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Value chain analysis of the Kenyan poultry industry: The case of Kiambu, Kilifi, Vihiga, and Nakuru Districts

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Preface

Since its re-emergence, HPAI H5N1 has attracted considerable public and media attention because the viruses involved have been shown to be capable of producing fatal disease in humans. While there is fear that the virus may mutate into a strain capable of sustained human-to-human transmission, the greatest impact to date has been on the highly diverse poultry industries in affected countries. In response to this, HPAI control measures have so far focused on implementing prevention and eradication measures in poultry populations, with more than 175 million birds culled in Southeast Asia alone.

Until now, significantly less emphasis has been placed on assessing the efficacy of risk reduction measures, including their effects on the livelihoods of smallholder farmers and their families. In order to improve local and global capacity for evidence-based decision making on the control of HPAI (and other diseases with epidemic potential), which inevitably has major social and economic impacts, the UK Department for International Development (DFID) has agreed to fund a collaborative, multidisciplinary HPAI research project for Southeast Asia and Africa.

The specific purpose of the project is to aid decision makers in developing evidence-based, pro-poor HPAI control measures at national and international levels. These control measures should not only be cost-effective and efficient in reducing disease risk, but also protect and enhance livelihoods, particularly those of smallholder producers in developing countries, who are and will remain the majority of livestock producers in these countries for some time to come.

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Disclaimer

The views expressed in this report are those of the authors and are not necessarily endorsed by or representative of the International Food Policy Research Institute (IFPRI), ILRI, or of the co-sponsoring or supporting organizations. This report is intended for discussion.

More information

For more information about the project, please refer to <http://www.hpai-research.net>.

Acronyms

COT	Certificate of Transport
DOC	day-old chicks
FAO	Food and Agricultural Organization of the United Nations
FGD	focus group discussion
HPAI	highly pathogenic avian influenza
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
KBS	Kenya Bureau of Standards
KEPOFA	Kenya Association of Poultry Farmers
KIPOFA	Kilifi Poultry Farmers Association
Ksh	Kenya Shilling
NAS	National Airport Services
USD	United States Dollar

Glossary

Pullet : 5 to 6-month-old female layer ready to lay eggs

Farm Categories (FAO 2010)

Sector 1 farm : Industrial integrated system with high level of biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity)

Sector 2 farm : Commercial poultry production system with moderate to high biosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife)

Sector 3 farm : Commercial poultry production system with low to minimal biosecurity and birds/products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl)

Sector 4 farm : Village or backyard production with minimal biosecurity and birds/products consumed locally

Executive Summary

The Kenyan poultry industry is characterized by dualism, comprised of both smallholder and large-scale poultry producers. The industry is characterized by two main production systems namely (i) the commercial hybrid poultry production system and (ii) the indigenous poultry production system. This study examines the poultry industry in Kenya with the aim of identifying the actors, assessing poultry and poultry product flows, and highlighting some of the policies and regulations relevant to potential outbreaks of highly pathogenic avian influenza (HPAI) in Kenya. Specific aims included:

- i) Characterizing the structure of the value chain;
- ii) Assessing the relative importance of specific flows of poultry and poultry products;
- iii) Identifying the various actors involved in the poultry trade and their linkages;
- iv) Providing insights on potential pathways of HPAI introduction in the value chain

The study was conducted in Kikuyu and Ndeiya Divisions in Kiambu District, Vihiga and Sabatia Divisions in Vihiga District, Nakuru and Rongai Divisions of Nakuru District, and Kikambala and Ganze Divisions of Kilifi District. The study areas were selected based on their relative density of poultry populations. A value chain approach was employed that entailed the use of semi-structured interviews and focus group discussions with various stakeholders including hatcheries, farmers, input sellers, processors, retailers and other intermediaries in four different value chains: commercial broilers, commercial layers/eggs, indigenous chicken, and guinea fowl/ducks.

Our value chain analysis indicates significant heterogeneity in the types of chains present in the poultry sector in Kenya, both by chain and region. Broilers and layers are more important in Kiambu and Nakuru, compared to Kilifi and Vihiga. Layer and egg value chains tend to be significantly longer and more diffuse than the value chain for broilers and indigenous chickens. For broilers, shorter chains reflect greater integration among actors through contractual (formal and informal) arrangements, while for indigenous poultry, most non-subsistence trade involves direct sales between farmers and buyers (who include other farmers and retailers). Outside of formalized, vertically integrated arrangements, governance relationships are largely *ad hoc*, although there are some qualifications to this. In Kiambu, contract broiler production involving strict biosecurity is more commonplace, while in Nakuru, contracts for broilers are more informal. There is also more 'structure' in the form of relational forms of transactions as products move into urban areas. In rural areas, by contrast, trade patterns are much more diffuse.

Biosecurity practices parallel the governance structures present in all of the sampled chains. Larger, more commercialized actors involved in formalized arrangements tend to have much stronger biosecurity practices than smaller-scale farmers. Hatcheries, for example, have strict regulations on handling and disposal of poultry and poultry products and hence risks of rapid spread of HPAI at this point of the value chain in case of possible outbreak would be negligible. These biosecurity measures are imposed on all farmers contracted by the hatcheries to produce broilers, usually under contract. This makes the contracted farmers, mostly found in Kikambala, Nakuru and Kikuyu Divisions have better biosecurity controls than the non-contracted farmers. While regulations exist at various parts of the chain in terms of processing, handling and transport of poultry products, these are largely

ignored outside of the most formalized chains. For instance, some farmers and brokers reportedly transport live birds in open carriers of or inside passenger vehicles, contrary to government regulation. Others transport live birds using hand and ox-carts without government movement permits. Still others transport live birds on bicycles and motor bikes. All these modes of transportation of birds entail great risks of exposure of and to infectious disease. The study further finds that some feed millers transport and deliver feed from one poultry farm to another which can exacerbate the spread of an infectious disease as the truck moving with feed could potentially transmit the disease into all farms it visits.

In Kilifi, regulations governing slaughter in particular are much more strictly followed, ostensibly in response to demand for products with higher levels of food safety from domestic and international tourists. Not surprisingly, intermediaries in Kilifi tend to have more long-term relationships with other actors in the chain. This suggests that regulations can be credibly applied and enforced with respect to HPAI, but require some sort of local context (e.g. ensuring the sustainability of ancillary sectors like tourism) to promote buy-in among local actors. Such measures need to not only involve the poultry sector, but also other local stakeholders as well.

The impacts of the HPAI scare in 2007 were short-lived, but had sharp impacts on the commercial sector in particular. In terms of impact of the scare on livelihoods, the study finds that the most affected farmers were those that reared broilers since the scare was mostly perceived to relate to the consumption of poultry meat. Broiler and layer producers were especially affected, with prices falling by up to half, and production and employment in these sectors experiencing a temporary decline. Recent research by Rich and Wanyoike (2010) suggested a role for associations in the livestock sector to reduce risks associated with future Rift Valley Fever outbreaks, and a similar recommendation could be made particularly for smaller and medium-sized commercial poultry producers. This will require significant strengthening of associations to move beyond marketing roles and towards more proactive advocacy and support roles for the industry as a whole. Such developments would not only assist with future animal health emergencies, but also strengthen the sector as a whole.

The indigenous sector was largely unaffected by the scare, but one should not underestimate the potential impact of a real outbreak on this sector. For example, indigenous poultry serve an important role as a source of “quick income” for producers who could be jeopardized by an HPAI outbreak; these specific livelihood impacts need to be teased out more carefully in further research. In addition, the timing of an HPAI outbreak matters greatly. Because farmers often sell their birds *en masse* prior to the main cropping season, an outbreak that occurred at such a period could provide farmers with difficult decisions – either sell birds at a lower price or risk retaining birds and incurring crop losses they may cause. Future research should pay close attention to the seasonality of impacts in gauging how HPAI broadly affects the agricultural economy.

1. Introduction

1.1 Overview of the poultry sector and study motivation

The Kenyan poultry industry is characterized by dualism, comprising both smallholder and large-scale poultry producers, with the former forming the majority in terms of population of birds. The industry is characterized by two main production systems namely (Nyange 2000):

- i) the commercial hybrid poultry production system
- ii) indigenous poultry production system

The commercial hybrid production system relies on imported exotic parent and grandparent stock and is exclusively market oriented. From the standpoint of biosecurity, farms in this production system fall under sector 1-3 classification used by the Food and Agricultural Organization of the United Nations (**FAO**) (see Glossary above). The commercial hybrid production system is further divided into layer and broiler subsystems. Commercial poultry production constitutes 23.8% of the total poultry population, with broilers representing 16.2% and layers another 7.8%. Other poultry species such as ducks, guinea fowl, and turkeys comprise about 2.2% of the total poultry population produced by commercial production systems (Animal Production Division 2006). The commercial production system is concentrated in major towns including Nairobi, Nakuru, Mombasa, Kisumu and their environs.

The indigenous poultry production is the dominant poultry production system in Kenya. It is mainly concentrated in rural areas and involves 75% of rural households. Approximately 71% of eggs and poultry meat in Kenya are derived from indigenous poultry (Republic of Kenya 2008a). The indigenous poultry system is characterized by unconfined birds that scavenge around the homestead and often interact with wild bird species in the process.

Table 1 summarizes poultry populations by category for the eight provinces of Kenya.

Table 1. Poultry populations in Kenya, by province and category, 2006 (thousand birds)

Province	Layers	Broilers	Indigenous	Others	Total
Rift Valley	283.4	1137.1	5776.4	167.8	7364.6
Coast	79.4	248.0	2153.5	133.6	2614.5
Western	23.6	116.5	2517.6	159.7	2817.4
Nyanza	48.2	203.6	5944.8	46.8	6243.3
Central	440.9	1079.2	1787.0	35.6	3,342.7
Eastern	112.6	163.9	3628.8	21.3	3926.7
North Eastern	0.3	0.2	165.0	0.0	165.5
Nairobi	957.8	188.1	141.4	10.0	1,297.3
Total	3136.5	1946.2	22114.3	574.9	27771.8

Source: Republic of Kenya, 2006

Trade in poultry and poultry products in Kenya is characterized by extensive movement of live birds and their products within Kenya (i.e. between regions) and from neighboring countries across the border into Kenya. The dominance of the indigenous poultry production system in Kenya with its limited biosecurity combined with the nature of the poultry trade poses a potentially significant challenge to the design of strategies necessary to prevent possible outbreaks of avian influenza in Kenya.

This study is part of a wider study that examines the Kenyan poultry industry to assess its preparedness against a possible outbreak of highly pathogenic avian influenza (**HPAI**). The wider study has four components: a livelihoods component, a risk assessment and risk mapping component, an analysis of the costs and benefits derived from the prevention of HPAI, and an analysis of poultry value chains, which forms the basis of this report.

The role of value chain analysis in this study is to highlight the impacts that HPAI has throughout the poultry marketing chain. These impacts are often overlooked in policy circles, with policymakers focusing instead on the upstream impacts at the producer level. However, the cumulative downstream impacts that HPAI has on traders, slaughterhouses, retailers, casual employment, and support services is often larger than the impacts of the disease at the farm level. More significantly, the failure to capture these diverse impacts may further have important implications on the evolution and control of disease that may accentuate its impact. In particular, the socio-economic linkages embedded in livestock value chains may serve as important risk factors for the entry, spread, and persistence of disease. Thus, an understanding of these linkages is critical to inform policy and understand the broader livelihoods impacts of the disease.

Our value chain analysis was conducted in four districts in Kenya that were selected based on the relative importance of the poultry industry. It included personal and key informant interviews and focus group discussions (**FGD**) with various actors in different poultry and poultry product (including table eggs) value chains in Kenya that were administered during February and March 2009. The specific terms of reference of this study were to:

- i) Characterize the structure of the value chain;
- ii) Assess the relative importance of specific flows of poultry and poultry products;
- iii) Identify the various actors involved in the poultry trade and their linkages;
- iv) Provide insights on the potential introduction of HPAI into the value chain.

The rest of this report is organized as follows. The remainder of this section provides more details on the sites selected for this study. Section 2 describes the value chain actors present in the different poultry value chains in Kenya. Section 3 characterizes the value chains for the various poultry and poultry products traded in Kenya, including table eggs. Section 4 highlights the potential impact of the introduction of HPAI in Kenya in a value chain context, while Section 5 summarizes the HPAI policies and regulations enacted or strengthened in response to the HPAI scare. Section 6 provides some concluding comments and implications for policy and future research.

1.2 Description of sites

This study was conducted in Kikuyu and Ndeiya Divisions of Kiambu District; Vihiga and Sabatia Divisions in Vihiga District; Bahati and Rongai Divisions of Nakuru District; and Kikambala and Ganze Divisions of Kilifi District (See Figure 1). The rationale was to choose two divisions in each district that contained high and low densities of poultry to capture the differences in management strategies used by mostly subsistence farmers (low density areas) and mostly commercial operations (in the high density areas). In each division, interviews were held with officials from the Ministries of Agriculture and Livestock, poultry hatcheries, poultry processors, large and small-scale commercial poultry farmers, indigenous poultry farmers, feed and veterinary medicine stockists, poultry transporters, poultry traders (wholesalers, retailers, and intermediaries [brokers]) and meat inspectors.

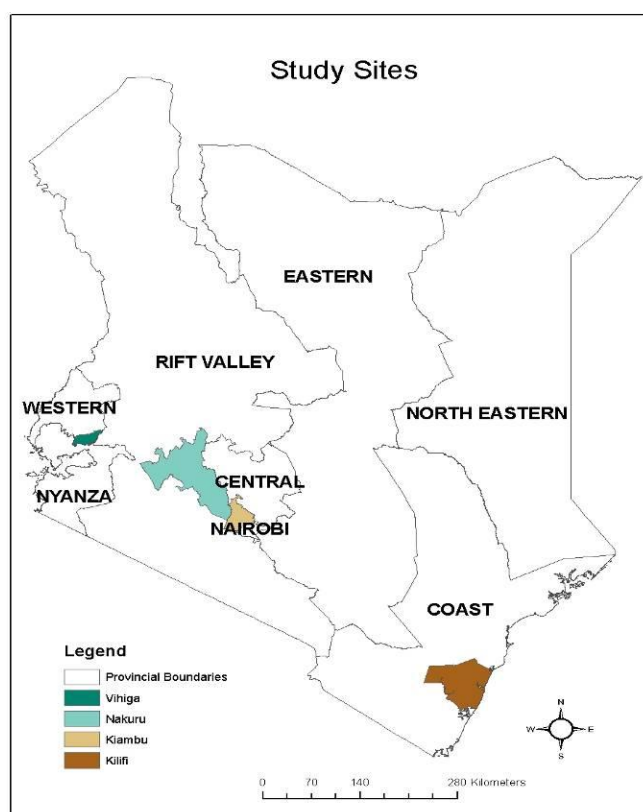


Figure 1. Study sites

In Kiambu, we selected Kikuyu Division because it mainly falls under sectors 1-2 in the FAO classification scheme, and is characterized by a high concentration of commercial poultry produced under a system that both monitors the production process and has a system of managing waste. By contrast, Ndeiya Division has a larger population of poultry that falls under sectors 3-4 in FAO's classification. In Nakuru, we focused on Rongai Division, which not only falls under FAO sectors 1-2, but also contains a high concentration of indigenous poultry. Vihiga mainly contains sectors 3 and 4

types of production with a focus on indigenous poultry. In Kilifi, we selected Kikambala and Ganze Divisions. The former contains sectors 1-2 poultry that is dominated mainly by broiler production in contracted farms and medium-scale commercial production. Ganze Division, on the other hand, is dominated by indigenous chicken and falls under sectors 3-4.

Additional interviews were also held with major supermarkets and retail markets as well as fast food outlets that serve as major outlets for poultry in our study districts. Information generated through these interviews was supplemented by detailed FGD with poultry actors in each division selected. Appendix 1 provides the list of the numbers and types of chain actors interviewed in the four study regions. Additional secondary data on poultry and poultry product prices and other poultry production costs were collected from Divisional and District Livestock Offices.

2. Sector-level poultry chains: Overview and identification of actors

Poultry is only one of the activities farmers in the study districts engage in. In Section 2.1 of this chapter, we provide the background on each study district and identify some of the key actors in the poultry value chain. Section 2.2 then briefly characterizes the actors by describing their role and how they are linked to each other.

2.1 Background on study districts and actor identification

Poultry production: Kiambu District

Kiambu District has a total area of 1,324 km², 90% of which is arable land (Republic of Kenya 1997). Its economy is dominated by agriculture which employs approximately 75% of the population. The major agricultural activities undertaken by households in the district include dairy production, poultry keeping, crop production and pig farming. Coffee and tea formed the major cash generating activities in Kiambu District until the early- to mid-1990s. However, the poor performance of tea and coffee markets has led to a shift to livestock, especially dairy and poultry production. The shift to dairy and poultry production in Kiambu is also driven by the high demand for milk and poultry products in surrounding urban centers, notably Kiambu and Nairobi (*ibid.*).

Kiambu is one of the most renowned districts in poultry production in Kenya mainly due to its egg production. The district mainly produces chickens, but there are a few farmers that keep ducks and turkeys. Farmers keep different types of chicken including broilers, layers and traditional (backyard) chickens. Broilers and layers are produced by commercial establishments. Approximately 85% of the chickens raised in Kiambu District are exotic. On the other hand, traditional poultry (comprising 15%) is mainly produced for subsistence in backyard settings. The production of layers is much more widespread than broiler production in Kiambu. However, at the time of the survey, the production of layers and commercial broilers in particular was significantly below that in the previous year (2008) and much lower than in 2007. The majority of the respondents interviewed in this survey attributed the declining trend to the spiraling cost of feed.

There are two systems of commercial poultry production in Kiambu District: contract and non-contract production. Under the former, farmers keep poultry under contract with one of the breeders. Approximately 1000 farmers raise broilers in Kiambu District under contract with Kenchic. The contracted farmers are part of an integrated poultry production system that is controlled by the breeder. The breeder supplies day-old chicks (**DOC**), feed and veterinary services, while the farmer provides land/housing and management (i.e. care) under the advice of the breeder. In other words, the farmers are under a production management contract (Minot and Ngigi 2010). The marketing of mature birds (especially broilers) is managed by the breeder and sold mainly to upscale clients in Nairobi and Mombasa such as Steers Restaurant (15%), Nakumatt Supermarkets (70%) and Kenchic-appointed retailers (15%). In this case, farmers are paid mainly for their management labor and some amount to compensate for the cost of their land/housing. Not all farmers are able to produce under contract with Kenchic Ltd. Only farmers who can raise a minimum of 3000 birds are awarded

such contracts. In addition, the farmer must be able to raise an advance cash capital of Ksh 80-90¹ per chick and follow Kenchic's farm-to-fork quality assurance and production protocols. The farm must also be located at least 50 km from the breeding facility in Athi River (Nyaga 2007). Most contracted farmers had chicken flocks averaging 5000-6000 birds. Contracted farmers also kept dairy animals and/or were engaged in tea production. Chicken production ranked third as a source of livelihood in Kiambu, suggesting that it ranks third as an income source for contracted broiler farmers. Nyaga (2007) characterizes this production system as sector 1 because contracted farmers strictly follow the biosecurity procedures/controls set by Kenchic.

The non-contract mode of production is the more common poultry production system in Kiambu District. All layers and indigenous poultry (which comprise 85% of chickens produced in Kiambu District) are raised without a contractual arrangement. Under this system, farmers are responsible for meeting all production costs and for the marketing of their birds. Some non-contracted farmers work independently while others use formal producer and/or marketing organizations. These organizations mainly help farmers to market their poultry and poultry products and also to access technical information through training. However, only a small number (approximately 10%) of non-contracted farmers belong to these organizations.² Non-contract poultry in the district falls under low biosecurity production regimes because there are no checks on how waste and diseased birds are managed. Poultry waste (feathers, offal and blood) are often left at the spot where the birds are slaughtered.

Indigenous chickens produced in Kiambu are mainly kept for subsistence and hospitality purposes. The majority of households (about 75%) keep up to 10 traditional chickens. The results of our FGD indicate that about 6% of farmers in Kiambu produce indigenous chickens for commercial purposes. Indigenous chickens are mainly left to scavenge for insects, kitchen leftovers, green leaves and minerals in a free-range system. However, this backyard system of production is constrained by the availability of land as high population pressure in the district has significantly reduced land sizes. Thus, commercial poultry production under more intensive systems is much more preferred by farmers.

Most of poultry production is concentrated in Kiambu West, particularly in Kikuyu, Ndeiya and Limuru Divisions (see Figure 2). In terms of poultry populations, Kikuyu Division has the highest population of birds while Ndeiya has the lowest. Table 2 below presents the distribution of poultry populations in Kiambu West. The highest population of indigenous chickens is found in Ndeiya Division, while Kikuyu Division leads in both total population of poultry and the population of layers.

¹ The Kenya Shilling (**Ksh**) was changing at approximately Ksh 80 for 1 US Dollar (**USD**) during the study period.

² Some of the poultry production and marketing organizations were collapsing due to high cost of feed at the time of this survey.

