only	Natural brooding Knowledge gaps	*Market ecosystem
12	Farmer designed low cost chicken houses	Localized solutions Knowledge gaps	Customizability *Epistemic challenges

13	Rearing many faster growing roosters for market	Market-driven production	Market embeddedness
14	Sale of live birds to middlemen at farm gate	Power imbalances in the value chain, challenges in market access	*Market ecosystem
15	Middlemen: We sell chickens and eggs to our customers in towns, some on the highway and they end up in different destinations	Fragmentation in the value chain, lack of traceability, localized and informal markets, no mention of processing or higher-end markets, need for market coordination	*Market ecosystem challenges (Lack of integration, weak value addition, organizational challenges)

***** Identified challenges within the practice

4.2 Challenges affecting Efficacy of Indigenous Chicken Value-Chain Practices

An open question on the hindrances to indigenous chicken productivity was posed to the participants during group participatory informal discussions. This approach answered the question; what are the challenges in the IC value chain? At the community level, there were diverse barriers to indigenous chicken rearing, based on open codes, this included; limited access to markets, lack of organized marketing channels, geographical isolation captured in some locations, poor access roads, limited access to information, and lack of resources to facilitate acquisition of breeding flock.

These initial primary categories were further categorized into broader axial codes: Market-related constraints, Poor access to financial services, Un-employment and weak resource base, Poor access roads, lack of organized markets, Risks associated with disease outbreaks, Lack of knowledge and knowledge gaps, Limited access to information, social norms, Lack of appropriate technologies, Weak extension services, Unemployed youths fearing to take risks, and Lack of incentives due to poor prices.

A closer scrutiny of the axial coded categories from the focus group discussions revealed a pattern in which all the categories could be clustered to form five higher order concepts through selective coding, namely; Epistemic limitations, Risk aversion and Inertia-towards-change, Economic powerlessness, market ecosystem challenges and Infrastructure related barriers.

4.2.1 Epistemic Limitations

A closer examination of challenges such as lack of knowledge to undertake commercial indigenous chicken rearing, insufficient information, skills, limited access to education and traditional practices hindering the acquisition of new knowledge broadly indicates the epistemic limitations faced by smallholder chicken producers. In this context, epistemic limitations refer to all constraints related to information and knowledge, examples of which are indicated in Table 2.

Table 2

Raw Data on Epistemic Challenges and Their Interpreted Axial Codes

	Descriptive Raw Data	Axial code category
a	*"I have not been able to access information on how to control common diseases in my chickens".*	Limited access to information
b	"*You know..., me I did not go to school much, I just use my own knowledge, the ones who went to school, may be they are better.....*"	Limited access to new knowledge/awareness on basic husbandry
c	" *We just leave our chickens to fend for themselves, that is the knowledge we have*"	Limited knowledge
d	" *I learnt of some herbs one can use to control chicken diseases from my neighbour but they do not help much when there is an outbreak*"	Reliance on traditional knowledge/Limited knowledge
e	"*I got some information from a local agro-vet shop on what to use to control diseases, but it did not work, maybe I used it when it was too late*".	Lack of knowledge/Weak Extension services

The epistemic limitations centred on a lack of information and knowledge regarding chicken husbandry practices, with a notable emphasis on responses related to disease control. Another notable concern among the participants was regarding chicken nutrition. One participant suggested that indigenous chicken manage to "*find sufficient food when they fend for themselves"*. This datum indicates insufficient knowledge of the nutritional requirements of chickens for optimum productivity. Indigenous chicken that are left to scavenge take longer to reach maturity and produce less compared to those fed additional supplements (Alene *et al.*, 2023). Lack of knowledge in indigenous chicken husbandry has been reported elsewhere by Kimenchu *et al*. (2024).

4.2.2 Risk Aversion and Inertia-Towards-Change

The attitude of inertia-towards-change among participants was detected as they tended to insist that their past practices have always "*served them well"* (Table 3). Lack of adequate exposure to information may have contributed to the attitude. As one participant put it "*we rarely have any one from outside talking about how we should keep chickens; our veterinary officer often attends to our cows but no one talks about chicken."* This statement indicates not only lack of information to initiate change but also an epistemic limitation in facilitating chicken productivity. It is plausible that the lack of information contributes to inertia-towards-change and epistemic limitations regarding indigenous chicken productivity.