Table 2. The poultry population in Kiambu, by division (count)

Division	Layers	Broilers	Indigenous poultry	Turkeys	Total
Kikuyu	44,000	200	5,500	0	49,700
Ndeiya	27,000	0	7,300	7	34,307
Limuru	34,000	0	5,500	0	39,500
Total	105,000	200	18,300	7	123,500

Source: Republic of Kenya, 2009

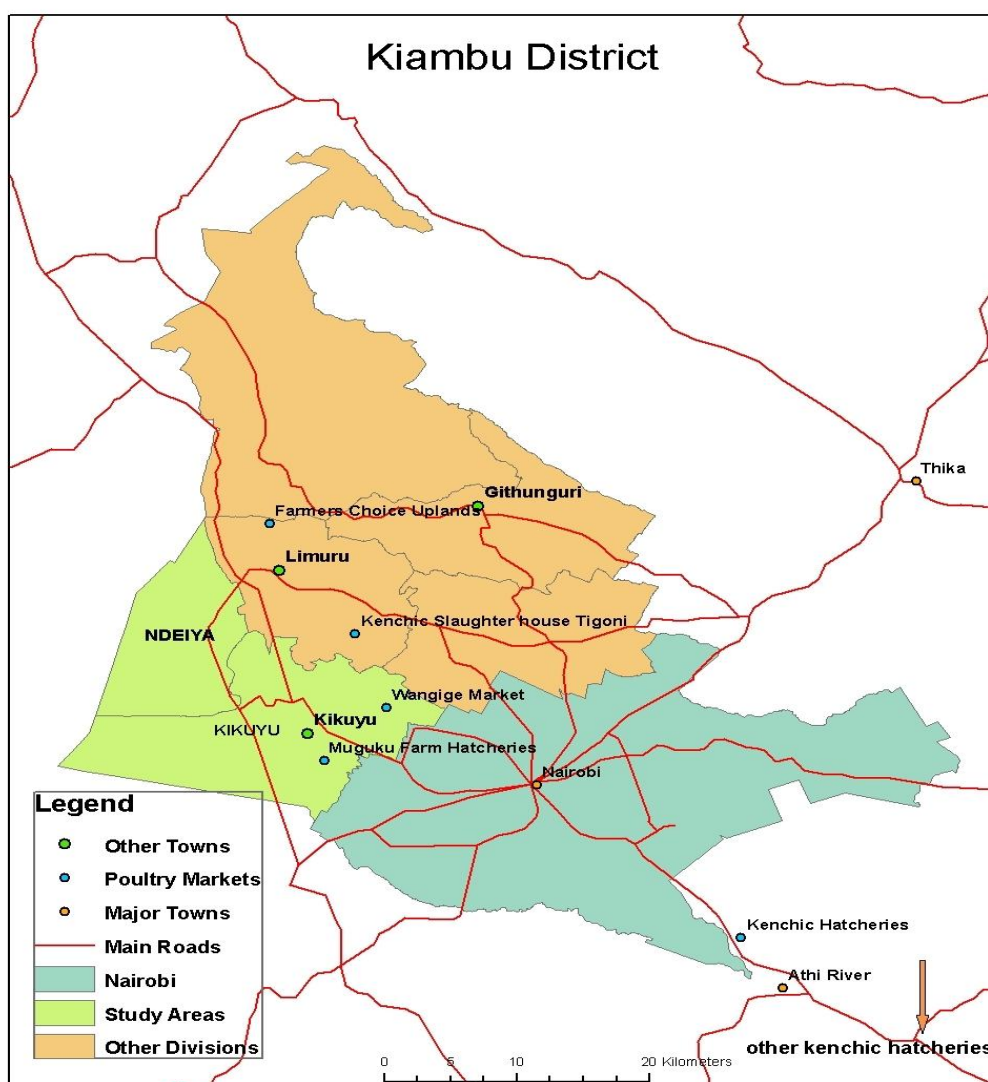


Figure 2. Map of Kiambu District showing study areas and major trading centers

The high concentration of poultry production in Kikuyu Division is probably due to its proximity to Muguku Farm Hatcheries, a major source of DOC, and also the ease of access to external markets. Unlike the other divisions, Kikuyu Division is connected to major (i.e. Nairobi) and local markets by a good network of paved roads. It is also much closer to Nairobi than the rest of the divisions. The major local poultry market – Wangige – is located within the division and metropolitan Nairobi is approximately 15 km away. By comparison, the majority of farmers in Ndeiya Division have to travel an average of more than 20 kilometers on roads that are impassible during the two wet seasons to reach the nearest major poultry market in Wangige.

A number of actors are involved in the marketing of poultry and poultry products between the farm and the final consumer in the district. These include brokers/traders, rural retailers, rural wholesalers, urban retailers and urban wholesalers. Other actors that provide services in the value chain include veterinarians, transporters, millers and feed traders. Appendix 2 provides a summary of the actors interviewed in the district during this study.

Poultry production: Nakuru District

Nakuru District (see Figure 3) lies within the Rift Valley with a human population of 471,514. The major drivers of the economy in the district are agriculture and tourism. It has high levels of poverty and unemployment. Poultry and wheat production are among the major agricultural enterprises in the district in terms of earnings, with wheat production dominating the other enterprises. The main poultry type produced in the district is chicken. Poultry production in the district falls under the same system as in Kiambu District, with farmers producing either under contract or without contract.

The proportion of farmers producing chickens under contract in Nakuru is higher than in Kiambu. Interviews with key informants and traders indicated that majority of broiler producers (approximately 80%) produce their birds under contract with buyers. However, unlike Kiambu, contracts are mostly informal and take the form of verbal agreements with traders, hotels and fast food outlets. Only producers who raise broilers for hatcheries have formal contracts. Such farmers comprise about 15% of broiler producers in the district. More farmers in the district keep layers compared to those producing broilers, which is likely due to the strong demand for eggs in Nakuru and other distant markets, notably Kisumu and Mombasa. However, unlike Kiambu District, most farmers produce eggs only on prior arrangement with the buyer, a form of futures contract. The farmer is responsible for all the production costs. The buyer collects the eggs at the farm gate and hence deducts transport costs. However, farmers who can afford transport deliver the eggs directly to the buyer.

Poultry production in the district has benefited from a number of public and donor projects implemented in the district to address the high incidence of poverty and unemployment. These poultry improvement projects include “Njaa Marufuku Kenya”, National Agriculture and Livestock Extension Programme, and Smallholder Poultry Commercialization Development Project. These projects target increasing poultry production in the district by at least 20% over a period of 10 years.

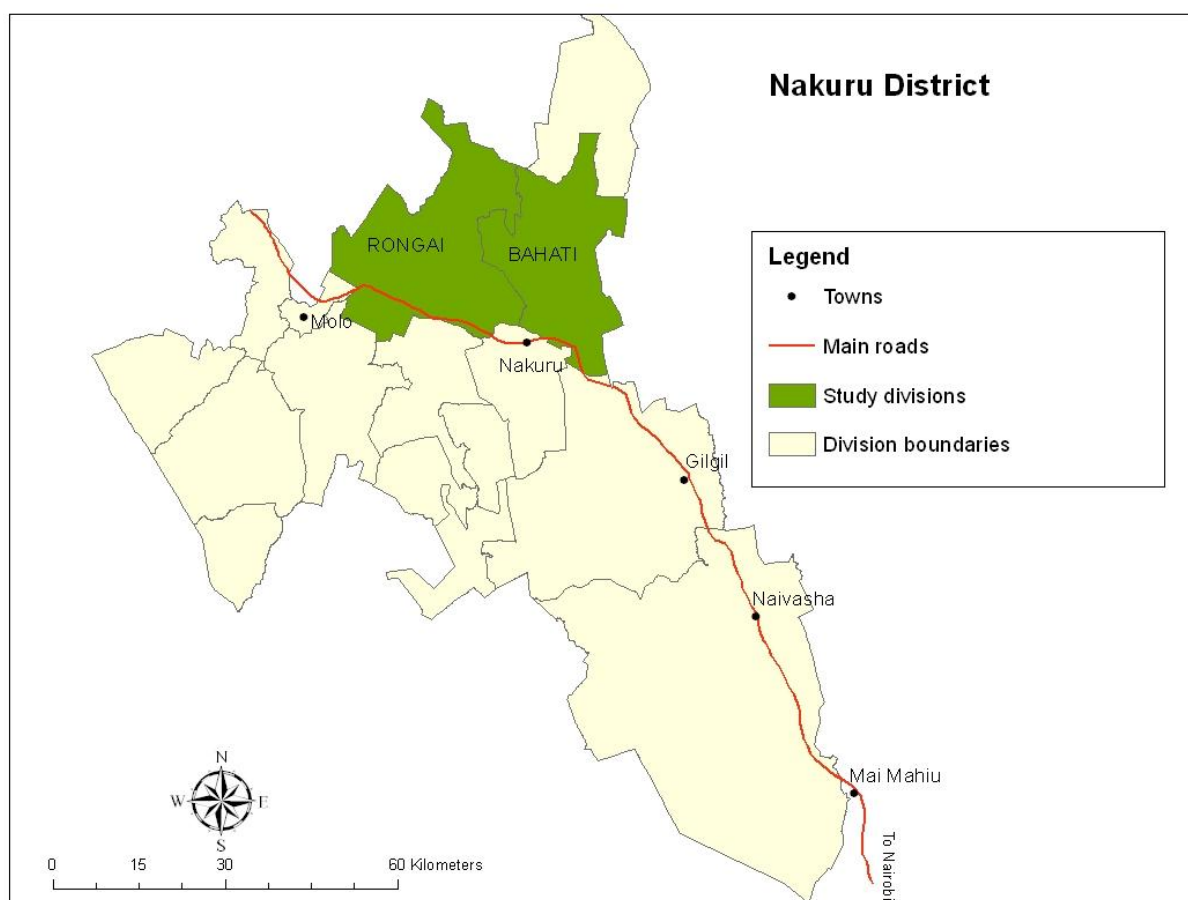


Figure 3. Map of Nakuru District showing the study areas and major trading centers

Farmers in Nakuru District keep both traditional/indigenous and exotic chickens. Bahati Division has the largest number of commercial poultry farmers. Discussions with various chain actors, for example, indicated that 82% of the broilers produced in Nakuru are produced in Bahati Division. Farmers there keep on average 300 to 3000 birds per farm. As noted earlier, the majority of poultry farmers do not produce under formal contract with breeders. In order to overcome some of the poultry production and marketing challenges, some farmers have formed producer associations. These associations have in turn formed an umbrella association that, as one of its key functions, constructed a slaughter facility for its members. Most poultry production in Bahati Division falls under sector 1-2 of the FAO classification. Rongai, on the other hand, is dominated by farmers who keep indigenous birds (more than 90%) in traditional sector 4 production systems. Not surprisingly, there are greater controls on the movement of poultry and poultry products in Bahati (and hence better biosecurity) than in Rongai, where birds are largely left to scavenge.

Apart from the poultry promotion activities by the government and donor groups noted above, production in Nakuru District is driven by two other factors. First, there is high local and regional demand for eggs produced in Nakuru District. Local demand emanates from the large population of egg consumers among the residents of Nakuru Town and its environs and also from the demand by

tourist hotels and large organizations such as colleges. Regional demand for Nakuru-sourced eggs extends to Bungoma District and Kisumu City. These areas depend on Nakuru more than any other area (such as Wangige Market in Kiambu and Kampala) for most of their eggs because of the lower transport costs from Nakuru.

Appendix 3 presents the various poultry chain actors interviewed in Nakuru District. As in Kiambu District, these actors included rural traders, rural assemblers/brokers, rural wholesalers, urban retailers and urban wholesalers. Other actors included hatcheries and service providers, namely transporters, veterinary doctors, feed millers and feed retailers.

Poultry production: Kilifi District

Kilifi District (see Figure 4) covers an area of 3053 km² and borders Malindi District to the north, Mombasa District to the south, and Kaloleni and Kwale Districts to the southwest. The main livestock enterprises are poultry and dairy production. Poultry is produced under both commercial production and traditional subsistence systems. The types of poultry kept by farmers in the district include indigenous/backyard chickens, layers, broilers, ducks, turkeys, and guinea fowl. Table 3 below summarizes the poultry population in Kilifi District as of 2008.

Indigenous/backyard chickens account for more than 75% of the poultry kept in Kilifi and are concentrated in Ganze Division. Unlike Kiambu and Nakuru Districts, broiler production is the leading commercial/exotic poultry enterprise in the district. Broiler production accounted for 12.5% of the total poultry population in the district in 2008 (Table 3). Table 3 also shows that Kikambala and Bahari Divisions lead in the production of broilers. The dominance of broiler production in the two divisions is due to their close proximity to Mombasa and Malindi. Both cities are major tourist centers on the coast and hence centers of high demand for broilers by tourist hotels.

Table 3. Poultry population in Kilifi District, 2008

Type	Division						Total	
	Kikambala	Ganze	Chonyi	Bamba	Vitengeni	Bahari	Number of birds	% of total
Indigenous chickens	13,700	42,000	50,000	96,500	66,200	172,000	440,400	75.2
Layers	28,500	600	1,360	0	500	12,050	43,010	7.3
Broilers	64,500	0	0	0	500	8,200	73,200	12.5
Ducks	6,800	3,700	4,500	400	2,100	2,050	19,550	3.3
Turkeys	879	15	4	0	10	1,800	2,747	0.5
Geese	1,010	4	155	0	12	1,700	2,881	0.5
Others	0	1,560	0	260	100	2,040	3,960	0.7
Total	115,389	47,879	56,058	97,160	69,422	199,840	585,748	100.0

Source: Republic of Kenya, 2008b

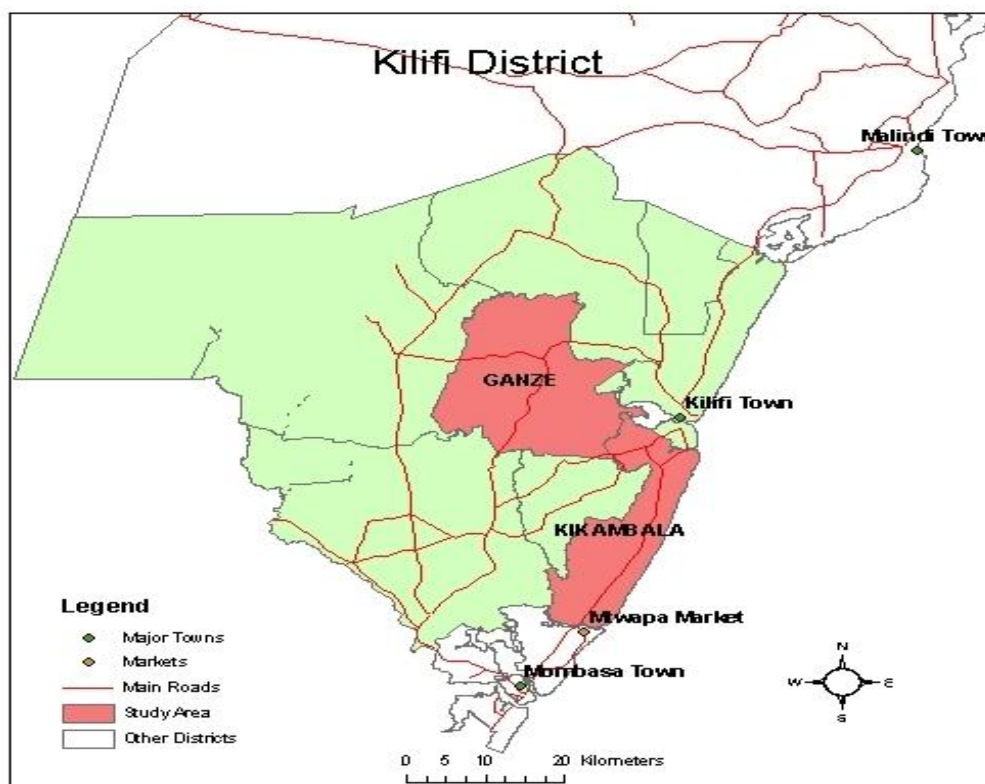


Figure 4. Map of Kilifi District

Unlike Kiambu and Nakuru District, Kilifi does not have contract production of poultry. However, there are producer organizations that try to help smallholder poultry producers market their poultry and poultry products. A notable one is the Kilifi branch of the Kilifi Poultry Farmers Association (**KIPOFA**), an affiliate of Kenya Poultry Farmers Association. A key biosecurity function performed by KIPOFA is the provision of slaughter facilities to its members. The Association had 36 registered members at the time of the survey.

Kikambala is one of the major centers of commercial layer and broiler production in Kilifi. Indeed, it is the leading producer of both broilers and layers in the whole district. Kikambala also hosts the most important poultry market in the district, the Mtwapa Market, which is situated near many of the tourist hotels in the area.

The major poultry actors in Kilifi District are the same as those in the first three districts discussed above. They include breeders (hatcheries), rural assemblers, rural retailers, rural wholesalers, urban wholesalers and urban retailers. The actors also include service providers, i.e. transporters, feed millers, feed retailers and veterinary doctors. Two other service providers that play important roles in Kilifi are veterinary drug stores and meat inspectors. Veterinary drug stores in Kilifi District act as retail outlets and/or distributors of DOC, especially to smallholder farmers. Unlike Kiambu District, the inspection of dressed poultry carcasses is strictly enforced by meat inspectors in Kilifi District. Kilifi poultry farmers interviewed in this study indicated that they would not sell uninspected

carcasses for fear of being fined or their chicken being destroyed if caught. Hotels in Mombasa, Kilifi and Malindi help to enforce this rule by only buying carcasses that have been inspected and stamped by government meat inspectors.

Poultry production in Vihiga District

Vihiga District is one of the smallest districts in Kenya with an area of 200 km² and just three administrative divisions: Sabatia, Vihiga, and Chavakali (Figure 5). The district has a population of 261,037 people. Agriculture and livestock are the main livelihood activities in the district, although livestock production plays a much less significant role due to small landholdings. Poultry and cattle are the main livestock enterprises in the area. The dominant poultry production system is that of traditional poultry raised mainly for subsistence (Table 4). There is production of commercial layers and broilers in the district, with more farmers keeping layers than broilers. The flock size of an average farmer ranges from 100 to 300 birds. There is no contract production of commercial layers in Vihiga District. Farmers generally produce eggs and sell to hotels or large traders who buy in bulk and transport to hotels in Kakamega or Kisumu.



Figure 5. Map of Vihiga District

Table 4. Poultry population in Vihiga District, by category

Type/category	Number
Indigenous chicken	183,600
Layers	9,300
Broilers	3,300
Total	196,200

Source: Vihiga District Livestock Reports, 2007 & 2008b

2.2 Roles of chain actors, business linkages, and governance mechanisms

Hatcheries

As the first actor in commercial poultry farming for broiler and layer production, hatcheries source the parent and/or grandparent stock locally or internationally and use them to produce DOC. The hatcheries, notably Kenchic Ltd. and Kenbrid, import their parent stock from France, Britain, Holland or United States of America. Kenchic also imports the grandparent stock for broilers in addition to the parent stock. Hedge Farm used to import its parent stock from Mauritius but shifted to Kenchic following the HPAI scare. The number of chicks imported depends on the orders received by the hatchery from its customers. For instance, Muguku hatcheries imports 700,000 layer parent stock chicks every four months, whereas Kenchic imports broiler grandparent stock after every 2 years. The parent stock for layers costs Ksh 400-560, while broiler grandparents cost Ksh 3200 per chick.

Kenchic imports grandparent stock from which it produces approximately 300,000 parent stock. It sells some of the parent stock chicks to other hatcheries in Kenya and in the region, notably Tanzania, Uganda and Zambia, and keeps the rest for its own hatcheries. Parent stock chicks are sold at approximately Ksh 250 per piece.

Table 5 presents the production of DOC by the leading hatcheries in Kenya. DOC are sold to farmers in Kenya, though some are exported. Approximately 20% of Kenchic's DOC is exported to neighboring countries. Of the DOC exported by leading hatcheries in Kenya, 75% goes to Tanzania and Uganda while the rest goes to Zambia and the Democratic Republic of Congo.

Table 5. Day-old chicks (DOC) produced by the major hatcheries in Kenya, 2006

Hatchery	Layers	Broilers	TOTAL
Kenchic	2,900,000	10,100,000	13,000,000
Muguku	300,000	700,000	1,000,000
Sigma	780,000	312,000	1,092,000
Kenbrid	384,000	768,000	1,152,000
TOTAL	4,364,000	11,880,000	16,244,000

Source: Republic of Kenya, 2006

As indicated above in Table 5, Kenchic dominates the DOC industry in Kenya both for layers and broilers. Kenchic hatches the fertilized eggs in its Nairobi hatchery farm and transports the DOC to its depots located in other parts of the country. The main hatchery supplying poultry farmers in Vihiga is located in Kisumu; a second hatchery, LekChick, was of less importance. The Kenchic depot in Kisumu gets its supplies from the Athi River Kenchic hatchery in Nairobi and supplies the whole of Nyanza and Western Provinces. The depot sells 10,000-15,000 DOC per week depending on the season, of which 70% are layers and 30% broilers. In terms of distribution, 50% of DOC are sold to Kisii District, 20% in Kisumu District, 20% in Western Province and 10% in Kericho. Vihiga District has to share the 20% sold to Western Province with the other districts in the province.

However, the Kenchic depot in Kisumu is unable to meet the high demand for DOC in western Kenya. The commercial poultry farmers we interviewed indicated that they are sometimes forced to wait for 3-6 months to have their orders delivered. Consequently, some farmers get their DOC directly from Kenchic in Nairobi or Kenbrid in Naivasha. Some intermediaries in Vihiga take advantage of the gap between demand and supply of DOC by buying layer and broiler DOC from Nairobi and Naivasha at Ksh 85 and Ksh 52, respectively, and selling them to farmers in Vihiga at Ksh 100 and Ksh 60, respectively. The DOC shortage has also encouraged an active production of indigenous poultry in Vihiga, as indicated by Figure 6.

Muguku Farm and Kenchic Ltd are the main suppliers of DOC to farmers in Kiambu, Mombasa, and Nakuru. These hatcheries sell up to 60,000 DOC per week. Kenchic sells 80% of the DOC to farmers and retains 20% for their farms and contracted farmers.

Farmers in Nakuru District obtain their DOC from KIM Poultry Farm, Kenchic Ltd, Golden Chick, Sigma and Muguku Farm Hatcheries. Interviews with key informants indicated that these hatcheries together sell approximately 50,000 layer DOC and 6,000 broiler DOC per week to farmers in the greater Nakuru District, indicating that broiler production is relatively more important in the district. Table 6 gives the distribution of volumes of DOC sold by the different hatcheries in the district. As shown, Kenchic, Kenbrid and Kim Poultry dominate the DOC market in the district. Interviews with other actors in the poultry value chain in Nakuru District further revealed that 30% of farmers buy between 100-200 chicks; 60% buy 300-500 birds and 10% buy over 500 birds.

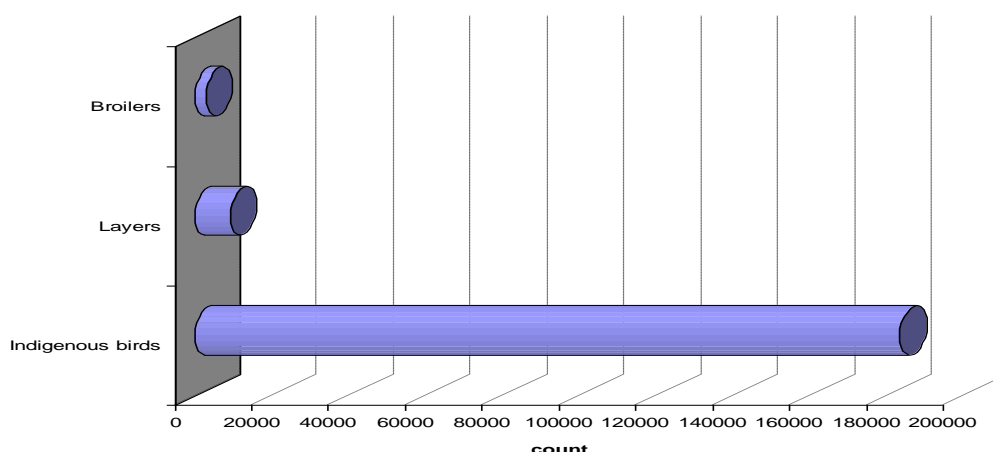


Figure 6. Poultry population (counts) in Vihiga District

KIM Poultry Farm gets its parent stock of 6000 birds every 2-3 months from Kenchic Ltd and hatches approximately 20,000-30,000 DOC per week. It sells 60% of its DOC to contracted outgrowers and 40% to contracted agents who distribute to poultry farmers. It therefore does not deal directly with farmers.

Table 6. Weekly volumes of broiler day-old chicks (DOC) sold by dealers in Nakuru

Firm	Number of chicks per week
KIM Poultry	20,000-30,000
Kenchic	22,000-28,000
Muguku	4,000
Kenbrid	2,000-3,000
Golden Chick	1,000
Sigma	500
Total	49,500

In Kilifi District, the main hatcheries are Hedge Farm and G.E.M.'S Farm. The latter (now inactive) used to breed broilers, layers, and guinea fowl, whereas the former only breeds broilers. Other known breeders are the Kenchic and Muguku hatcheries. Hedge Farm buys 600-2000 parent stock chicks from Kenchic in a production cycle, with new cohorts spaced at 8-month intervals. The farm buys the parent stock at Ksh 250 per chick and sells DOC to producers (farmers) at Ksh 40 per chick, and to appointed sales agents in Mombasa, Malindi and Kilifi at Ksh 35 per chick. It disposes of the parent stocks when 22-24 months old to brokers at Ksh 300-400 per bird. The urban-based brokers then sell these to consumers in major local markets or distant markets (usually Nairobi, Kisumu and Mombasa).

The parent stock chicks mature at the age 4.5 months, after which they start laying fertile eggs for hatching into broiler/layer DOC. The fertile eggs are screened for fertility and diseases, especially *Salmonella*. The hatcheries normally vaccinate DOC before being sold to farmers either directly or through sales agents. To reduce the mortality rate and improve the vitality of DOC, hatcheries follow a feeding and vaccination program recommended by breeders in the exporting country. Disease control measures are also undertaken to minimize disease risks. The most common control measure involves placing disinfectant foot baths at all entrances to the hatchery. There are also strict disease control procedures that all visitors must follow when they visit the farm. In addition, all workers handling DOC undergo regular medical tests and bathe before handling the chicks. The hatcheries also maintain clean surroundings, clearing bushes mainly to keep away wild birds and rodents. Hatchery units are also spaced and located so as to control the spread of a disease.

The hatcheries have numerous biosecurity measures in place. These relate to the handling of dead birds, waste and the movement of live DOC. Chicks that are rejected due to deformation are gassed, crushed, and dumped into secured disposal pits. Other waste (poultry droppings) are sold as manure or used by the hatchery farm. The hatcheries we visited sold poultry manure³ to neighboring crop farmers. Several other measures are taken by hatcheries to control any outbreaks or spread of diseases within and outside the hatchery farms. First, visitors to a hatchery should not have visited another poultry farm in the last 48 hours. Second, workers go through routine medical tests. Third, shoes must be disinfected when entering a poultry farm. Hatchery workers must also take a shower before entering chicken houses. Fourth, poultry units are sufficiently spaced apart so that the spaces act as barriers against disease spread.

Most the interviewed hatcheries had sales agents. The sales agents link the more distant farmers with the hatcheries. They therefore serve farmers that are too far from the hatcheries and unable to afford the costs of transporting DOC from the hatchery to their farms. The agents take orders from farmers and then place bulk orders with the hatchery and collect the chicks from the hatcheries on behalf of the farmers. The agents are often veterinary drug stores (popularly known as agro-vet shops) that double up as collection points for farmers who prefer to order their DOC through such stores. However, there are also independent agents who sell DOC for the company as brokers. Some hatcheries, especially in the case of Kenchic, have formal contracts with the sales agent that specifies the storage and handling procedures, among other conditions.

Some of the agro-vet shops offer veterinary services to the farmers. For instance, they administer vaccines as part of their service package. This package is especially attractive to small-scale farmers who cannot afford to buy a complete dose. Some of the agro-vet shops also provide vaccination under interlinked credit schemes that involve payment after selling the eggs or broilers. However, this kind of package is offered only to preferred customers with long-term (usually more than 3 years) business relationship.

Some hatcheries issue farmers with a vaccination and feeding program at the time of purchase. However, the source of information used by farmers depends on the production sector (Nyaga

³ Purchase of infected manure can act as a disease vector when purchased by other farmers.

2007). Contracted farmers (sectors 1-2) use the breeder as their information source while farmers belonging to sectors 3-4 depend on government extension staff for information.

The relationship between the government and the breeder farms (i.e. hatcheries) is mainly limited to regulation. The government regulates the means of transportation used for DOC and also the movement of spent parent and grandparent stock. In the latter case, the regulations relate to the movement of live birds which require a movement permit. The hatcheries, however, depend on the government for the provision of public goods especially infrastructure (electricity, water, roads). A number of breeders have formed an association that lobbies the government for both fair regulation and the provision of public goods. The association also performs other roles such as the training of members, disseminating of information about disease control and promoting the consumption of poultry products.

Poultry and poultry product intermediaries

A number of poultry and poultry product intermediaries exist in the different poultry value chains. Generally, there are three broad categories of intermediaries in the marketing of poultry and poultry products: live-bird traders, egg traders, and traders that handle dressed carcasses of poultry. Among these intermediaries, the first two are more common in the study districts. Most of these intermediaries are specialized in their functions in the chain, either in the handling of eggs only or live and dressed birds only.

Live-bird intermediaries deal in live exotic and/or indigenous poultry but sometimes handle dressed birds, especially when the client prefers to have dressed carcasses. Indeed, there were no intermediaries that dealt in dressed carcasses only. On the other hand, the majority of the intermediaries that handled eggs did not handle dressed chicken in Kilifi, Nakuru and Kiambu Districts where commercial layer production was more important.

Intermediaries mainly serve farmers who are unable to transport their live birds or eggs to the market due to high transport costs, who need urgent cash and cannot wait for a market day, or who lack information on where to sell or who to sell to. High transaction costs have indeed been attributed to the choice by many farmers in Africa to trade at the farm-gate rather than walk their produce to the market (Fafchamps and Hill 2005; Fafchamps and Gabre Madhin 2006). In the current study, poultry farmers use intermediaries to market their poultry and poultry products. These intermediaries operate at different stages of the value chain. However, they generally link the farmer to the rural or urban consumer. The intermediaries include rural assemblers, rural retailers, rural wholesalers, urban retailers, urban wholesalers and urban retailers.

The number of intermediaries in any of these value chains differs depending on the market and district. The typical number of intermediaries ranged between one and four, indicating that some poultry chains are highly fragmented and hence entail high transaction costs (Shiferaw et al. 2007; 2008). The first kind of intermediary was the rural assembler who collected live birds or eggs from farmers at the farm-gate and assembled eggs in bulk before transporting to the market. The majority of these rural assemblers paid for the birds or the eggs on the spot (95%) thus taking ownership whereas others collected the birds or eggs on credit (5%) and remitted the money after sale. Where credit is involved, the arrangement or agreement on price and time of payment is verbal.

There were two categories of rural assemblers in the study districts. The first category deals with only a few birds or crates of eggs and does not necessarily sell in rural markets. These types of rural assemblers trade around 10-20 birds or crates of eggs and sell them generally by hawking the birds/eggs to hotels in the rural towns or door to door in residential estates in urban centers. The nature of relationships between buyers and rural assemblers differed among the study areas. In Kiambu, there was no long-term relationship between buyers and sellers. However, in Kilifi, most assemblers (approximately 60%) had repeated and long-term trading relationships. Some of these assemblers also supply rural retailers on market days. The majority of this first category of rural assemblers trade in indigenous poultry and use bicycles to transport the birds and eggs from the farm to the buyer. The second type of rural assemblers deals with much larger volumes of birds or eggs, acting as buying agents of larger traders such as rural and urban wholesalers. These assemblers deal in hundreds of birds or crates of eggs at a time and usually target commercial layer and broiler farmers. They collect the birds or eggs either on bicycles, ox or human-drawn carts, or small trucks (i.e. pick-ups) depending on the distance. The sale can be in cash or credit. For the latter, verbal agreements are made to remit payment after sale. These rural assemblers sometimes buy their birds or eggs from the first category of assemblers, usually to fill up their orders. They then sell to rural and urban wholesalers and in most cases transport live birds or eggs to the buyer.

The second type of intermediary in the poultry value chain in each of the study districts is the rural retailer. Rural retailers purchase live birds or egg either directly from farmers who walk their birds or eggs to the market, or from rural assemblers. These transactions are made on a cash basis. The majority of these rural retailers have no business relationships⁴ with the farmers they buy from. However, some have had repeated transactions with certain rural assemblers that have led to the development of trust. Indeed, the findings of the FGD suggest that approximately 10% of assemblers sell their birds to rural retailers on credit. The farmer delivers chickens to retailers and collects cash after the retailer has sold them, usually at the end of day. Rural retailers sell their live birds mainly to rural restaurants and individual consumers. The sale of eggs and live birds to final consumers, however, was strictly on a cash basis.

Rural wholesalers of live birds are uncommon in most districts covered by the study. However, this category of traders is found in Vihiga District where they deal mainly in traditional chickens. They purchase live birds from other traders and assemble them in bulk before selling to the next actor in large consignments only. This was especially the case where birds came into the rural livestock market from other districts, e.g. Nandi. The intermediary bought or received the consignment and sold to other traders in larger numbers at a wholesale price. Rural wholesalers also operated in Kilifi District. The majority of rural wholesalers traded mostly in indigenous chickens, but a few sold exotic chickens. Some rural wholesalers have business relationships with the traders they buy from that have been mainly forged through repeated transactions. Some rural wholesalers acted as typical brokers in the sense that they assist distant traders to market the traders' consignment without actually taking ownership/possession of the birds.

⁴ Business relationships take the form of repeated transactions and, sometimes, the extension of credit to each other, and thus revolve around trust.

In the case of eggs, however, there were several individuals that played the role of rural wholesaler. The most active participation of rural wholesalers in the poultry value chain was in Wangige Market in Kiambu District. In this market, rural wholesalers assembled large volumes of eggs by buying from rural assemblers and selling them to urban-based brokers. Some of the rural assemblers in the Wangige Market bought their eggs from large-scale farmers.

Urban wholesalers and retailers are located in major cities supplied by the districts covered in this study. They include Nairobi, Kilifi, Mombasa, Malindi, Nakuru, Vihiga, Kakamega and Kisumu. These intermediaries are supplied by rural assemblers and transporters who buy large consignments from rural wholesalers or directly from medium and large-scale farms. The majority of urban wholesalers have business relationships with their suppliers forged through repeated transactions over many years. Such urban wholesalers therefore receive regular consignments from their suppliers and usually can specify the volumes they want. The weight of the birds is the major quality parameter used but some traders check the physical condition (such as the alertness) of the bird, too. The sale of chickens can be on cash or credit basis depending on the length of the relationship. The relationship, however, remains informal and the agreements made are not formalized into written contracts. Approximately 85% of the wholesalers bought their chicken from traders that they have dealt with before.

One of the categories of urban retailers that have gained significance in the last few years is the urban supermarket. Major supermarkets in Mombasa, Nairobi and Nakuru sell both dressed chicken and table eggs. However, these retailers, especially Nakumatt in Nairobi and SunBeam in Mombasa, buy their supplies from established hatchery farms such as Kenchic which in turn raised the birds on contracted out-grower farms. Table eggs, on the other hand, are purchased from urban-based brokers who in turn bought them directly from rural/urban wholesalers and/or rural assemblers.

Transporters

Transporters play an important role in the movement of poultry from various production points to final consumers. The transport of birds is made by producers, brokers, and small-scale retailers from farm or intermediate markets to the end market in different ways in each of the study districts. For instance, in Kiambu, transporters used specialized pick-up trucks designed for poultry transportation with an upper and lower carrier and that can accommodate approximately 500 birds. On average, a single transporter can transport up to 2500 birds per week during the high season and 1000 birds during the low season.⁵ Transport services are offered right from the farm-gate to rural intermediate markets and distant urban end markets such as Kariokor and Burma Markets in Nairobi. Some farmers and brokers have their own transport trucks that double-up as transporters. A few brokers transport birds using public service vehicles.

In Nakuru District, poultry transporters use public service vehicles (buses, mini buses and taxis). A few farmers and brokers have their own unspecialized vans for taking birds to the market. Similarly,

⁵ High season denotes period of high demand (such as April, August and December associated with festivities), whereas the low season is a period of low demand, e.g. January, May and September (months when most families have to meet school fees).

there are no specialized poultry transporters in Kilifi District. Small-scale producers and traders therefore use public transport and taxis to get poultry to the market. Large-scale producers have their own conditioned trucks for transport. On the other hand, contracted broiler farmers in Nakuru get transport from the firms they raise chickens for. KIM Poultry Farm, for instance, provides transport services to its contracted farmers. A similar arrangement exists for Kenchic's contracted farmers in Kiambu District.

There are numerous government regulations that govern the transportation of poultry. In particular, transporters of processed birds are required to obtain a certificate of transport (**COT**) issued by the veterinary officer to the owner of the carcass. Additionally, all transporters of live poultry/birds are required to obtain a transport/movement permit at an annual fee of Ksh.3500. Most of the transporters interviewed said they would not transport for any trader without a movement permit or COT or with any sick bird. In Vihiga and Nakuru Districts, such regulations were largely unenforced and most actors were unaware of their existence. In Kilifi District, a movement permit and COT are issued upon payment of an annual fee of Ksh 100 and Ksh 20 per consignment, respectively.

The influence that transporters exert on the ultimate price that farmers receive or consumers pay for poultry and poultry products depends on the district. As expected, in districts where there are many specialized poultry transporters, the cost that farmers or traders pay for transportation is lower due to greater competition among transporters. Thus farmers and traders in Kiambu, where there were approximately 50 traders, paid much lower prices for transport. Farmers and brokers in Kilifi mainly use public transport and hence have no specific fee they pay per bird for transport as this varies from one carrier to another. Transport fees for public-service vehicles vary given the illegality of transporting poultry in such types of vehicles. Vehicle owners usually charge higher fees in anticipation of paying bribes to police when stopped. The bribe is worked into the transport fee, thus increasing the price consumers pay for the final poultry product.

Feed millers

A number of feed millers supply poultry farmers in the study districts. These include Jubilee Feeds Ltd, Chania Feeds Ltd, Trust Feeds Ltd, Ohami Feeds Ltd, Pwani Feeds Ltd, Sirari Millers, Unga Millers Ltd, Pembe Feeds Ltd, Malindi Millers Ltd and Naku Modern Feeds Ltd. The other known feed millers serving especially Kilifi District poultry farmers are Kitui Millers, Unga Feeds, Pwani Feeds and Dola Feeds. Most of these millers have distributors. Some, such as Sirari Millers Ltd, sell feed directly to farmers and even deliver feed to the farm. The delivery of feed directly to the farm benefits farmers by reducing the costs usually charged by intermediaries for their services. However, it can increase faster spread of disease in case of an outbreak because trucks can spread the disease as they move from one farm to another. Other millers, e.g. Hedge Farm Millers Ltd in Kilifi District, only serve their farms. The types of feed delivered by various millers include pellets, chick mash, grower mash, layer mash, broiler starter, broiler finisher, bone meal, fish meal and coconut seed cake.

Apart from commercial millers, farmers and breeders manufacture their own feed. In some contracted farm systems, delivered feed is made and directly sold to the farm by the breeding company. Some large-scale farmers also formulate and mill their own feed.

In theory, the formulation of feed by some large-scale farmers and breeding companies is expected to reduce the influence that feed millers have on feed prices by introducing some competition. However, this effect went largely unnoticed in our study districts. Feed prices remained very high regardless of the direct milling by some farmers and breeding companies. There are two reasons why millers still control feed prices in the study districts. First, most farmers still depend on feed from registered milling companies because farms that mill their own feed do not usually sell to other farmers. Second, government regulations require that commercial millers obtain a milling permit and this has limited commercial milling of poultry feed by farmers.

All millers are registered members of the Association of Kenya Feed Manufacturers (AKFEMA) and are required to pay a registration fee of Ksh 20,000 per annum. A government regulation in force requires that all feeds meet the Kenya Bureau of Standards (**KBS**) quality requirements and hence the bags must bear the KBS logo.

Veterinary-input dealers/stockists

Most feed stockists we visited sell feed in smaller packages and quantities to make it affordable to smallholder farmers. The majority sell feed in 70 kg bags and also in smaller packages. Feed millers deliver feed to the stores from which farmers buy directly. Most of the stockists interviewed knew how much feed their regular customers need and are able to plan ahead accordingly.

Some of the rural-based stockists interviewed indicated that they sell about 140 bags of feed (each of 70 kg) per month, while those located in larger trading centers sell up to 300 70-kg bags of feed in a month. The amount sold, however, depends on several factors including the extent of direct sales by feed millers, the poultry production season, and the extent to which farmers use home-formulated feeds. Some feed millers, especially Dola Millers Ltd in Kiambu, deliver feed directly to farmers. This especially occurs among large-scale poultry farms and/or contracted firms when the breeder buys feed from a miller and delivers to its farmers.

Some of the biosecurity practices undertaken by feed stockists include using feed bags only once, keeping free-ranged chicken away from stores, and not allowing customers to touch or handle opened bags of feeds they are buying. A number (approximately 10%) of large feed stockists extend in-kind input loans to their trusted farmer clients. They also provide regular feedback to the millers regarding demand supply conditions and consumer preferences. The feedback is usually in terms of customer complaints and satisfaction about feed.

The stockists interviewed indicated that 2007 was a much better year for the business than 2008. In 2008, poultry feed sales declined substantially, especially towards the end of the year. The decline in sales could be associated with maize shortages in the country that dramatically increased the price of feed. Maize is a major component of most poultry feeds. Table 7 below represents the buying and selling prices of various products facing feed merchants and poultry farmers in Kiambu at the time of the interview.