Table 3

Raw Data Examples in Risk Aversion and Inertia towards Change

	Descriptive raw data	**Interpretation**
1	*We have always done this (housing structure) and it has served us well*	Rigidity
2	*We have not been told by our extension officers, ...*	Poor information-seeking behaviour, (Lack of willingness to source for information?)
3	*We keep small flock of chicken, to avoid high losses in case of disease outbreaks*	Risk aversion (Prioritizing minimizing of potential losses)

4.2.3 Market Ecosystem Challenges

A market ecosystem concept was thought to describe a situation that prevails when producers are connected to marketers and consumers of a given product. It is used in reference to the interactions that influence supply, demand, pricing and competition among players (Zhang & Watson, 2020). This concept was evidently in play when respondents refer to "*Lack of organized markets for chickens and eggs*," an indicator of a poor market ecosystem in which there is a lack of structure.

Lack of rules or standards often characterize a lack of market structure, leading to inconsistent practices. "*We sell at the price offered by the chicken trader....*" this datum suggests that there is no negotiation between the producer and the trader; the producer paints the picture of being a price-taker. There was some consensus among focus group participants that selling chicken and chicken products tended to rely on the pricing set by the traders. In this scenario buyers may offer farmers prices that are below fair market value or below the cost of production. "*They sometimes lie to us that the prices of chicken are very low in big towns like Kisumu*". This datum from one of the participants indicates two things; one is the dishonesty on the part of the trader and secondly is the lack of price information on the side of the producer. There is an element of information asymmetry in the marketing of the chickens; the buyers appeared to control information on the market prices.

In regard to a question on how the chickens were priced, some participants indicated that the buyers "*estimated chicken weights by hanging with his hands*"; this indicating that there was lack of standardized pricing mechanisms. The estimates by hand weighing suggests a value chain that lacks access to technology or simply has not embraced it. Further, an observation from one participant that, "*we get good prices during Christmas season, but when it comes to January, we get the opposite*", indicates a market ecosystem with inconsistent market demands. Part of the data to describe the ecosystem challenges are as indicated in Table 4.

Table 4

Raw Data on Market Ecosystem Challenges and their Interpreted Axial Codes

	Descriptive Raw Data marketing	**Interpretation**
1.	*"Sometimes the buyers lie to us that the prices in the main markets have dropped, but when you check you find that the prices are good where they are selling"*	Information asymmetry
2.	*"Chicken weights are estimated by hand weighing, hanging and estimating weight*"	Lack of standards
3.	"*There is one middle man who comes around looking for chicken in our village, when we need to sell we call him to come cover"*	Few buyers/weak demand
4.	*"I once sold a number of chicken to a trader, when I counted the money and compared with the chickens I had sold, I was so disappointed"* (Exploited, No market valuation)	Exploitation/Lack of market valuation
5.	*"We have many problems with selling our chicken products I once lost a whole tray of eggs when my motorbike hit a rock" (*Infrastructural barriers?)	Infrastructural barriers
6.	*"I sell my chicken to travellers. Whenever I need to sell I take them to the roadside, stand there shortly and I will get some travellers to buy"*	Informal marketing
7.	*"We sell it at the same price whether we sell it at home or at the shopping centre"*	Expense without value-creation

The market ecosystem challenges appeared to be quite diverse in the area. In one case a participant stated; "*I once sold a number of chickens to a trader and when I reflected on the amount received after selling a large flock of my chicken, I was disappointed*". This datum suggests that the producer had no prior expectation, had not established the worth or fair market value for his chicken before deciding to sell. It may also indicate that the producer was in dire need of cash and had to sell anyway, in which case; he/she was prone to exploitation. Overall this problem is broadly a market ecosystem challenge which poses barriers to efficient functioning of the market.

4.2.4 Economic Powerlessness

Limited financial resources and other systemic problems that tended to limit participation in indigenous chicken value chain as an economic activity was interpreted to mean economic powerlessness among the participants. Poor access to financial services for improvement of chicken housing, inability to handle risks associated with disease outbreaks, unemployed youths fearing to take risks and lack of incentives due to perceived poor chicken prices were viewed as broadly contributing to economic powerlessness.

In the current context, economic powerlessness is used to refer to a situation in which individuals lack the ability to improve their social-economic status. The focus is on limited financial resources and inability to access credits. In one case, a participant narrated that he had not been able to construct a better coop for the chickens because he had no finances. *"I had many other financial obligations like paying fees for my children"* .This datum suggests a failure of the participant to improve on the productivity of the chicken through better housing, ostensibly because of financial constraints; a case of economic powerlessness. Some data on economic powerlessness are as indicated in Table 5.

Table 5

Raw Data on Economic Powerlessness and Interpreted Axial Code Categories

	Descriptive Raw Data	**Interpretation**
1	*"I wanted to vaccinate my chicks, they were many, I delayed because I had many other things to do and I did not have enough money. They all later died, I regretted I should even have borrowed money to vaccinate them"*	Poor access to financial services/ Indecisiveness
2	*" I am unemployed, I wanted to start rearing chicken, I am still looking for some finances to construct a chicken house and buy chicks"*	Resource-poverty/Lack of initial capital
3	*'Everything requires money, even starting with one chicken"*	Lack of initial capital
4	*" Vaccines for Newcastle disease is sold in doses for 100 chicken, I wish there were doses for 10 chicken"*	Scale of operation
5	*" predators went with many of my chicken, I could not afford to enclose them in a fence"*	Financially unattainable

4.2.5 Restrictive Infrastructure

According to the participants, infrastructure significantly contributed to losses in indigenous chicken productivity. Participants highlighted various challenges, including the lack of nearby markets and poor road conditions. For example, one participant stated: "*We often travel long distances on rugged roads, even to sell a few chickens. There is no market nearby*." This observation underscores the dual challenge of inadequate market infrastructure and the difficulties caused by bad roads.

Another participant provided further clarity:

> *"Our roads are impassable. We would rather sell our chickens to a middleman so that he struggles with it, than transport them all the way to market through bad roads."*

This statement reflects a sense of resignation among producers, who prefer offloading the burden of transportation to middlemen. It also indicates that middlemen are more willing to assume the risks associated with transport.

Beyond road conditions, participants also raised concerns about market infrastructure. One producer shared:

> "*We travel about 30km to our major open-air market on Tuesdays and Fridays whenever we have something to sell. The market has no shelter or storage facilities, so we have to sell our produce quickly*."

This lack of market amenities exposes producers to adverse weather conditions and leaves them vulnerable to hurried sales at poorly negotiated prices.

4.3 Opportunities for Upgrading the Indigenous Chicken Value Chain

4.3.1 Opportunities

The participants were guided by facilitator to identify actions that could transform the challenges into opportunities using problem tree analysis techniques, as part of PRA tools. The highlights of the focus group discussions are summarized below.

Capacity-building and Extension services: Cognizant of the limited knowledge among producers regarding chicken management practices, the participants seemed unanimous in agreeing on the need for, "enhancing farmers training, supporting farmers through awareness creation on best practices, and strengthening extension services". The overarching theme for this intervention was capacity-building and Extension services.

Financing - A Community-Based Financial Model: In light of the apparent economic challenges faced by farmers due to financial limitations, the consensus among the focus group participants centered on two main ideas. One key point of agreement was that, "the government needs to establish friendly credit facilities to assist smallholder farmers invest in their chicken projects". This view highlights several important components: the government's role as a key actor, the need for affordable financial support, and a focus on improving the livelihoods of smallholder farmers. The central theme emerging from this viewpoint is the facilitation of access to affordable credit.

The second key point raised by participants was the importance of strengthening community groups to foster savings and lend to members in need. Participants suggested, "*We need to strengthen our community groups to make savings so as to lend out to its members in need, to invest in their projects*". This emphasizes aspects of community empowerment, collective finance mobilization, internal financial support for members, and facilitating productive ventures. The overarching concept here is a community-based financial model, where leadership comes from the community, with input from the government and other stakeholders. This model aligns well with the principles of sustainability.

Institutional Framework for Coordination of the Value chain: The indigenous chicken value chain was highly disintegrated, with input suppliers, producers, marketers, distributors and customers all acting independently. Producers, the key actors in the value chain voiced their concerns, in one case they pointed out that:

> *"We do not have an integrated value chain for indigenous chicken, every producer acts on his/her own. Even our self-help groups are not specialized on any specific livelihood strategies. Sometimes we receive support from projects, but on a short-term basis."*

This dataset highlights several challenges: the lack of an integrated structure among actors, the absence of focused strategies within self-help groups, dependency on short term external interventions, and the limitations of these interventions. The central issue identified is the absence of an institutional framework to coordinate and integrate actors within the indigenous chicken value chain. Similar findings have been reported elsewhere in Abbasi *et al.* (2023), Abbasi *et al.* (2024) and Ariffin *et al.* (2024). The current finding points to an opportunity, as identified by the participants, to enhance coordination by forming and/or strengthening producer organizations and linking them with other actors in the value chain.