Table 7. Prices of various poultry feeds in Kiambu District, February-March 2009 (Ksh per 70 kg bag)

Feed type	Buying price	Selling price
Chick mash	1850	1950
Growers mash	1550	1650
Layers mash	1700	1780
Broiler starter	2200	2300
Broiler finisher	2100	2200
Pellets	1680	1700
Maize germ	1200	1400
Fish meal	2650	2800
Pollard	1200	1400
Chick crumbs	2650	2800

Source: Author's survey, 2009

Poultry slaughter

One of the areas to which the HPAI scare brought substantial change was in the slaughter of poultry. In this section, we describe the two main ways poultry is slaughtered in the study districts. In particular, we examine the home slaughter of poultry and slaughter in municipal slaughter facilities.

Most indigenous poultry farmers slaughter their birds at home. The chicken is slaughtered by severing the head after which blood is drained off onto the ground or grass. The body is then immersed into hot water, and the feathers removed by hand plucking. None of the farmers interviewed in Nakuru, Kiambu and Vihiga indicated that they called in the veterinary officer to inspect birds before slaughter or the carcass after the slaughter as required by the law.

Waste was in most cases dumped in open pits where domestic waste is disposed. However, some farmers simply left the waste at the slaughter site. What constituted waste differed among different districts. For instance in Kiambu and Nakuru, the head, offal and lower legs are considered as waste and were given to dogs and cats or simply thrown into disposal pits along with the feathers. However in Vihiga District, only the feathers were considered waste. The intestines, the legs, and the head are cleaned, cooked and eaten as a meal. In Kilifi, the common practice was to give the lower part of the legs, the head, and offal to the people hired to de-feather the birds as part of their pay.

The second system available to farmers for the slaughter of their chicken is through municipal council slaughterhouses. Some small-scale commercial farmers, brokers, and retailers in Nakuru District mainly used this system. The Nakuru Municipal Council's slaughterhouse is located in Bondeni and farmers who wish to use it must transport their chickens there. Farmers complained of the high cess fees charged by the Council and the cost of transporting chickens to the facility.

Consequently, many farmers and traders opt instead to slaughter their chickens on farm or at home. Farmers paid for each bird Ksh 2 for inspection, Ksh 12 for de-feathering, and a Ksh 10 council fee. The Council issued a slaughter certificate only upon the payment of these fees. Defaulters when caught are fined Ksh 1000.

Chickens slaughtered at the Municipal Council slaughter facility are done so by first severing the head after which it is dipped in a drum containing hot water and turned around for about 2 minutes to ease de-feathering by hand. De-feathered birds are washed clean in running water and placed on a table for evisceration, by cutting one side of the abdomen and extracting all the viscera. The cloaca is cut to remove the intestines. Feathers are put on a wheelbarrow and taken to a municipal disposal site.

Previously, the poultry slaughtering facility was housed within the retail market but was later moved to the slaughterhouse in Bondeni following the HPAI scare. Before the move, traders only paid Ksh 10 but now pay Ksh 20 in both facilities in addition to transport costs to and from the slaughter facility.

One major difference between Kilifi District and the rest of the study districts was in the way birds are slaughtered in municipal units. In the former, the birds are slaughtered on a slab made of cement and blood drained into a covered pit. This system of slaughter is recommended for small-scale exotic chicken farmers due to the high cost of transporting a few birds to a municipal slaughterhouse described below. However, it is only in Kilifi District where this system of poultry slaughter is enforced. Poultry farmers in Kilifi District indicated that meat inspectors insist on slaughtering the birds on the slab. None of the farmers interviewed in the other districts indicated that they were required to do this. At the same time, Kilifi poultry farmers noted that they would not sell their uninspected chicken unlike farmers in the other districts. The veterinary staff interviewed in this study attributed this to the types of consumers in Kilifi District, the majority of which are tourists. Thus, the veterinary department in the district chooses to be strict on the safety of chicken sold by enforcing government regulation relating to safety of livestock products including poultry. However, the construction of this type of slaughter facility entails a cost that a farmer must bear (if in the backyard) or the trader bears if it is in a market center. In the case of Mombasa, it was traders who met the construction cost of the slaughter facility. Appendix 4 presents the costs of constructing a slaughter slab. However the cost of building the slab is a one-time investment. It was not possible to ascertain whether farmers and traders who built the slab passed on the costs to consumers as the respondents interviewed argued that they did it to comply with the regulation, and thus implicitly bore the cost.

Poultry processors

The main poultry processing plants serving Kiambu West District are Kenchic Ltd, Alfa, and Farmer's Choice. Kenchic Ltd has its plant in Tigoni, while Farmer's Choice is located in Uplands. The Kenchic follows the "Farm-to-Fork" code of practices. This code ensures that the product is traceable from hatchery/farm through the processing stage to the consumer's table.

The major products of poultry processing include whole chickens (capons), chicken pieces (i.e. thighs, drumsticks, etc.), sausages and burgers. Capons are sold to retail shops and outlets such as

hotels and restaurants, supermarkets, Kenchic distributors/retailers, fast food outlets (e.g. Steers Restaurants) and butcheries, National Airport Services (**NAS**) and caterers. Sausages, which make a small proportion of the output, are sold to NAS and caterers, and to leading supermarkets. The leading buyers of Kenchic's processed poultry products are supermarkets (especially Nakumatt), the Steers restaurant chain, Kenchic fast food outlets, and butcheries.

Kenchic sells its branded poultry products to final consumers through appointed retailers usually as whole chicken or branded sausages and hamburgers. At the time of this survey (February-March 2009), Kenchic's whole chicken sold at Ksh 280 per kg, hamburgers at sh 175 for a 400-gram pack, and sausages at Ksh 364/kg. Kenchic products from Kiambu poultry farms are sold as far away as Naivasha, some 350 km away on the Nairobi-Nakuru highway.

Poultry processors in Nakuru District include KIM Poultry Farm, Poultry Farmers Association of Kenya, and the Municipal Council slaughterhouse. KIM Poultry has its own private slaughter facility but does not offer slaughter services to other farmers as a biosecurity measure. The farm keeps 18,000 broilers at any given time, usually rotating in lots of 6,000 birds. It slaughters the entire lot of 6,000 birds once birds have attained the right weight.

As noted in the preceding section, small-scale farmers, brokers and retailers in Nakuru District process their birds at the Municipal Council's slaughterhouse in Bondeni and pay fees for a council certificate, which serves as a certificate of quality. On a typical week, the number of ex-layers, indigenous birds and broilers processed at the Nakuru Municipal Council slaughterhouse are an estimated 90, 294, and 205, respectively. The relatively low number of birds slaughtered at the council's slaughter facility is probably due to the high fees since most poultry farmers were used to slaughtering their birds in their backyards at no fee. Most of the farmers and brokers we interviewed indicated that they found council fees too high. It also implies that poultry products sold in the district are often either slaughtered at home or by KIM Poultry Farm. It was not possible to establish the veracity of this, however. Nonetheless, major supermarkets in Nakuru, such as Tuskys and Gilanis, have stringent quality requirements on the poultry products they retail and demand inspection or quality certificates from their suppliers.

Some non-contracted farmers in Nakuru District have formed an association called the Poultry Farmer Association of Kenya. The association also has a processing facility and cold storage unit with a capacity of 15,000 birds. The association buys birds from its members at between Ksh 200-220 and sell at Ksh 280-300 per bird. The profits made by the Association go towards meeting its operational costs. On average, the association processes a minimum of 400 birds per week.

Poultry products from the Nakuru slaughter facilities are sold both within and outside of the district. In terms of distribution, 20% of the processed birds are sold in Nairobi, 60% are sold in Nakuru, and the remaining 20% are sold in Kisumu. In Nakuru, 80% are sold to retailers such as restaurants, hotels and colleges (especially Egerton University). The remaining 20% is sold to individual consumers (i.e. Nakuru residents) who usually buy 1-5 birds at a time for home consumption.

Chicken retail outlets: The case of Steers restaurant

The main poultry processors in Kenya are Kenchic, KIM, Alfa, Ideal, and Farmer's Choice. These processors sell some of their products to fast food chains in Nairobi, Kisumu, Nakuru and Mombasa. The amount sold to this specific type of client varies by firm but roughly ranges between 20% and 40% of total throughput. Kenchic, for instance, sells approximately 11,000 capons per day to fast food outlets.

In this survey, we interviewed only one fast food retailer: Steers Restaurant. Steers Ltd, one of the oldest modern fast food chains in Nairobi, gets its supplies of chicken from Kenchic. The fast food chain imports the rest of its raw materials (especially spices, sauces, packages, etc.) from South Africa. The company has its own production department that further processes and marinates whole chicken purchased from Kenchic prior to distribution to its retail shops. At the Steers production unit, the whole chicken is cut into six pieces: thighs, drumsticks, breasts, wings, skin and fat. Wings are sold to Chinese restaurants while fat is sold to pig farmers. The bones and other waste are disposed by contracted waste-disposal services. Sales by Steers are highest during March-April, August-September, and November-December periods which coincide with school vacations and major holidays: Easter in April and Christmas in December. At the time of this survey, Steers bought its capons of a standard weight of 1.30-1.35 kg at Ksh 230/kg and sold them at Ksh 260/kg. During the week, sales are highest on Friday and Saturday when up to 5000 pieces are sold per day, and lowest on Sunday through Thursday with only 800 pieces sold per day. A 2-kg piece of Steers deep fried chicken sells at Ksh 170.

3. Poultry value chains, products flows and governance

This section describes and characterizes each set of actors in the table egg, spent-layer, broiler, and indigenous poultry value chains. Where data were available, we also present information on the available volume of poultry and/or poultry products flowing through different points along the chain.

3.1 Commercial layer and egg value chains

Layer farmers mainly produce eggs and spent-layers for the market. The by-product of their production process is poultry waste which is used as dairy feed and as farm manure. The main variable inputs into their production process are DOC, feeds, vitamins, dewormers, disinfectant, charcoal (for heating), and vaccines. Fixed inputs are brooders and poultry houses. These inputs are the same across the four study districts because they are based on the recommendations of the hatcheries which are standard for the industry. The main actors in the commercial layer value chain include producers, hatcheries, brokers, final consumers, feed stockists, service providers (e.g. transporters, veterinary doctors and livestock production officers), retailers and processors. Each of these actors has defined roles in the value chain as the products move down the chain. Appendix 5 presents the costs of these inputs and benefits generated in the form of a gross margin analysis.

Most layer farmers in Kiambu District produce eggs on a year-round basis. To ensure consistency in the production of eggs, they keep flocks in cohorts staggered every 6 months. Most commercial layer producers keep 100-1000 birds. A farmer with 500 birds collects an average of 13-15 trays⁶ per day for the first 15 months. Production, however, decreases to 6 trays per day during the last 2 months at which point the birds are sold off as spent layers (or ex-layers).

All of the commercial poultry farmers we interviewed across the four districts indicated that they mostly follow the recommended feeding and vaccination regimes received from hatcheries (for larger established farmers) and (for smallholders) government extension staff or agro-vet stores from whom they buy DOC. They also perform routine hygiene and disease control practices including cleaning the feeders and drinkers, clearing the bushes around the poultry units to keep rodents away, ensuring the presence of disinfectant foot baths for visitors to reduce disease outbreaks, and constructing the poultry units away from direct air movement. These practices reduce chicken mortality and increase egg production per cycle.

Production practices used in raising layers

Commercial layer farmers buy their DOC from hatcheries either directly or through their appointed agents. Small-scale farmers mainly buy their DOC from agents of hatcheries, while medium-to-large-scale farmers buy directly from the hatcheries themselves. The use of appointed agents for DOC was more prevalent in Kilifi and Vihiga Districts which were mainly supplied by the Athi River-based Kenchic Ltd. Farmers in Nakuru and Kiambu, on the other hand, mainly got their DOC directly from

⁶ A tray contains 30 eggs.

hatcheries because these facilities were close. The hatcheries and appointed agents ensure that chicks are packaged properly in approved boxes and that the farmer has appropriate means of transport. These requirements have to be met before layer DOC are released to the buyer and are meant to reduce losses due to stress and/or death during the transportation to the farm.

Farm-level layer production practices were almost uniform in all the districts covered in this study. Slight differences existed in small-scale farms where there was much less adherence to recommended practices. Such farmers seek to save on the costs of some expensive practices, notably feeding, by mixing purchased feed with their own milled maize bran. During the first 8 weeks, chicks are kept in a brooder and fed on starter mash. During this period, the poultry unit is frequently disinfected to keep off parasites. Some farmers administer vitamins along with vaccines or drugs to increase the vitality of the chicks and reduce the level of stress. Between day 1 and 3, the chicks are vaccinated against Newcastle disease.

The administration of vitamins is followed between day 7 and 14 with the first dose of Gumboro vaccination. Some farmers, however, reported administering the vaccination against Newcastle on day 21. Most farmers repeated the Gumboro vaccination between day 22 and 30. Fowl pox and fowl typhoid vaccines are given at different times by different farmers. The majority administered fowl typhoid and fowl pox vaccines in the 8th and 10th week, respectively. Some of the large-scale producers give the Reovox vaccination at the 16th week. Reovox vaccination is aimed at controlling salmonella but is not administered by small-scale farmers due to its high cost. From the age of 8-18 weeks, farmers feed layers on growers mash until they start laying eggs, at which point layers mash is introduced. Due to high feed costs, some farmers mix growers mash with maize germ or bran in equal proportions, usually for the mature chickens. The chicks are dewormed frequently at all ages. The birds start laying eggs once they reach a weight of 1.6 kg.

Product flows

Sales of eggs

Figure 7 presents the channels used by Kenyan egg producers. Producers usually sell their eggs directly to retailers or through agents/intermediaries known as brokers. Two types of brokers are involved in the egg business, namely rural and urban. Rural brokers comprise the village assemblers who mediate transactions between the farmer and other market actors, usually through informal agreements.

Most of the rural brokers we interviewed pay cash on the spot and hence do not require any form of agreement other than on price. Farmers contact the brokers (by phone or by walking to the market) when they have eggs to sell. The use of phones to contact traders was mostly common in Kikuyu (Kiambu), Rongai (Nakuru) and Kimbala (Kilifi). These are all peri-urban areas and have traders with mobile phones. In the rest of the areas, farmers travelled to urban centers to find traders. Those farmers that walked to urban centers in search of buyers indicated that it allowed them to talk to several buyers without incurring high phone call costs. The transactions in this case can be either repeated or single, depending on the size of operation of the farmers. Farmers raising large numbers

(more than 2000) of birds on regular rotations tend to have repeated transactions and often contact specific brokers by phone when they have a flock to sell. This occurred among interviewed farmers in Kikuyu, Rongai and Kikambala. Less commercialized farmers in the other study areas changed their buyers often and sold to the one with best price. While farmers generally know the buyers whom they sell to, there are no binding relationships between them in any of the study areas. The farmers we interviewed indicated that they contact (e.g. by phone) a few buyers to ask for their price before deciding on a buyer. In doing so, they are able to choose the buyer with highest price and are also able to bargain. Hence, a single buyer does not have complete power to dictate price due to this type of competition among traders.

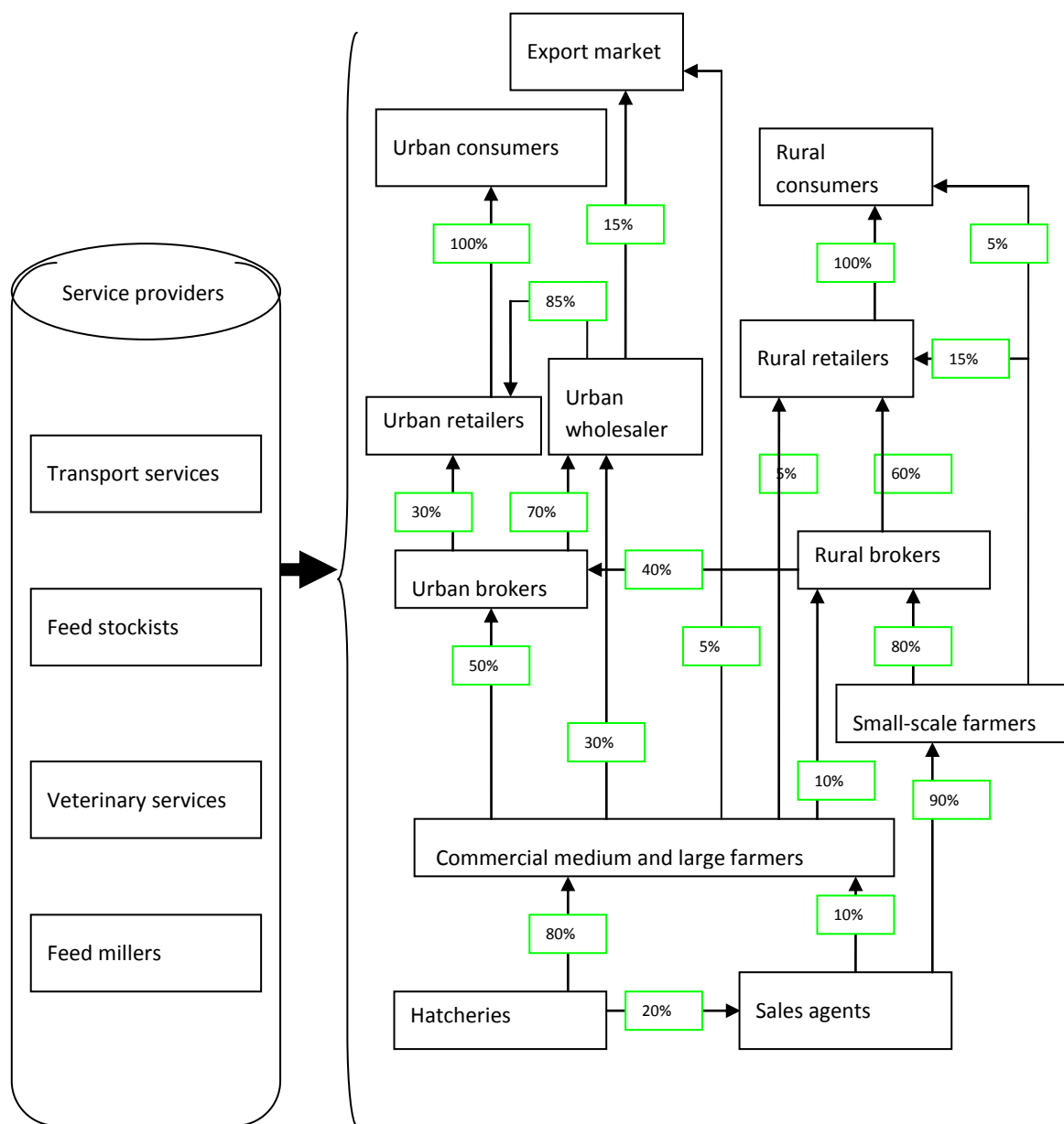


Figure 7. The table egg value chain in Kenya

In Kiambu and Kilifi Districts, some farmers sell their eggs directly to rural retailers (hotels, supermarkets and restaurants), usually through prior orders. Others (especially the larger ones) sell eggs directly to urban retailers in Nairobi and Mombasa towns usually through advance orders and advance payments. It was not possible to estimate the volume of eggs moving in each of these channels due to lack of data. Even the Livestock Department did not have information on the volumes of eggs handled by traders in each of the chains. At the same time, most smallholder producers in Kiambu preferred selling their eggs in the local market. Such farmers argued that transporting eggs to these markets earned them higher income than selling at the farm-gate, an indication that the margin earned through sales to rural brokers was small. Smallholder farmers use public service vehicles to transport eggs to the market, while larger farms use their own vehicles.

The majority of the farmers we interviewed transported their eggs to the market twice a week in Kiambu and delivered at least 34 trays each market day. The most active egg market is the market in Wangige. Key informant interviews indicated that approximately 10,000 crates of eggs are traded in this market each week making it the largest egg market in Kenya. The price of eggs in Wangige Market varies depending on the type of buyer. Rural brokers in Kiambu are on average able to collect 100-300 crates of eggs in a week from farmers at a price of Ksh 150-165 per tray. The rural brokers sell the eggs to urban brokers and rural retailers at Ksh 170-195 and pay a fee of Ksh 5 per tray to the County Council. They also incur an additional cost of transporting the eggs to the market. The cost of transport differs for different brokers. Most (80%) use bicycles and ox-carts, with a cost ranging between Ksh 50-100 per bike trip (if not using their own bike) and Ksh 250-300 per ox-cart trip. Rural retailers eventually sell the eggs to the final consumer who buys at Ksh 180-200 per tray. Farmers who sell in the market have to pay a council fee of Ksh 5 per tray. Some of the brokers we interviewed indicated that they could buy up to 50 trays on a market day. There are approximately 60 egg brokers in Wangige Market. Urban brokers transport the eggs to Nairobi and sell to urban wholesalers in Burma, Kariokor and City Markets. Some of the eggs from Kiambu District are sold as far as Mombasa, Malindi, Kisumu and Tanzania by urban wholesalers. Some rural brokers in Kiambu perform the function of transportation as well. Interviews revealed that these brokers assemble and then transport eggs to these urban centers where they sell to urban brokers and wholesalers under informal (90%) or formal (10%) contractual arrangements.