Risk aversion and cooperative marketing: Farmers' unwillingness to take risks, particularly marketing risks, was identified as a key barrier to improving indigenous chicken productivity. Farmers often offload marketing risks to intermediaries, resulting in revenue losses. When asked why they did not venture into joint marketing, they explained,

> "*We cannot venture into joint marketing; there are other risks. Suppose we aggregate our produce and miss a market – everyone will lose*".

This data reflects a lack of collective planning, weak cooperative marketing, concerns about market access, and fear of collective failure. Axial codes derived from this data include risk perception, lack of confidence in markets, and fear of failure in joint initiatives. Together, these factors point to the overarching theme of reluctance to participate in collective actions due to perceived risks, and probably other reasons such as insufficient social capital (Cheruiyot & Kibett, 2024).

This reluctance reveals a case of risk aversion among smallholder farmers, which limits their ability to access better markets. However, it also suggests an opportunity for government service providers and other stakeholders to build farmers competence and confidence in cooperative marketing, addressing the barriers to collective action and unlocking better market opportunities.

Partnerships for Infrastructure Development: Weak infrastructure was identified as a significant impediment to indigenous chicken productivity, particularly in the marketing segment of the value chain. During a focus group discussion, one participant remarked, "*We mostly sell our produce to middlemen who come to our homes to avoid transporting the produce on rugged roads and risking losses, such as egg breakages*". Other participants echoed these sentiments.

From a grounded theory perspective, this anecdote highlights key themes, including reliance on middlemen, the preference for convenience selling, the impact of rugged roads on marketing decisions, and a general tendency toward risk avoidance. The axial codes derived from this data included infrastructure challenges, transportation risk concerns, and dependence on intermediaries. The dependence on intermediaries leaves the producers vulnerable to exploitation. This productivity-limiting environment tends to empower intermediaries to exploit the situation at the expense of the producers (Kirori, 2015). Physical infrastructure such as roads and markets is crucial for agricultural productivity (Macharia *et al.*, 2022).

What action is required? When the participants were asked about their strategies for addressing these challenges in the future, they emphasized the need for collaboration with local authorities, particularly county government, to improve road and market infrastructure. Such partnerships present an opportunity to enhance the productivity of farmers and strengthen their livelihood strategies as illustrated in Figure 3.

Framework for Upgrading the Value chain: Complexity theory, which advocates for multiple causality and diverse research perspectives; such as participatory research, suggests that phenomena should be examined holistically, incorporating the viewpoints of as many stakeholders as possible to drive societal change (Cohen *et al*., 2007). Participatory research is largely grounded in interactionist qualitative approaches that enable in-depth knowledge acquisition. Aligned with this perspective, the current study investigated the indigenous chicken value chain, primarily leveraging interactionist qualitative methods to foster change. As a result, the study developed a framework for understanding the value chain and optimizing its productivity and sustainability as a livelihood strategy. In this framework, change; synonymous with value chain upgrading, is based on: In-depth understanding of producers' practices and assessment of their efficacy in driving productivity and sustainability, analysis of challenges through active community involvement, survey of the community and its environment to identify opportunities, and fostering outcomes that enhance productivity and sustainability (See Figure 3).