Within Kiambu District, more eggs were sold through rural brokers in Ndeiya than in Kikuyu Division probably because the main egg markets (Wangige and Nairobi) were more distant, with direct sales to the market entailing higher transport costs. These findings corroborate those of Fafchamps and Gabre-Madhin (2006) that indicated that smallholder farmers sell their produce at the farm-gate to avoid the transport costs of travelling to the market.

Brokers were also the dominant actors linking farmers to the next level of egg buyers in Nakuru. A few large-scale farmers in Nakuru sold eggs directly to wholesalers (usually at Ksh 195 per tray) and other distant markets including Nairobi and Kisumu. However, most farmers sold their eggs to rural brokers at the farm-gate at Ksh 185-200 per tray. Rural brokers handle 82% of the eggs sold in the district. These rural brokers sell the eggs after consolidating them to retailers or urban brokers at Ksh 195-220 per tray.

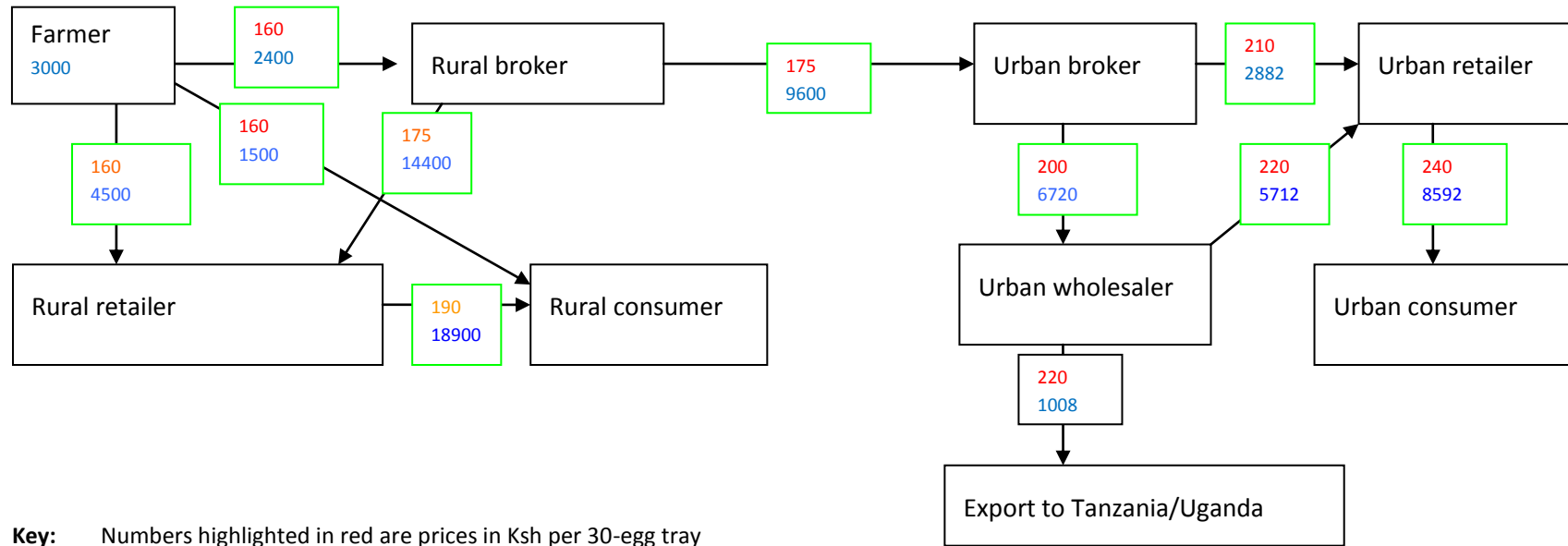
In Kilifi District, different farmer types sell their eggs through different channels. The established large-scale farmers sell eggs under contracts directly to hotels and supermarkets in Kilifi, Malindi and Mombasa at Kshs 200 per tray. Approximately 1,400 trays of eggs move through this channel per week. The smaller egg producers sell their eggs to rural brokers and rural retailers. Rural brokers handle 65% of the eggs sold by smaller farmers with another 25% sold by farmers directly to rural retailers and 10% sold directly to final consumers. Rural brokers buy eggs from farmers at the farm-gate at Ksh 150-170 per tray and transport them to the main local market, Mtwapa, where they sell eggs to urban brokers and retailers at Ksh 200-210 per tray. Some traders transport eggs to local towns (Kilifi and Malindi) where they sell them door-to-door to final consumers at Ksh 230-240 per tray. One interviewed rural broker handles 20-60 trays per week depending on the season. Most urban brokers sell their eggs to hotels and urban retailers.

Retailers buy their eggs from rural brokers and farmers (in the case of rural retailers) and urban brokers and wholesalers (in the case of urban retailers) in all of the study districts. These retailers included local supermarket/grocery stores, retail shops/kiosks and restaurants. In Nakuru, retailers handle 20% of the eggs produced in the district with one supermarket store selling up to about 20 trays of eggs per day. Approximately the same amount of eggs is handled by retailers in the other districts. Some of the brokers sold eggs both in bulk or single pieces, with one egg selling at Ksh 8-10. In Kilifi, retailers buy eggs from producers at Ksh 175-195 per tray or brokers at Ksh 200 per 30-egg tray and sell them at Ksh 240 per tray or Ksh 8-10 per egg.

Figure 8 below summarizes the flow of eggs (highlighted in blue) and the prices of a 30-egg tray at each point along the egg value chain for all study areas. Note that substantial amounts of eggs are consumed by rural consumers. Indeed, the data presented indicated that more than two-thirds of the eggs sold by farmers end up being consumed by rural consumers. This finding is likely due to the survey locations. Apart from Ganze, the remaining study locations were peri-urban where consumption of eggs is usually higher (Ngigi 1998). The high consumption of eggs in rural and peri-urban areas is also likely to be due to the fact that eggs offer cheaper animal protein source than the alternatives (i.e. meats and fish).

Sale of spent layers

In each of the four study districts, spent layers are disposed of at the age of 18-24 months after the egg laying percentage falls below 50% from their peak. Large-scale producers sell their culled birds to brokers at Ksh 220-230 per bird and will usually sell the entire flock at the time of sale. In Kilifi District, spent layers were sold as live or processed birds. Poultry farmers sell their spent layers to rural brokers who in turn sell the birds to hotels (i.e. retailers) in Kilifi town or to urban retailers in Malindi, Kilifi or Mombasa. Most rural brokers have no specialized transport and sometimes transport culled layers in passenger vehicles with other luggage. The farm-gate price offered by most brokers ranges from Ksh 170-260 depending on the season. Rural brokers sell birds to retailers and urban brokers at Ksh 220-350 depending on the season. Urban brokers mainly sell spent layers to urban retailers based in municipal/county council markets, hotels, or door to door in urban areas. Retailers sell spent layers to final consumers at Ksh 400 per bird.



Key: Numbers highlighted in red are prices in Ksh per 30-egg tray
 Numbers highlighted in blue are volumes of eggs in trays

Figure 8. Estimated volumes (trays/week) handled and average prices (Ksh/30-egg tray) charged by the various actors in the egg value chain

In Nakuru, farmers sell culled birds to rural brokers at a farm gate price of Ksh 200-250 per bird. These rural brokers sell the birds to retailers (in retail markets), hotels and restaurants at Ksh 260-280 per bird. The traders interviewed did not mention hawking spent layers from door to door as in Kilifi District. However, some brokers sell live spent layers on roadsides. In Vihiga District, on the other hand, farmers sell their culled birds mainly at the farm-gate at a price of about Ksh 300 per bird. The majority of these farmers sold their culled birds directly to consumers in villages due to high demand for poultry in Vihiga.

In Kiambu, some farmers have their own means of transport and therefore take their culled birds to local markets where they sell to rural brokers at Ksh 270-290 per bird. Other rural brokers buy culled birds directly from farmers at a farm-gate price of Ksh 250-270 per bird. Rural brokers then sell culled birds in local markets to rural and/or urban brokers at Ksh 270-290 per bird. From here, urban brokers sell the culled birds to retailers in major urban markets, such as Nairobi, at Ksh 300-320 per bird. A consumer in an urban market will then buy the culled birds from urban retailers at an average price of Ksh 400 per bird. Figure 9 illustrates the distribution of culled birds along the value chain. Notably one-half of spent layers from medium and large-scale farms are sold in urban markets through urban brokers, while another 35% is sold through rural brokers. This suggests that this chain is heavily dependent on the various intermediaries to market its birds.

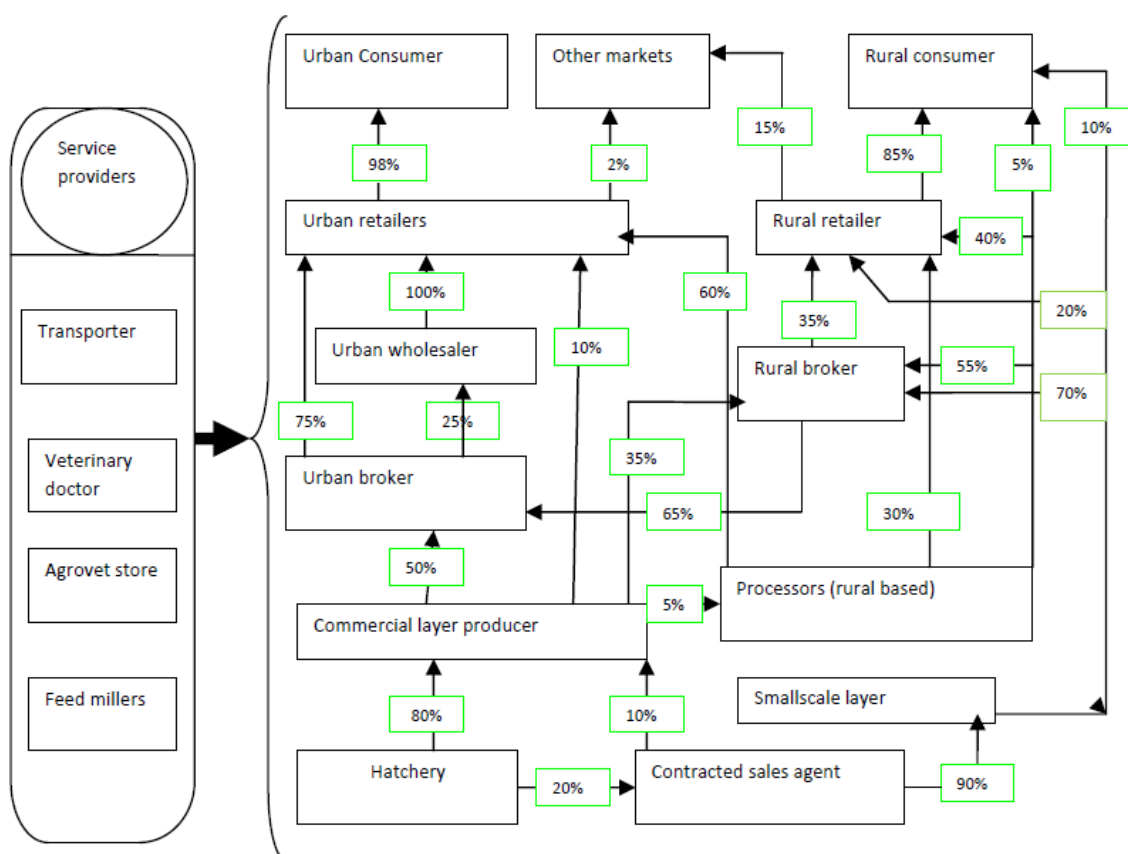


Figure 9. Value chain for culled/spent layers with estimated shares of volume handled by each channel

Overall, the total number of spent layers marketed per week in the study areas was approximately 10,000 birds with the bulk coming from Kiambu and Nakuru Districts where layer production is a more common practice. These two districts accounted for more than 70% of the total spent layers sold by farmers at the time of this study. Figure 10 presents the volume (number of birds) flowing through the spent-layers chain (highlighted in blue) and prices at each of the points along the chain per week. One important difference in this chain compared to the egg value chain is that most of the birds are consumed in urban areas rather than in rural ones. This is not surprising given the higher cost of chicken meat compared to alternatives such as beef and pulses (especially beans).

Governance mechanisms

Transactions in the commercial layer value chain mainly involve informal relationships based on arm-length transactions. These relations are short-term with one trader dealing with different buyers at different times depending on the price offered by one buyer relative to the others. There are no written contracts between the different actors in the chain in each of the four study districts. The only exception is in the sale of DOC that involves either the hatchery or their appointed agents and in the contract production of broilers by farmers in Nakuru and Kiambu. In the former, agents using an interlinked credit scheme involving the provision of DOC and other veterinary inputs to farmers on loan have formal written contracts that allow them to recover the cost of inputs and services from their sales. In the latter, farmers sign contracts with the hatchery that also facilitate recovery of the cost of inputs and services from the sales. These regions in which contract-oriented arrangements are found include Kiambu, Rongai and Kikambala where commercial production dominates. Poultry production in these areas fall under sectors 1-2 because the contracting hatchery farm enforces stringent biosecurity measures similar to those on their farms. The remaining actors trade with each other either through informal agreements or non-repeated transactions.

Layer farmers association

Some farmers in our study districts belong to farmers associations formed to help farmers with the production and marketing of poultry and poultry products. These include the Kilifi Poultry Farmers Association (**KIPOFA**) and Tumaini Youth Group in Kilifi District and the district chapter of the Kenya Association of Poultry Farmers (**KEPOFA**) in Nakuru. The main goals of these poultry farmers associations include:

Helping members pool resources, especially financial, to expand production;

- Upgrading of production through the use of the hybrid cockerels and engaging in common procurement of farm inputs;
- Negotiating better prices for their products;
- Capacity building for members through training activities;
- Training members on how to formulate their own poultry feed.

These associations have regulations on membership and require members to pay an annual subscription of Ksh 200 and monthly contribution of Ksh 200 per member. KIPOFA is an affiliate of

the Kenya Poultry Farmers Association (KEPOFA) and benefits from information, inputs and access to loans through KEPOFA.

A branch of KEPOFA also existed in Nakuru District. The branch, in addition to providing the above services to its members, had a slaughterhouse for use by members at a fee (see section 3.2 below for a discussion on this). We did not find any active farmers association in Vihiga and Kiambu Districts. These farmer associations did not enforce biosecurity controls in members' farms, as production decisions are made by farmers individually. Rather, these associations mostly handled marketing activities, although they facilitated the training of members on general poultry production and marketing strategies by inviting guest trainers.

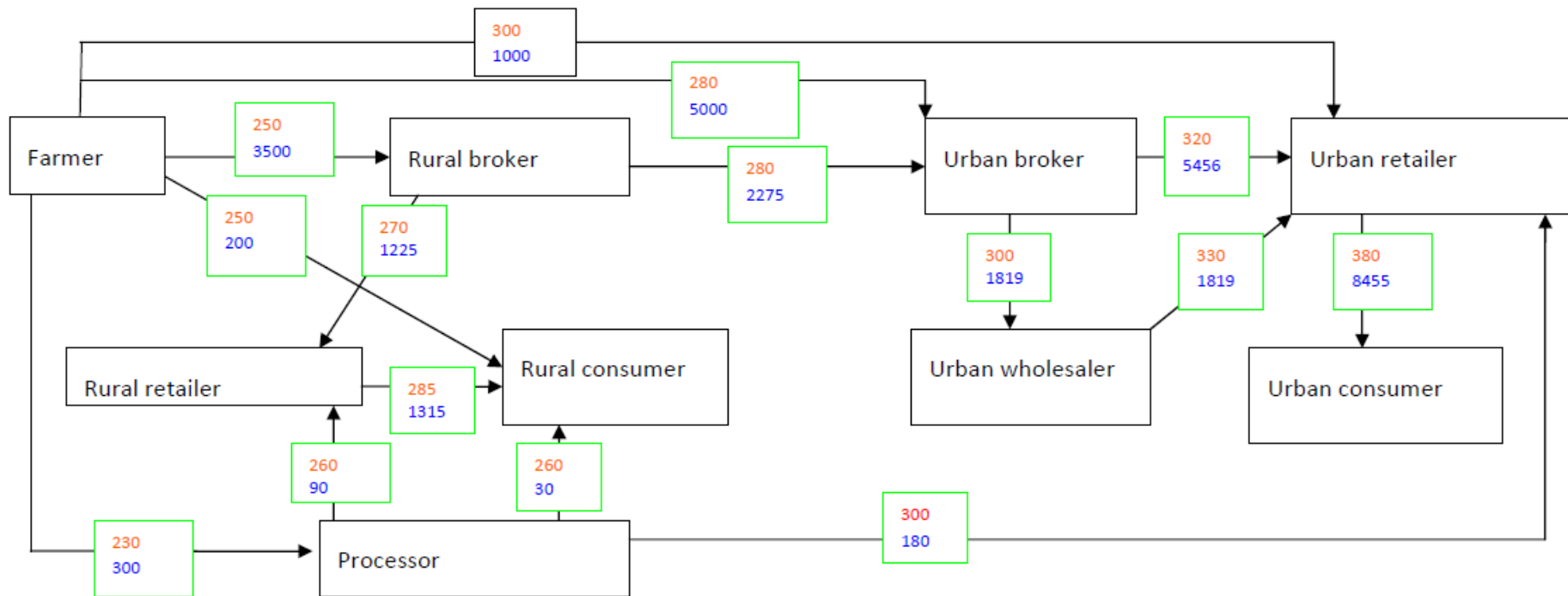


Figure 10. Average prices (Ksh/bird) charged by various actors (in red) and estimated volume of culled layers (number of birds, in blue) marketed per week in the spent-layers value chain in the study sites

Public policy and regulations

Public policy and regulations relating to layer production cover both the production of DOC and sale of spent layers. Regulations regarding the acquisition of parent and grandparent stock of DOC include the need to have a sanitary certification issued by the responsible authorities of the exporting country together with an import permit. Besides this regulation, hatcheries are required have the brooder inspected regularly by veterinary officers.

There is also a government regulation related to the movement of spent layers. These regulations require that:

- Transporters of spent layers possess a movement permit issued by a veterinary doctor. The permit costs Ksh 100 per year;
- Only inspected and stamped carcasses of spent layers can be sold to consumers;
- Transporters of spent layer carcasses must obtain a COT (Certificate of Transport). COT for each consignment costs Ksh 20;
- The container and carriers used for the transport of carcasses should be licensed and painted red and white.

The extent of enforcement of these regulations differed among the study districts. There was stricter enforcement of regulations especially relating to the slaughter, handling and marketing of spent layers in Kilifi District than in all other districts. The veterinary staff in Kilifi and Mombasa worked together to enforce requirements relating to the sale of dressed spent layers. This stricter enforcement in Kilifi and Mombasa may be attributed to the sensitive nature of the market dominated by tourists. The veterinary staff in Kilifi and neighboring Mombasa District also enlisted traffic police in the strict enforcement of regulations regarding the transportation of live and dressed spent layers. We did, however, find similar strictness in the movement and marketing of eggs in Kilifi while the enforcement of regulations relating to production, movement and marketing of live/dressed spent layers and eggs by veterinary staff in Nakuru, Kiambu and Vihiga was largely absent. The traffic police also did not strictly enforce these regulations in these three districts. Instead, some police officers allowed birds to be transported without a permit after receiving bribes. Thus in terms of biosecurity, Kilifi District was way ahead of the other districts and is better prepared to deal with an outbreak because of stricter control and regulations related to biosecurity, except for transportation. In the latter, the movement of delivery trucks among farms can be a source of introduction and spread of an infectious disease.

3.2 Value chain for commercial broilers

Commercial broiler production is unique in its extent and scale of production in each of the surveyed districts. Broiler production is less popular than the production of layers in three of the four study districts due to narrow profit margins caused mainly by high feed costs. Appendix 6 provides representative costs and revenues in broiler production in the form of gross margin analysis. As shown, costs account for approximately 74% of the revenues from production as compared to only

35% for layer production⁷. The higher profitability of layer production arises from the fact that there are more products (e.g. spent layers and manure⁸) sold besides eggs. In Vihiga District, where chicken is the most popular among the different meats consumed, traders interviewed indicated that consumers preferred traditional indigenous chicken to broilers. Commercial production of broilers is also constrained by poor management skills, especially among poultry farmers in Vihiga District, resulting in high chick mortality and general losses to disease. In contrast, broiler production is more popular in Kilifi District, ostensibly because of the high demand for poultry meat by local and urban tourist hotels in the district and in neighboring Mombasa and Kwale Districts.

Broilers are produced by both large-scale and small-scale farmers. Large-scale poultry production involves farmers who keep an average of 1000-2000 birds per cycle⁹ for about 50 days while small-scale producers keep around 100-600 birds per cycle. Most commercial broiler farmers follow a feeding and vaccination program provided by the hatcheries. As in the production of layers, broiler farms that we visited in the four study districts follow strict disease control measures including foot baths with disinfectants at the entrance of the poultry units, regular disinfection of feeders, water troughs, and brooders, and the general hygiene of staff. Most broiler producers have poultry units that are separated from residential buildings.

Some integrated farms such as Kenchic Ltd and KIM Poultry Farm produce broilers under contractual arrangement with out-growers. These firms produce DOC and poultry feeds, and process the birds. They provide all the needed inputs and make all the decisions, with the farmer providing labor, production site, housing, and management of birds. To obtain a contract with Kenchic, a farmer must have the capacity to rear a lot of 9000-12,000 birds at any one time. Such contracts therefore target large-scale farmers.