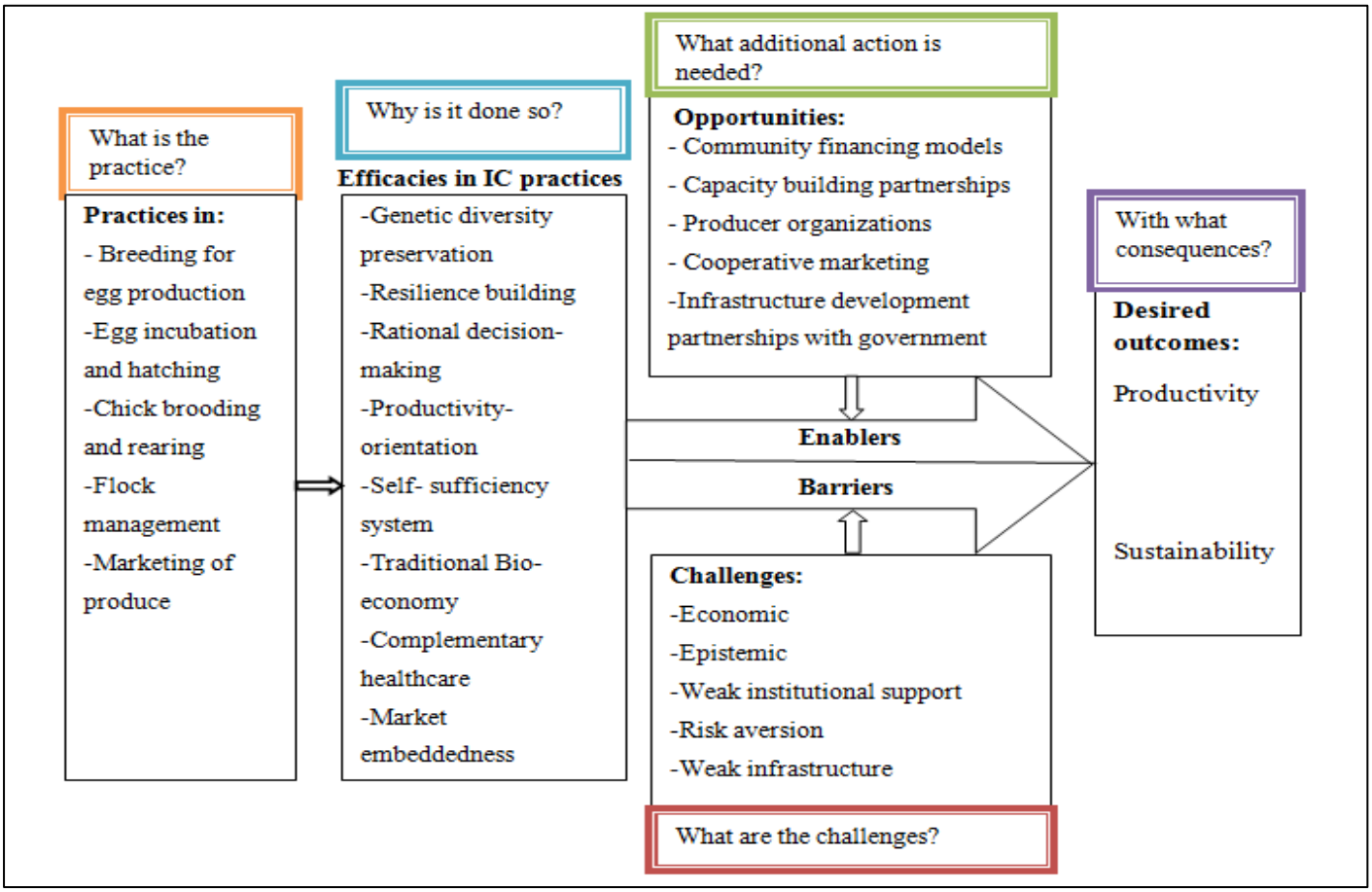

Figure 3

Community-Centred Indigenous Chicken Productivity Optimization Framework based on Grounded Theory Analysis

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study evaluated the efficacy of indigenous chicken value chain practices among smallholder farmers using a participatory approach. The findings reveal that farmers' practices made significant contributions to the productivity and sustainability of indigenous chickens. These contributions include genetic diversity preservation, resilience-building, rational decision-making, productivity-orientation, self-sufficiency system, bio-economy integration, complementary healthcare, and market embeddedness. Despite these strengths, the study identified key challenges that limited the effectiveness of these practices. These challenges, as analyzed through grounded theory approach, include epistemic gaps, economic powerlessness, risk aversion amongst producers, weak institutional support, and restrictive infrastructure. To harness potential opportunities, this study proposes a five-step participatory process for developing a

framework for value chain upgrading: a participatory assessment of the current situation, an examination of efficacies in current practices, a participatory identification of challenges, a scanning of opportunities, and a participatory formulation of strategies to sustain and promote successful practices for enhanced productivity and sustainability of the livelihood strategy.

5.2 Recommendations

Recommendations for Practice and Policy

This study recommends that service providers in the agricultural value chains address epistemic challenges faced by smallholder farmers by strengthening agricultural Extension services and building farmers' capacity to form and strengthen their organizations, such as indigenous chicken cooperatives. It also recommends improvements in road and market infrastructure, a major constrain identified in two of the three Sub counties.

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