Management practices in the production of broilers

As in the case of layers, the kind of management depends on the scale of the farm. Large-scale farmers in all four study districts adhere to the feeding and management practices recommended by breeders more strictly than do small-scale farmers. The feeding and vaccination programs used depend on the hatchery but farmers in the surveyed areas had similar practices. However, in general, birds are fed on broiler starter mash from the 1st to 3rd week. From the 4th to 6th week, broiler finisher, pellets and crumbs are used.

Poultry vaccines are administered at various ages. During the 2nd week, birds are vaccinated against Gumboro, followed by Newcastle disease and infectious bronchitis vaccinations in the 3rd and 4th weeks, respectively. During the 4th week, Gumboro vaccine is repeated. Vitamins are given 3 times per week until broilers are sold, while deworming is done every 2 months. These practices did not differ much by study district.

⁷ It should be noted, though, that broilers take shorter time to produce than layers.

⁸ Layers generate higher volumes of manure because of the longer production period compared to broilers.

⁹ Both small and large farmers follow the same production cycle recommended by the hatchery.

Birds require regulated heating and lighting especially during the early stages of production. The type of heating in each study district differed depending on the scale of production. Large-scale producers use automatic heaters to regulate the heat and electricity for lighting. Such heating systems were common in Kikuyu (Kiambu) and Kikambala (Kilifi). In Vihiga, the use of electric heaters were less common with farmers (mostly medium-scale) using charcoal heating. Small-scale farmers generally use charcoal burners for heat regulation and lantern lamps for lighting.

Product flow in broiler value chain

Broilers are reared for meat, with the main product of broiler production being dressed chicken. As shown in Figure 11, farmers sell their broilers through a number of market outlets. These include other farmers, consumers, rural and urban brokers, urban wholesalers and rural and urban retailers. Broilers are either sold as live birds or dressed carcasses. In the latter case, the slaughter is done by the firm (as in the case of Kenchic and Farmer's Choice) or in council slaughterhouses for smallholder broiler farmers as described above for culled layers. In Nakuru District, farmers used either the municipal slaughter facility or the one owned by the KEPOFA Nakuru branch. The association has a processing facility and cold storage with a capacity for holding 15,000 birds that farmers can use when their birds reach mature age and before they find a buyer. In Kilifi District, the use of slaughter slabs was common, while the majority of medium and smallholder farmers slaughtered the birds in the backyard in Kiambu and Vihiga.

Established firms like Kenchic and Farmer's Choice produce a range of poultry products. These include whole dressed chickens, chicken pieces (e.g. legs, thighs and breast), sausages and burgers. Overall, capons represent about 80% of the share of these products with chicken pieces, sausages and burgers accounting for 5%, 3% and 2% respectively

Poultry processors sell capons to rural and urban retail shops and outlets including hotels, restaurants, supermarkets, distributor agents, butcheries, NAS (National Airport Services) and other caterers. NAS is unique among these buyers because it demands traceability and the adoption of international food safety standards. The sale of poultry products to NAS was common only in Nairobi and Kilifi (Kikambala) and less so for Nakuru. In Vihiga, there were no sales to NAS. Producer firms have supply contracts with their clients. For instance, Kenchic Ltd sells 70% of its processed capons to supermarkets (Nakumatt) and 20% to Steers Restaurant under formal contracts, and the rest to Kenchic distributors. Poultry products from all study districts end up in the major supermarkets (especially Nakumatt).

In Nakuru District, small-scale broiler farmers produce broilers under formal and informal contracts with local hotels and restaurants. Indeed, smallholder broiler farmers we interviewed indicated that they only produce broilers under contract with buyers because of the high cost of feeding the birds beyond their market age. The majority of the broiler farmers who produce birds without prior contracts with buyers are members of the Nakuru branch of KEPOFA.

In Kilifi District, large-scale broiler producers sell 80% of their birds (dressed broilers) to the Mombasa tourist hotels, 15% to Malindi and Kilifi hotels, and the rest to hotels in Nairobi. A few large-scale farms sell their dressed broilers to supermarket outlets in Mombasa town. These producers sell dressed broilers at Ksh 220-260/kg depending on the season. On the other hand,

smallholder broiler producers sell live birds to either rural brokers or dressed birds directly to hotels and restaurants in local towns. The majority sell their live birds to rural brokers at a uniform price of Ksh 200-300/piece depending on the season, with the highest prices prevailing during festive seasons (April, August and December). Some (about 10%) rural brokers pay the whole cost of the entire flock but collect the birds in bunches of 10-100 depending on the order and the quantity bought. Such brokers pay towards the costs of feeding the birds during the post-purchase period.

Some smallholder broiler producers sell to retailers such as hotels and supermarkets, usually on order, at Ksh 220-280/piece, and also to the final consumer at Ksh 280-300/piece depending on the season. The major local market for smallholder broiler farmers in Kilifi District is the Mtwapa Market. Farmers who are unable to get buyers and do not wish to sell to rural brokers transport their live birds to Mtwapa Market where they sell to urban brokers. Some 26 rural and urban brokers trade in both live broilers and culled layers in the market. Rural brokers assemble birds from farmers (usually known contacts or neighbors of such contacts) and bring them to Mtwapa Market where they, too, sell to urban brokers. Some (4) rural brokers double-up as retailers in the market. Other rural retailers are mainly local hotels.¹⁰ Approximately 8000 birds (comprising both broilers and spent layers) are traded in the market every week.

The majority of urban brokers buy their supplies based on prior orders made primarily by urban hotels, supermarkets or colleges. Where the buyer wants dressed broilers, urban brokers must meet the cost of inspection (Ksh 2/bird) and COT (Ksh 200 per consignment). Figure 12 presents the flow of broilers along the value chain in terms of number of birds bought and sold per week (highlighted in blue) and the prices charged by each actor (in red).

Approximately 50,000 broilers were traded per week at the time of this survey in all the study areas combined. As in the case of layers, the majority of broilers (88%) are consumed in urban areas. Unlike the spent-layer chain, the majority of broilers sold in both rural and urban areas do not pass through intermediaries (rural and urban brokers). This is probably because the majority of farmers produce broilers under prior arrangements with buyers (hotels or hatcheries). Most farmers opt to produce broilers under prior arrangements because the weight at which the birds must be sold is an important parameter in the sales process. Most interviewed buyers have specific dressed weights that they require. Farmers who cannot sell off their flock when the weight is attained therefore lose on feeding costs because the buyers pay the same price regardless of weight.

¹⁰ There were approximately 100 local hotels and restaurants in Mtwapa town.

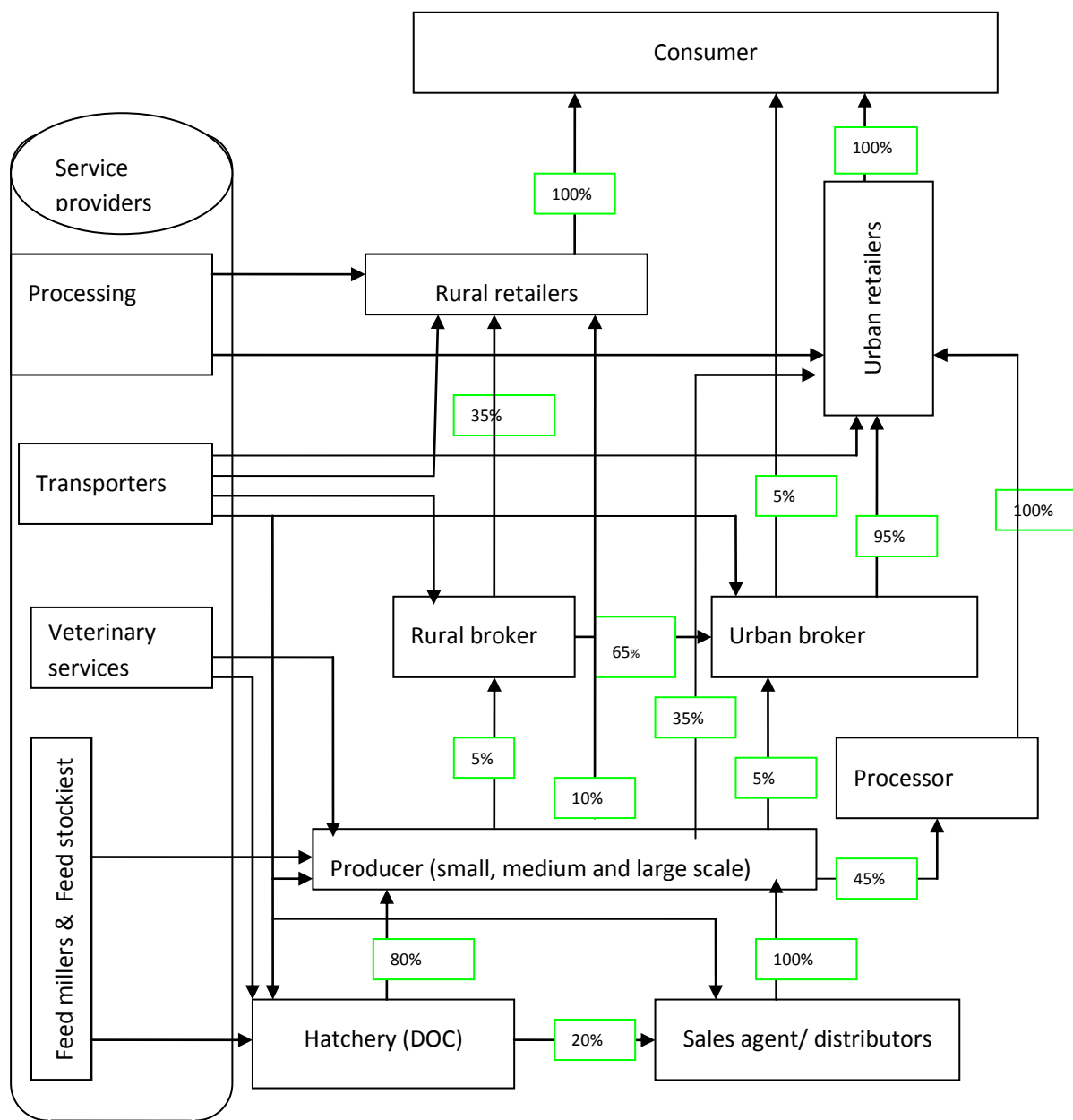


Figure 11. Broiler value chain and volume shares for each channel, 2009

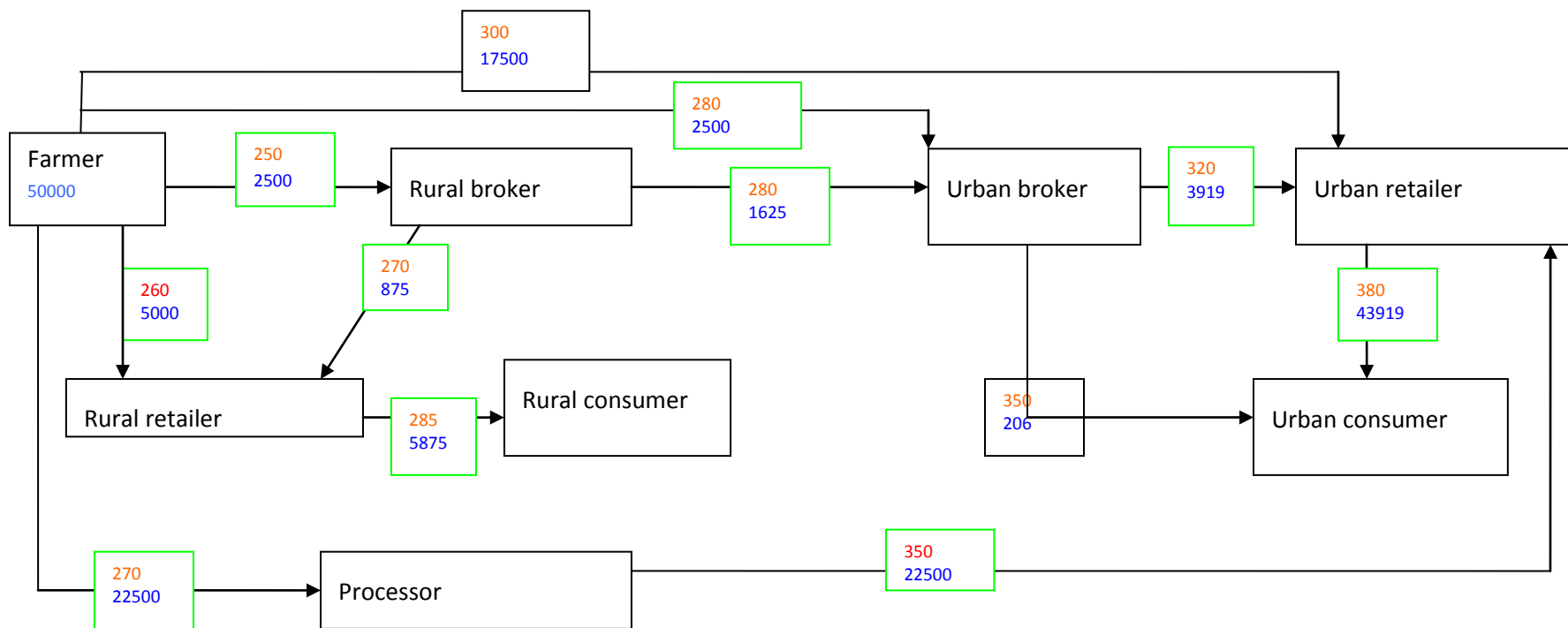


Figure 12. Average prices (Kshs/bird) charged (in red) and estimated volumes of broilers (number of birds, in blue) handled per week by the various actors in the broiler value chain in the study sites

Governance and coordination in the broiler value chain

Compared to the layer value chain, the broiler chain is more integrated. The high cost of feed generally discourages the production of broilers in each of the study districts. Farmers in all four districts generally preferred to keep layers and only kept broilers if they had a production or futures-type of contract. However, production costs are just one of the factors affecting non-contractual production of broilers. An important factor is consumer preference for indigenous chickens. These factors have encouraged contract production of broilers based on formal/written contracts between breeders and farmers, and that targets high-end markets such as retail supermarkets, tourist hotels and the aviation industry. These outlets are more discerning about quality than other broiler consumers.

The contract typically specifies production practices to be followed. DOC are provided by the breeder who owns the birds until they exchanges hands with the buyer of dressed carcasses. The contracting farm also usually requires that the farmer follows similar production and biosecurity procedures as the contractor. Indeed, some breeders, particularly Kenchic, have introduced safety protocols that assure the final buyer of product safety from farm to fork. In such production arrangements, the breeder basically determines the volume and quality of broiler products produced by its contracted farmers. However, the breeder is in turn subject to the quality specifications of its final clients. Some of these high-end broiler markets, especially tourist hotels and the aviation industry, have adopted international food safety quality schemes such as the hazard analysis and critical control points (HACCP) or farm-to-fork protocols, thus forcing their suppliers to comply (e.g. Kenchic Ltd). Some international hotels and major supermarkets in Kenya have a system of monitoring production practices, although this system is weak compared to that used in fresh vegetable production for export to the more demanding European supermarkets.

The above integrated production system, however, only involves large-scale broiler producers that are common in Kiambu, Kilifi (Kikambala), and Nakuru Districts. The other study areas did not have such integrated production systems for broilers. Small-scale farmers either raise the birds and look for buyers when the birds are ready for sale, or already have orders from buyers. In the latter case, farmers generally have informal agreements with buyers, which include small fast food restaurants in major towns or colleges/schools to supply dressed chicken. These kinds of arrangements were common in Ndeiya and Sabatia and Rongai Divisions. Such arrangements do not specify how the chicken should be raised or even its quality but generally specify the sale weight and price. Thus, the farmer in this case retains some power in determining what is sold in the market. However, some of these fast food restaurants and colleges require the stamp of quality approval by government inspectors as an indication of the safety of the dressed carcass.

In all study districts, there were some urban-based brokers that supplied certain fast food restaurants. Some of these brokers had informal arrangements with broiler farmers for the production of broilers. However, these intermediaries also do not specify the production practices to be followed by the farmer, but focus rather on price, time of sale and weight.

Role of associations

A number of broiler farmers belonged to farmer organizations that are formed to help farmers produce and market poultry and poultry products. In addition to the general functions of such associations discussed in section 3.1.4 above, broiler associations operating in Kilifi and Kiambu Districts sought to confront the marketing challenges their members faced. One such challenge was that of poor market access. Brokers typically bought broilers from individual farmers in the two districts and supplied the same clients they targeted. At the same time, such brokers insisted on taking broilers on credit but some failed to remit the payments after collecting the birds. Thus, to overcome this challenge, the association sells chickens on behalf of its members. In doing so, the association was able to negotiate better prices for its members and handled the payment mechanism to avoid non-repayment. In this manner, the association has been able to reduce the marketing power that brokers had over the determination of price and generally over the broiler market in these two districts. The extent to which the association exercises market power is not known, but unlike their counterparts who do not belong in such associations, members were able to negotiate much higher prices (up to 20% higher) for their broilers.

Public policy and regulations

The public regulations relating to the production and marketing of broilers are the same as those for layers. These regulations cover the management of broiler DOC, the management of broilers and transportation of live birds and carcasses. In addition, however, a government regulation requires that if upon inspection the carcasses are found to be unfit for human consumption, a certificate of condemnation should be issued by the inspector barring the sale of such products. The farmer is then required to dispose carcasses in a way specified by a public health officer.

3.3 The value chain for indigenous/traditional poultry

Characterization of the indigenous poultry chain

The demand for indigenous poultry is high in all study districts. Some consumers prefer indigenous chicken to meat from broilers and layers because, they argue, it tastes better and it is more nutritious. In addition, the cost of producing indigenous chicken is lower due to its alleged higher resistance to diseases (Bebe and Owuor 2008). In the four districts surveyed, indigenous chicken and their products fetched a higher price than layers and broilers. For instance, the price of a broiler/layer was Ksh 250-300 per 2.5-3.0 kg liveweight, while a traditional chicken of similar weight sold for Ksh 350-400 in Kiambu, Nakuru and Kilifi. In Vihiga, a traditional chicken of the same weight costs less at about Ksh 300, probably due to the high population of traditional chickens in this district compared to other study districts.

The majority of interviewed farmers keep indigenous poultry. These birds are raised under a free-range system in which they are free to scavenge for food. In Kilifi District, indigenous chickens are mainly found in Ganze Division, while in Vihiga, populations of indigenous chickens dominate hybrids in both Vihiga and Sabatia Divisions.

Most producers build their stock by buying 2-3-month-old birds (locally referred to as 'growers') from other farmers at Ksh 50-100 per bird until they acquire the desired flock size. Some farmers raise their own indigenous chickens by maintaining a breeding stock with good qualities in terms of health, weight and good physical appearance. Others buy eggs for breeding at Ksh 12-15 from neighbors with breeding stock. Other farmers are given parent stock as gifts by relatives. The total number of birds per homestead varies between 10-100 birds. Traditional chicken production is of major importance to the livelihoods of the more commercially-oriented farmers, but is of relatively less importance to those who keep them for subsistence. Among farmers in the latter production system, crop production is the major source of income.

Most indigenous chickens in Kiambu District are concentrated in Ndeiya Division. Almost every homestead in the division has indigenous chickens. The majority of households have an average of 15 birds with the minimum number of birds being 5 birds and the maximum 100.

Most households in Kilifi District, Ganze Division also keep indigenous poultry. The lowest number of indigenous birds per interviewed household in Kilifi was 5 birds while the maximum was 200 birds. Indigenous chickens are kept mainly for home consumption, though some (approximately 80%) farmers produce commercially.

In Nakuru District, Rongai Division had a higher population of indigenous chicken than Bahati. Most farmers started their flock of indigenous chickens with a pullet and a cockerel bought from other farmers at an average of Ksh 200 and Ksh 250 per bird, respectively. Others started by buying chicks for rearing at an average price of Ksh 100 per chick. In Vihiga District, on the other hand, the source of the breeding stock varied greatly. Most farmers were given a pullet, a cockerel, or both as a gift by relatives and multiplied them. Other farmers bought the parent stock at Ksh 300 for a pullet and Ksh 350 for a cock from neighbors or the local market. Still other farmers raised their stock by using eggs from those who raise breeding stock. Eggs for breeding purposes sell at Ksh.15-20 per piece in Vihiga.

Some farmers in Kiambu, Nakuru and Vihiga Districts expanded their stock of indigenous birds by using turkeys to brood chicken eggs (i.e. turkeys lay on fertilized eggs of indigenous poultry until they hatch). To synchronize the 30-day brooding period of the turkey, farmers will give the turkey one dummy egg to sit on for the first ten days before introducing fertilized chicken eggs. Another practice observed in Vihiga, Nakuru, and Kilifi Districts was synchronized hatching whereby a dummy egg is given to every hen that becomes broody until the desired numbers of hens have all reached broodiness. The dummy eggs are then removed and fertilized eggs introduced at the same time. Upon hatching, chicks are separated from their mothers and put into an improvised facility to grow.

Another method used in Nakuru and Vihiga Districts to build up the stock of indigenous chickens was through continuous/consecutive hatching whereby the hen is made to sit on eggs for two or more consecutive cycles by removing chicks every time they hatch and replacing them with new eggs. Farmers used this method to rapidly build up the flock of indigenous chicken.

In Nakuru and Kilifi Districts, some farmers had developed improvised incubators. In Kilifi, a container is one-quarter filled with dry maize germ. The eggs are placed on this layer and another thin but sufficient layer of maize germ is added on top. This system helps the incubated eggs hatch

after a normal incubation period. Interviewed farmers indicated that the system achieves a hatching efficiency of 80%. In Nakuru, on the other hand, a homemade wooden incubator was used with 95% performance efficiency. In all cases, some of the chicks are sold and others are kept as replacement stock.

Management of indigenous chickens

Farmers of traditional chickens do not have a routine feeding and disease management program for their birds. Birds generally scavenge and are unconfined. Some farmers supplement their feeding with cereal grains, such as maize, and domestic waste including kale leaves.

Control of disease outbreaks is done by keeping the compound and poultry house clean, usually by sweeping. No fumigation is done. In the event that there is a disease outbreak, some farmers administer herbal concoctions as a treatment. The most common “treatments” include juices made from a mix of water and the leaves of aloe vera or the neem tree. Some farmers pound African bird eye chili and mix with water and administer to the birds while others give lemon juice. The herbal treatments are administered irrespective of disease symptoms. A few commercial indigenous chicken farmers give the Newcastle vaccine in the chicks’ first 21 days before they are allowed to scavenge in a free-range manner. These farmers were mainly found in Kiambu and Vihiga Districts and averaged about 5% of the indigenous chicken farmers in these districts.

Hatched chicks are transferred to a warm home-made brooder and fed on fine sieved maize germ, fish meal and water. They are removed from the brooder after 3 weeks, then free ranged.

Flows of indigenous chicken in the value chain

Figure 13 presents the channels through which indigenous chickens are sold in the study districts. In Kiambu and Nakuru Districts, approximately 90% of traditional chickens kept by non commercial farmers was sold, with only 10% consumed by the household. On the other hand, the majority of traditional chickens (80%) in Vihiga and Kilifi Districts are consumed by the household. Commercialized indigenous chicken farmers sold 100% of their birds, as would be expected.

Indigenous chickens are mainly sold locally to neighbors, rural brokers and in the local market. As in the case of layers and broilers, rural brokers collect and assemble chickens from different farmers and sell onwards to urban brokers and rural retailers. Urban brokers transport chickens to urban centers where, in the case of Kiambu, chickens are sold in Burma and Kariokor Markets. Indigenous chickens in the other districts are also sold in major towns including Kilifi, Malindi, Mombasa, Nakuru, Kakamega and Kisumu. In Vihiga District, the high demand for indigenous poultry has created a strong market for such birds from neighboring districts. For instance, traders interviewed indicated that there was an active trade in the sale of indigenous poultry in Vihiga by traders who transport them from Nandi District.

Regional trade involving Nandi and Vihiga Districts involves traders (known as market-link traders) that assemble indigenous chicken from farmers and transport them to Vihiga due to high chicken prices there. Traders interviewed indicated that they buy chickens in Nandi District at Ksh 250-280 per bird of approximately 3 kg liveweight. The birds are then transported in special cages using public service vehicles (passenger minibuses and buses) at an average cost of Ksh 4 per bird and

usually in batches of at least 50 birds. Once in Vihiga, these traders sell the chickens to rural brokers at Ksh 300-320 per bird. Some of these distant traders sell directly to other actors (final consumer or retailers) in the Vihiga County Council Market. The county council levies a fee of Ksh 200 per trader per day, or about Ksh 4 per bird for the 50 birds handled on average. Each market trader sells/handles about 200 birds per week. In Majengo Market alone, more than 2000 indigenous chickens are traded per week.

The free-range system of poultry production has a number of challenges. In particular, it has a high chick mortality rate estimated at 75% due to predation and diseases. The focus group discussion (FGD) with farmers in the four districts attributed the challenges to:

1. Low chick survival rate of between 20% to 30% due to poor poultry management and predation
2. Disease outbreaks that sometimes wipe out the whole flock, forcing farmers to start all over again
3. Conflicts¹¹ especially during planting season. To avoid confrontation with neighbours, farmers in Nakuru, Kiambu and Vihiga Districts said that they sell most of their birds just before planting season and retain only a few for continuity.

Governance mechanisms in the indigenous poultry value chain

The value chain for indigenous poultry is presented in Figure 13. There are no production contracts between indigenous poultry farmers and the buyers in the chain. However, there are trading relationships between the different intermediaries in the marketing of live birds. Trading relationships are mainly based on long-term repeated transactions and are neither dictated by kinship nor tribe. Some rural assemblers have informal arrangements with urban based traders that involve an agreement on the volume of birds to be delivered and an average price. The most complex kind of arrangement involves Nairobi-based traders (based in Burma, City, and Kariokor Markets) and rural assemblers from Machakos and Kangundo Districts.

Rural assemblers from these districts have informal arrangements with the Nairobi-based brokers¹² to supply traditional chicken. These rural assemblers bulk and transport birds to Nairobi, but cannot themselves sell in these markets because the Nairobi-based brokers have formed a cartel that bars any trader from outside from trading traditional chickens in the three main city poultry markets. The brokers therefore have power over the buying and selling prices of indigenous chickens in these markets. The brokers generally offer about the same buying and selling price indicating that there is a degree of collusion.

¹¹ The conflicts arise from chicken feeding on or destroying germinating seedlings of neighboring farmers' crops.

¹² In Kariokor, the largest city market for indigenous chicken, there are five brokers dealing with chickens from outside Nairobi, while in Burma and City Markets, key informant interviews indicate that there were four each.

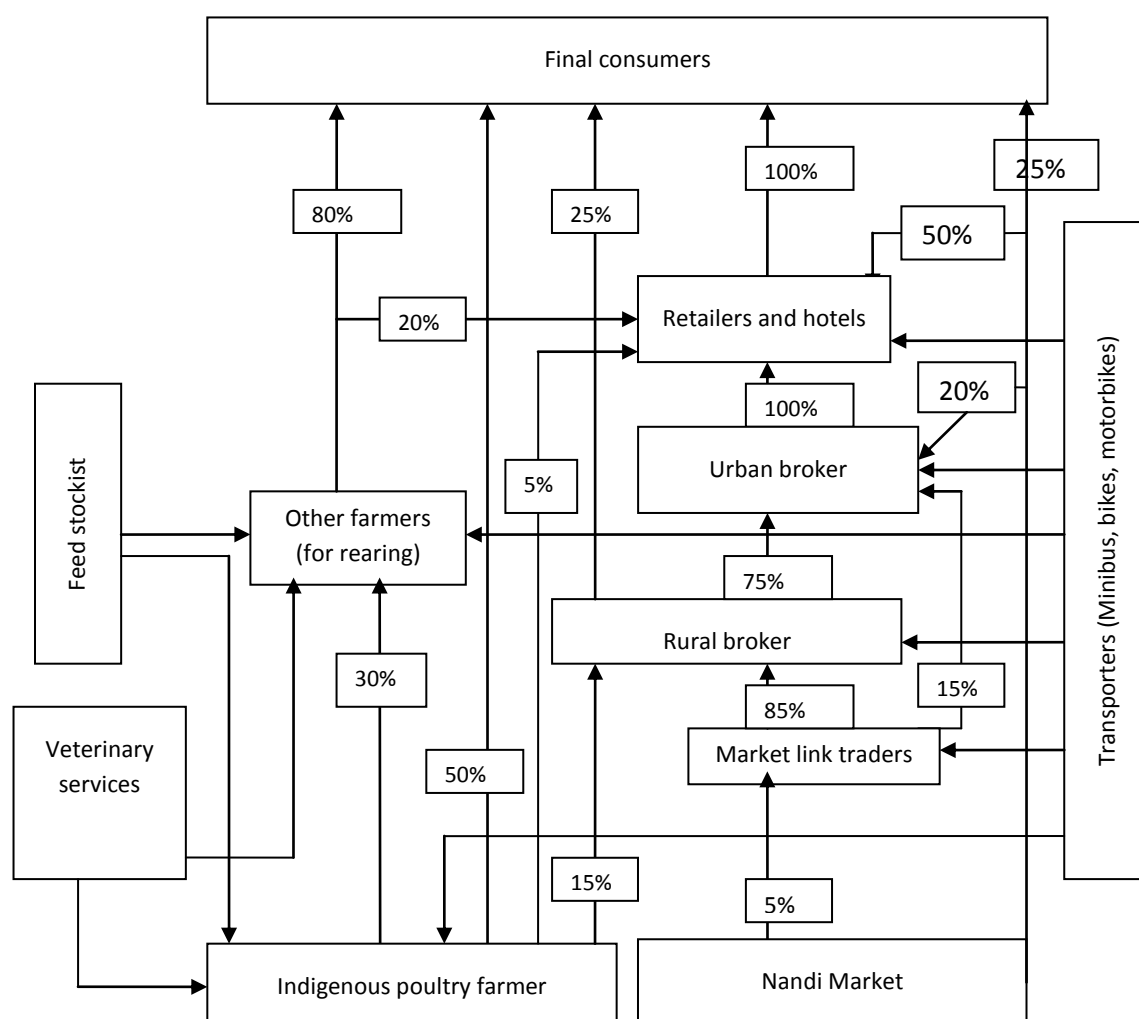


Figure 13. Value chain for indigenous chickens and volume shares handled by each channel

Public policy and regulations

One of the more known public policies relating to the production of indigenous chickens is that the farmers should not sleep under the same roof with chickens. However, this policy is largely unenforced since the standard practice in many rural areas is for birds to be housed in the family residence. Other public policies relating to the movement and transportation of live birds and dressed carcasses apply to indigenous chickens as well.

3.4 Value chains for guinea fowl and ducks

Characterization of the market

A few farmers interviewed in the study districts kept other kinds of domesticated birds. These included guinea fowl, ducks, and turkeys. Guinea fowl were mainly present in Kilifi and Vihiga Districts. In Kilifi District, only a few large-scale farmers kept guinea fowl. Farmers who kept guinea fowl collect guinea fowl eggs from nests in the wild laid by undomesticated birds and then mix these with chicken eggs to hatch normally. Others bought young birds from established guinea fowl farmers as parent stock. The fowl are mainly kept for meat and their feathers. Some large-scale farmers keep the birds for aesthetic beauty and mainly to target tourists. In such cases, guinea fowl birds are kept alongside other birds such as ostriches.

One large-scale farmer in Kilifi indicated that he hatches approximately 1000 guinea fowl keets per year. The keets are kept together with chicken chicks and are subjected to the same disease management and feed regimes given to chicks. The guinea fowl keets are then separated from the layer chicks at 6 weeks and transferred to the layer flock. While in the layer flock, guinea fowl are fed on the chicken growers mash and, later, layers mash. The farmers interviewed in this study usually keep 30-50 guinea fowl birds at any one time. Guinea fowl production for such farmers is an important but not the only source of livelihood for such farmers. These farmers also produced crops for sale and a few (5%) had other kinds of poultry, especially ducks and traditional chickens.

The main buyers of guinea fowl are farmers who grow them further to establish their own stock or for feathers. Some farmers raise guinea fowl for sale in tourist hotels in Mombasa and Nairobi that serve wild meat. Farmers buy 3-month-old guinea fowl keets at Ksh 400-600 per keet and sell mature birds to hotels at about Ksh 800 per bird. Hotels in Mombasa buy mature guinea fowl birds at Ksh 800-1000 per bird.

Governance mechanisms in the guinea fowl value chain

There is also an expanding trade in guinea fowl feathers. Some traders¹³ of guinea fowl feathers contract farmers to produce the feathers for them. The contract is usually written and specifies the volume of feathers, delivery time, and price to be paid. The farmer is responsible for both production decisions and costs, although the buyer offers technical advice. However, there are not many alternative buyers of guinea fowl feathers in Kenya. Consequently, buyers still have considerable market power over the price of feathers. Indeed, the farmers we interviewed indicated that contracting buyers usually offer a fixed, non-negotiable contract price.

Other buyers of guinea fowl feathers do not contract farmers but instead place advance orders for feathers with farmers. This kind of arrangement is based on an informal verbal agreement in which the farmer agrees to provide feathers while the buyer agrees to collect the feathers when ready. In this case, prices are usually determined at the time of collection and therefore depend on the price

¹³ Focus group discussions revealed that about six traders are involved in the buying of feathers in Kilifi District. Two of these traders have contracts with farmers for the production of feathers.

reigning in the market at the time of collection. Under this arrangement, the farmer holds some bargaining power over the price and can choose to sell to another buyer if one buyer offers a price that is not acceptable.

In both cases, the feathers are collected when guinea fowl shed them or upon slaughter. The feathers are usually weighed before sale. Farmers sell guinea fowl feathers at Ksh 500 for every 400 grams or the equivalent of Ksh 1.25/gram. Buyers use the feathers to decorate clothes, hats, and wall coverings.

Unlike the trade in feathers, there is no contracting in the supply of guinea fowl meat to hotels that buy such meat. Most farmers raise guinea fowl until they are mature and look for markets when they want to sell. However, some farmers receive orders from hotels or brokers supplying the hotels to supply dressed carcasses. Such arrangements are usually informal and the price is usually agreed upon at the time of delivery. Where a broker is involved, the broker collects dressed birds from the farmer. In some cases, the broker is also responsible for the slaughter and dressing of the birds. As in the case of broilers and spent layers, some brokers collect birds on credit and remit payment later. Such traders tend to have considerable influence over the price the farmer earns and determine the size (weight) at which birds are sold.

Public policy and regulation

The same government regulations relating to the transportation of live birds and poultry meats hold for the transportation of live guinea fowl and dressed carcasses. In addition, there is a government (Ministry of Wildlife and Natural Resources) regulation that discourages widespread domestication of these or other wild birds. However, this regulation is usually not enforced and there is ambiguity over what number of guinea fowl constitutes “widespread domestication”. Indeed, most of the farmers we interviewed are not even aware that it is illegal to keep and/or trade in large populations of guinea fowl.

The value chain for duck

Some farmers in our study districts kept ducks. Of the farmers that kept ducks, approximately 80% raised them for subsistence, while 20% raised them purely for commercial purposes. Subsistence farmers held from 1-5 ducks, while commercial farmers maintained an average of 100-500 ducks.

Duck producers bought the parent stock from other farmers at Ksh 200 per duckling and raised the desired population through a series of hatchings and growing ducklings. Most farmers argued that ducks are easy to keep since they scavenge around the homestead like indigenous chickens. Indeed, subsistence farmers did not have a routine disease management and feeding regime for their ducks. Some farmers, however, offered supplemental feeding, mainly involving maize germ and maize bran, to their ducks.

Farmers sell ducks when they attain a dressing weight of at least 1.5 kg to hotels at Ksh 400 per kg. Unlike the previous cases, most duck farmers sell ducks directly to hotels and restaurants. Only a few farmers indicated that they sell their ducks to brokers who then sell them on to retailers (hotels) and final consumers. The limited involvement of brokers in the duck trade is likely due to the low demand for duck meat in Kenya.

Governance mechanisms in duck trade

There is no formal contracting in duck production. The only form of trading relationship that exists in the chain involves brokers and farmers. Some brokers have informal arrangements with commercial duck farmers to raise the ducks for them. Such brokers collect the ducks when mature, selling to hotels and remitting payment later.

4. Impact of HPAI on producers and retailers

The HPAI scare emerged at the end of January 2006 following media reports in late November 2005 of mortality of commercial and wild birds in different parts of the country. The public announcement caused fear and panic among consumers, leading to sharp declines in the consumption of poultry products in food outlets and most homes. Farmers and farm workers even feared handling birds. This fear lasted through the end March 2006. The panic was exacerbated by the outbreak of HPAI in Southern Sudan about the same period. The government immediately imposed a ban on imports of poultry and poultry products. Strict control measures were instituted at all ports of entry. For example, a consignment of powdered eggs from China was impounded and refused entry into the country, while a consignment of poultry soup from Egypt was also rejected at the port of call in Mombasa. In addition, in order to control the potential spread of HPAI, the local slaughter of indigenous poultry was encouraged by establishing local poultry slaughterhouses to prevent live birds from being transported to larger cities. At the same time, the government through the veterinary department made frantic efforts to send surveillance missions to the border with Southern Sudan, with rapid response teams sent to sites reported to have high mortalities of domestic or wild birds. The samples taken from all these missions proved negative for HPAI, however. Consumer rejection or avoidance of poultry and poultry products ended following an outbreak of Rift Valley Fever towards the end of 2006, which led to an acute shortage of beef and goat meat and markedly reduced demand for such products. At the same time, the government undertook a campaign to educate consumers about the HPAI scare insisting that it was safe to eat poultry and poultry products. Families and food outlet patrons thus resumed eating poultry meats as an alternative to the unavailable beef and goat meat.

The impact of the HPAI scare in Kenya affected all parts of the value chain, from consumers to farmers. Although there has not been an outbreak in Kenya, information obtained primarily from the government's veterinary department through the press (radio and newspaper) highlighted the impact of the 2005-2006 scare on consumption of poultry products (Nyaga 2007). In this section, we describe some of the effects of the 2005-2006 scare, based on anecdotal evidence that was pieced together from interviews with the various stakeholders in the poultry industry. While both indigenous and exotic poultry can contract and transmit the disease, there was no discernable impact on indigenous chicken production based on our field interviews. However, indigenous chicken farmers indicated that they feared handling chicken during this time. The main impact of avian influenza was therefore confined to commercial broiler and layer production. Below, we discuss some of these effects.

4.1 Effect of HPAI on livelihoods

The impact of HPAI differed for different actors in the poultry value chain depending on study district and the importance of poultry in their overall livelihood. Among the study districts, the contribution of poultry to livelihoods of the farmers depended on the type of poultry kept. Overall, farmers who keep layers and broilers depended much more on poultry income for their livelihoods. During the FGD, farmers in Kikambala, Nakuru and Kiambu Districts, where farmers kept many more

exotic chickens than traditional breeds, ranked poultry as their first or second most important source of income. In Kiambu, poultry ranked second after dairy cattle, while in Kikambala, poultry was ranked as the leading source of income for broiler producers. On the other hand, the majority of producers of traditional chickens did not depend much on poultry for their livelihoods. Indeed, poultry was ranked last in Vihiga District and Ndeiya (study areas dominated by traditional chickens) as a livelihood source after crops and dairy.

Overall, at both the farm and chain level, layer producers incurred much lower losses because the consumption of eggs was less affected by the scare. Table 8 summarizes gross value added for certain chain actors on a weekly basis, reflecting important proportions of value added accruing to downstream actors such as traders and retailers. As shown in Appendix 5, the income from sale of eggs constitutes the greatest percentage of the income received from layer production. Hence, layer producers still earned income from poultry relative to broiler producers. However, farmers who had spent layers to sell incurred similar losses as broiler producers given the closure or dislocations in live-bird markets. For farmers who fully depended on broiler and layer production, the extent of the loss could be estimated as the net profit (gross margins) forgone, in the worst case scenario, should markets be closed. This loss could thus be higher than Ksh 24,000 per production cycle as shown by Appendix 6 for broiler production, and even higher for layer production assuming that the farmer totally abandons chicken production. If chicken production continues, then the loss would be equal to the income forgone from the sale of chicken (dressed or live) since we assume that the farmer will sell eggs and manure as before¹⁴. In this case, the loss due to the scare is less, i.e. Ksh 250-350/bird lost.

Table 8. Gross value added (VA) per week in commercial layer and broiler value chains

Chain actor	Eggs	Layers	Broilers
Farmers (VA, Ksh)	-	-	2,783,333
(percentage of total VA)			38%
Rural brokers (VA, Ksh)	360,000	92,750	66,250
(percentage of total VA)	27%	10%	1%
Rural retailers (VA, Ksh)	351,000	20,625	138,125
(percentage of total VA)	27%	2%	2%
Processors (VA, Ksh)	-	16,200	1,800,000
(percentage of total VA)		2%	25%
Urban brokers (VA, Ksh)	268,800	254,620	171,180
(percentage of total VA)	20%	27%	2%
Urban wholesalers (VA, Ksh)	134,400	54,570	-
(percentage of total VA)	10%	6%	
Urban retailers (VA, Ksh)	200,640	512,710	2,310,140
(percentage of total VA)	15%	54%	32%
Total value added per week	1,314,841	951,475	7,269,029

¹⁴ Most consumers thought the scare mainly concerned the consumption of chicken meat.

The effect of this loss would have been greatest during months of peak demand for chicken meat in Kenya, namely April, August and December which are associated with festivities. Farmers usually increase their flock size as they target these months. In the case of Kilifi District, the peak period runs from October to early February during the tourism season. In addition, while the impacts on indigenous poultry were relatively muted, it should be noted that many farms sell their birds prior to planting (usually between March and April) so that an outbreak that took place during this period could have impacts both on poultry income and on crop production, should there be increased conflict from farmers retaining their flocks. Fortunately, the fear of an outbreak came into full effect between January and March (Nyaga 2007). By this time, most farmers who targeted the high Christmas season had already sold most of their stocks of birds and eggs.

There were at least two kinds of effects of HPAI on livelihoods in Kenya. The first relates to the loss of welfare due to the public's fear of consuming poultry products. Overall, the stakeholders we interviewed indicated that the first response to the HPAI scare by most people was to stop consuming poultry products, especially poultry meat. Most consumers, especially those in urban areas (served by Kikambala, Kikuyu and Ndeiya), received information about the scare earliest and switched to the consumption of other meats; some abstained from meats altogether. The remoteness of the other study areas (Ganze Division and Vihiga District) created some lag in information spread, thus delaying the onset of the switch from poultry; this served to reduce the impact somewhat. Available data indicated that consumption of chicken meat dropped by between 20-90% during the height of the bird flu scare, with larger effects felt in fast food outlets in urban centers. The extent of the drop in sales of chicken among fast food outlets depended on the type of outlet and its strategic response to the scare. Thus, while some smaller outlets registered a drop in sales of deep fried chicken by 90%, the established outlets such as Steers Ltd recorded only a 20% drop in the sale of their prepared chicken products. The latter was able to manage the bird flu scare more successfully than smaller outlets by spending money on campaign ads that assured its customers of the food safety procedures it follows to ensure that only safe birds reach the consumer's table.

The HPAI scare also had an employment effect. Most farms responded to the reduction in the consumption of poultry products by laying off some their workers or freezing the employment of casual workers. The number of workers laid off due to the scare depended on the size of operation. The majority of small-scale commercial farmers depends on family labor and therefore were not affected as they still had to care for the birds in anticipation of improvements in demand. However, medium- and large-scale establishments made considerable cuts in labor, ranging from 50-80%. This effect was felt not only at the production level but also in other downstream segments of the value chain including fast food outlets that sell chicken as a main accompaniment to fries. Even major fast food stores such as the Nairobi-based Steers and Galitos were affected by the HPAI scare. However, the labor displacement was lower higher up the value chain.

4.2 Impacts on commercial broiler and layer producers

Commercial broiler farmers were the most affected group by the HPAI scare. The scare in Kenya was triggered by high mortality of commercial layer birds and other wild birds in different parts of the country (Nyaga, 2007). Broadcast of news about the mortality of birds fuelled fear in Kenya. However, it was the outbreak of HPAI in southern Sudan and reports of mysterious deaths of wild birds in Nakuru that elicited government reaction. Soon after the outbreak of HPAI in southern Sudan, the government imposed a temporary ban¹⁵ on the importation of poultry and poultry products. These events caused fear among consumers. Farmers could not sell their chickens at the time as hotels and fast-food restaurants cut back on purchases. Hence farmers had to keep the birds for an extended period thus incurring additional feeding costs. Where chickens could be sold, there were disposed of at very low prices of Ksh 100 instead of the prevailing market price at the time of between Ksh 180-200. Consequently, farmers that had mature ready-for-market broilers lost significant amounts of money¹⁶. If we extrapolate from the data provided in Table 8, a reduction in prices throughout the chain by up to 50% would lead to a weekly loss in the chain value-added of at least Ksh 3.6 million per week.

The HPAI scare affected not only sales of dressed and prepared broilers, but also sales of live chickens in most poultry markets in Kenya. Following the 2005 HPAI scare, restaurants in the surveyed areas recalled that consumers were scared of consuming the chicken meat and even farmers afraid of handling poultry. The situation improved when the government declared poultry meat to be safe for consumption. In particular, the Ministry of Livestock intensified campaigns to increase poultry product consumption by using slogans such as *kuku ni salama*¹⁷.

The FGDs revealed specific losses from the HPAI scare. One large-scale farmer indicated that he lost 20,000 birds in a period of 3 months in Kilifi due to the ban. The proprietors of three hotels and two fast food joints we interviewed indicated that they suffered large reductions in sales of poultry products of between 85-95%. A notice from the public health service required hotel operators to get a certificate at a fee of Ksh 1500 and a daily inspection fee of Ksh 2 per bird. Customers shifted to fish and beef for fear of HPAI. Some producers slaughtered their birds and hired a freezer to preserve them at a cost of Ksh 1000 per month for 6 months. Others gave away chicken for free to save on feeding costs. Some farmers in Kilifi abandoned poultry and shifted more to crop farming.

The sale of eggs was also affected by the HPAI scare. Some of the interviewed farmers indicated that they were unable to sell their eggs as their clients cancelled orders. Farmers therefore accumulated eggs hoping to sell later when the situation improved. Other farmers simply crushed their eggs, dried

¹⁵ The ban on sale of domestic poultry and poultry products was later lifted and followed by a government effort to promote the consumption of chicken and other poultry products again. However, the ban on imports of poultry and poultry products was still in effect at the time of this study (i.e., mid 2009).

¹⁶ Income losses incurred by broiler producers ranged from 40-50% in the less affected areas to 80-90% in the more affected areas. The latter areas included Kikambala where government officials strictly enforced government meat safety regulations as discussed below.

¹⁷ Which translates into "chicken is safe".

them and mixed them with feed to reduce on the costs of feeding the layers. These impacts were not uniform, however -- commercial egg producers in Vihiga indicated no loss of business as eggs sold in normal fashion, probably because of the remoteness of the district from Nairobi. Moreover, the FGD revealed that most consumers did not perceive the consumption of table eggs as being risky. Thus, the consumption of eggs was much less affected compared to that of broilers.

One positive effect of the HPAI scare is that it led to some concerted efforts by the government to train farmers about HPAI. Some of interviewed actors indicated that they were trained on how to prepare for and handle HPAI outbreaks by field staff of the Ministry of Livestock and Fisheries. For instance, transporters were trained on the importance of disinfecting their vehicle after every trip, the need for a transport permit or COT, to transport only one species of poultry, and not to transport any sick birds to the market. Producers were trained on the importance of observing cleanliness, and not to live under one roof with poultry.

4.3 Impacts on retailers (hotels)

Many restaurants, both small and large and especially fast food chains, recorded high losses during the HPAI scare. On average, poultry meat sales fell by 60% as consumers shifted to other meat types such as pork, mutton, lamb and beef. There were direct losses emanating from the spoilage of stored dressed birds that had to be thrown away. One operator we interviewed lost on average 70 birds weekly valued at Ksh 39200. In addition, restaurants that had stocked uninspected chicken had to destroy them following a directive from the Livestock Department that hotels and restaurants stock only inspected and stamped carcasses of poultry. This directive emanated from a government regulation that all meat be inspected before sale to consumers; the HPAI scare simply resulted in the strengthening of this existing regulation.

5. Policies and regulations on HPAI

In this section, we briefly review some of the government laws, policies and regulations that can affect the control of possible outbreaks of HPAI in Kenya. Overall, a number of government laws and regulations affect livestock movement and marketing in Kenya. Some of laws that became relevant during the HPAI scare include Animal Diseases Act, Stock Traders Licensing Act, and Hatcheries Act (Export Processing Zone Authority, 2005). The Animal Diseases Act empowers the Veterinary Director to:

1. Declare areas infected, issue provisions affecting infected areas (isolation, disinfections and movement of animals), and search for and destroy infected animals
2. Prohibit importation of animals, slaughter and disposal of forfeited animals and carcass of infected animals, search and detain animals suspected to be diseased
3. Indemnify and pay compensation for destroyed animals
4. Prescribe fees for drugs and vaccines or prohibit use of vaccines or drugs

The Act also incorporates the Subsidiary Legislation of The Animal Disease Rules related to the importation and movement of animals, including birds. This legislation also includes the requirement of a license for importation of animals through Mombasa or Lamu ports or through Kisumu, Nairobi and Mombasa airports. It further covers the examination of imported animals and requires that certificates of importation accompany consignments of imported animals. The certificates must specify tests carried out.

The Stock Traders Licensing Act Cap 498 prohibits trade in stocks without a license except for farmers/traders who sell stocks in local/own residential areas. The Act empowers the Provincial and District Commissioners to issue annual licenses and the police, veterinary and administration officers to inspect the licenses.

The Hatcheries Act is the first significant government regulatory policy/law in the poultry industry that deals specifically with the operations of the hatcheries. All workers in hatcheries are required to have health certificates issued by the Ministry of Health. Every hatchery is also expected to obtain an inspection certificate issued by a designated veterinary officer. Prior to the issuance of the certificate, the hatchery is inspected for cleanliness and vaccination procedures. The veterinary officer also inspects fertilized eggs before incubation.

All sales agents of poultry hatcheries are also required to obtain licenses allowing them to buy DOC from recognized hatcheries only. There are also government regulations on procedures and practices for handling, transportation and storage of DOC. Of these regulations, requirements on transportation and storage are relatively more enforced. For instance, traffic police arrest transporters when found transporting chicks in cartons/boxes.

Transportation of birds between regions and to the market is also regulated under the Stock Traders Licensing Act. A poultry transporter is required to obtain a poultry movement permit issued by a veterinary officer. Among other things, the veterinary officer, before issuing the permit, must certify that the live birds will be handled well and that they will not be transported in the open carriers of

vehicles. In addition, transporters of dressed/slaughtered birds are required to obtain a certificate of transportation issued by a certified meat inspector upon inspection of the birds prior to and after slaughter. Every dressed bird must also bear an inspection stamp certifying that it is safe for human consumption. Consequently all slaughter houses require the presence of an inspector to stamp the carcasses before sale. The regulation also requires that birds slaughtered in backyards are inspected and the carcasses stamped before sale. The carcasses must further be transported in an approved container. These primarily apply to the commercial sector; as noted earlier, transport in a number of surveyed regions relies on informal means of transport in spite of the regulation. Regulations require transport of poultry in specially modified pickups and no mixing of birds with people in public service vehicles. Though, this rule was yet to be implemented by small-scale farmers.

Another important policy enacted by the Kenya government in response to the HPAI threat is the regulation of poultry slaughter. Prior to the outbreak of HPAI in Asia, poultry farmers were allowed to slaughter birds in their backyards while traders could slaughter the birds in the market. Following the outbreaks of HPAI in Asia and Europe, the government directed that poultry slaughter be done in conventional slaughterhouses or an approved slaughter facility, albeit with limited success (except in Kilifi District). The latter include slaughter slabs in the case of small-scale farmers. Thus, the slaughter of chicken can only be done in slaughterhouses with meat inspectors or on slabs whereby an inspector is called in to inspect the carcasses after slaughter. As noted in the earlier analysis, with the exception of Kilifi, many of these practices, particularly in the traditional sector, are not adequately enforced. Moreover, the government through the Ministries of Livestock and Health has been advocating to farmers not to sleep under the same roof with poultry. However, small-scale farmers in Ndeiya and Ganze were yet to respect this regulation.

6. Conclusions

This report examined the poultry industry in Kenya with the aim of identifying the actors, assessing poultry and poultry product flows, and highlighting policies and regulations that relate to the effect and control of possible outbreaks of HPAI in Kenya. In particular, the study characterized value chains for broilers, layers, table eggs, indigenous chickens and other domesticated birds.

Our value chain analysis indicates significant heterogeneity in the types of chains present in the poultry sector in Kenya. Layer and egg value chains tend to be significantly longer and more diffuse than the value chain for broilers and indigenous chickens. For broilers, shorter chains reflect greater integration among actors through contractual (formal and informal) arrangements, while for indigenous poultry, most non-subsistence trade involves direct sales between farmers and buyers (other farmers and retailers). In general, outside of formalized, vertically integrated arrangements, governance relationships are largely *ad hoc*, although more 'structure' in the form of relational forms of transactions exist as products move into urban areas. In rural areas, by contrast, trade patterns are much more diffuse.

Biosecurity practices parallel the governance structures present in each of the sampled chains. Larger, more commercialized actors involved in formalized arrangements tend to have much stronger biosecurity practices than smaller-scale farmers. While regulations exist at various parts of the chain in terms of processing, handling and transport of poultry products, these are largely ignored outside of the most formalized chains. For instance, some farmers and brokers reportedly transport live birds in open carriers of or inside passenger vehicles contrary to government regulation. Others transport live birds using hand and ox-carts without government movement permits. Still others transport live birds on open bicycles and motor bikes. All these modes of transportation of birds entail greater risks of exposure to infectious disease. However, in Kilifi, regulations governing slaughter in particular are much more strictly followed, ostensibly in response to demands for products with higher levels of food safety from domestic and international tourists. Not surprisingly, intermediaries in Kilifi tend to have more long-term relationships with other actors in the chain. This suggests that regulations can potentially be credibly applied and enforced with respect to HPAI, but require some sort of local context (e.g. ensuring the sustainability of ancillary sectors like tourism) to promote buy-in among local actors. Such measures need to not only involve the poultry sector, but also other local stakeholders as well.

The impacts of the HPAI scare in late 2005-early 2006 were short-lived, but had sharp impacts on the commercial sector in particular. Broiler and layer producers were especially affected, with prices falling by up to half, and production and employment in these sectors experiencing a temporary decline. Recent research by Rich and Wanyoike (2010) suggested a role for associations in the wake of future Rift Valley Fever outbreaks, and a similar recommendation could be made for HPAI, particularly for smaller and medium-sized commercial producers. This will require significant strengthening of associations to move beyond marketing roles and towards more proactive advocacy and support roles for the industry as a whole. Such developments would not only assist with future animal health emergencies, but also strengthen the sector.

The indigenous sector was largely unaffected by the scare, but one should not underestimate the potential of a real outbreak on these groups. For example, indigenous poultry serve a strategic role as a source of “quick income” for producers that could be jeopardized by an HPAI outbreak; these specific livelihood impacts need to be teased out more carefully in further research. In addition, the timing of an HPAI outbreak matters greatly. Because farmers often sell their birds *en masse* prior to the main cropping season, an outbreak that occurred during such a period could provide farmers with difficult decisions – either sell birds at a lower price or risk retaining birds and impacting crop production. Future research should pay close attention to the seasonality of impacts in gauging how HPAI broadly affects the agricultural economy.

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Appendix 1: Chain actors interviewed in each study district

The study was done in 4 districts in Kenya namely, Kiambu, Kilifi, Rongai and Vihiga. In each district two sites were selected namely, one with high poultry density and one with low density. Each site covered a division and as selected to coincide with the sites selected for livelihood studies.

The chains targeted are:

- ✓ Traditional (range raised chicken)
- ✓ Commercial broiler
- ✓ Commercial layer
- ✓ Ducks/guinea fowl

The following actors were interviewed in each of the above poultry chains:

- ✓ 1 breeder/hatchery
- ✓ 3-6 traders/rural assemblers/brokers (including at least one dealing with commercial farmers)
- ✓ 3 poultry retailers (including one major destination market/supermarket)
- ✓ 2 commercial broiler farmers
- ✓ 2 commercial layer farmers
- ✓ 2 feed stockists/agro-input dealer
- ✓ 2 processors
- ✓ 1 slaughterhouse

In addition to the chain actors, we also interviewed 10 informant interviews in each selected district giving a total of 40 key informant interviews. The key informant respondents were carefully selected to include:

- ✓ 2 livestock officers (especially those dealing with poultry) at the district level
- ✓ 2 divisional (site) livestock officers
- ✓ 4 traders and/or leaders in the major poultry markets (2 in site/local market and two in the district market, depending on the existence of such markets)
- ✓ 2 in the major markets

Lastly, we held one focus group discussion in each of the divisions (sites). The focus group members were selected from among farmers, traders and local livestock staff.

Appendix 2: Poultry chain actors interviewed in Kiambu District

Actor	Position on the chain	Position in the firm
Muguku Farm hatcheries	Hatchery	Manager
Key informant (2)	Service provider	District Livestock Officer
Key informant	Service provider	District Veterinary Officer
Egg trader	Producer	Owner
Egg broker	Broker	Seller
Chicken broker	Broker	Seller
Chicken broker (3)	Broker	
Transporter	Transporter/broker	
Key informant (transporter)	Transporter	Broker/transporter
Egg trader	Producer	
Egg broker	Broker	
Kenchic	Processor	Production manager
Traditional poultry producer	Producer	
Commercial layer producer	Producer	
Commercial layer farmer	Producer	Owner
Jarimu feed stockist ¹⁸	Service provider	Owner
Wanjoki feed stockist	Service provider	
Kenchic distributor	Retailer	
Rural poultry retailer	Retailer	Owner
4 chicken brokers	Brokers	Owners
FGD (2)		
Commercial layer producer	Producer	
Commercial layer producer	Producer	Owner
Commercial broiler producer (2)	Producer	Owner
Mathiora feed stockist	Feed stockist	Manager
Early bird feed stockist	Feed stockist	Sales representative
Kenchic	Hatchery and producer	Manager
Steers	Processors & retailers	Manager

¹⁸ Stockist is another term for Agro-input dealer

Appendix 3: Poultry chain actors interviewed in Nakuru District

Actor	Position on the chain	Position in the firm
District livestock officer	Service provider	District Livestock production officer
Divisional livestock officer	Service provider	Divisional officer for livestock and veterinary.
Hygiene officer	Service provider	District veterinary officer
Producer	Service provider	Association's chair person
Producer association	Processors	Chair man
KIM Poultry farm	Feed miller	Farm manager
Commercial layer farmer	Producer	Owner
Indigenous poultry farmers	Producer/ breeder	Owner
Commercial broiler farmer	Producer	Owner
Kenchic depot	Day old chick	Depot manager
LENS	Feed miller	Owner
Tuskys Supermarket	Producer	Owner
3Processed chicken traders	Rural Broker/retailer	Owner
Live chicken trader	Broker/retailer	Owner
Live chicken retailers (2)	Urban retailers/broker	Owner
Commercial broiler farmer	Producer	Owner
Poultry traders	Traders, brokers, retailers	Proprietors.
Kenchic depot	Day old chick	Depot manager
Jams Hotel	Retailer	Manager
Midland Hotel	Trader	Manager
Divisional livestock officer (Bahati)	Service provider	Divisional officer for livestock and veterinary.
FGD	Producers	Owners
Processed chicken trader	Retailer	Owner
Slaughter house attendant	Processor	Slaughter house attendant
Charity restaurant	Retailer	Manager
Public Health official	Service provider	

Appendix 4: The slaughter slab

Farmers who find the transportation of poultry to slaughterhouses difficult due to distance are mandated by the government to construct and use slaughter slabs for slaughtering their chicken.

The specifications of the slab are that:

- i) it has a hard floor
- ii) drains into a covered pit which acts as a liquid/blood waste collector
- iii) should have a separate pit for feathers. (This pit does not have to be covered)
- iv) all windows must be covered with wire gauze.

The slaughter slab must be inspected and licensed by the Veterinary Department before it is used for slaughter.

The estimated costs of constructing the slaughter slab are as follows:

Item	Cost (Ksh)
Blocks (for wall)	4,000
Cement	17,500
Sand	22,500
Iron sheet	3,000
Labor & miscellaneous	30,000
Total	77,000

Appendix 5: Gross margin analysis of production of 500 layers

	Item	Quantity	Price per unit	Total
A Feed				
	Chick mash	9.5	2,100	19,950
	Chick	500	87.50	43,750
	Poultry house	1	20,000	20,000
B				
	Disinfectant	1	200	200
	1 st day vaccine	1	600	600
	7 th Gumboro vaccine + vitamin	1	350	350
	14 th day 2 nd dose Gumboro vaccine + vitamin	1	350	350
	21st day Newcastle vaccine + vitamin	1	350	350
	28/30 th day Gumboro vaccine + vitamin	1	350	350
	Typhoid injection (8 weeks) + vit	1	2,350	2,350
	5 th dose of vitamins	1	150	150
	Deworming (8 weeks old)	1	600	600
	Fowl pox (3 mo old) + vitamin	1	2,350	2,350
C Feeds (16 weeks old)				
	• Growers mash	36	1,650	59,400
	Other inputs			
	• Egg trays	80	20	1,600
	• Saw dust	4	800	3,200
	• City Council fees	450	5	2,250
D Total cost of poultry feeds and vitamins (A+B+C)				158,100
E Sales of poultry and related products				
	• Egg			
	• ex-layers	1,666 trays	175	291,550
	• Poultry manure	500	250	125,000
		80	400	32,000
F Total revenue from sales of poultry and products (F)				448,550
G Gross Margin/ bird (F-D)/500 = 581				

Source: Authors compilation 2009.

Appendix 6: Gross margin analysis of production of commercial broilers, 300 birds

Item	Quantity	Price per unit	Total
A			
Broiler starter	4 bags	2,500	10,000
Broiler finisher	15 bags	2,100	31,500
Broiler crumbs	2 bags	2,300	4,600
Broiler chicks	300	55	16,500
B			
Disinfectant	1 unit	200	200
7 th Gumboro vaccine + vitamin	1 unit	350	350
Newcastle vaccine + vitamins	1 unit	250	250
C Other inputs			
Charcoal	2 bag	800	1600
Charcoal jiko	1 units	1,200	1,200
Sawdust	1 unit	800	800
D	Total cost (A+B+C)		67,000
E Sales of broilers and related products			
• broilers	300	250	75,000
• Poultry manure	40 bags	400	16,000
F	Total revenue from sales of poultry and products (F)		91,000
G	Gross margin/bird: $(F-D)/300 = 24,000/300 = 80$		

Source: Authors' compilation 2009.