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Integrated snapshot

KENYA

Cattle and poultry sectors



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**ASL
2050**

Cattle and Poultry in Kenya

Livelihoods, Environment and Public Health

Introduction

Kenya's population is anticipated to grow from about 43 million in 2014 to over 95 million in 2050, with the share of urban population increasing from 25 to near 45 percent over the same period. GDP per capita is expected to more than double from USD 1 300 approximately in 2013 to near USD 3 000 in 2050 (Fig. 1).

A larger, increasingly affluent and urbanized population will demand more and more high-quality foods, including meat, milk and other livestock products. This growing demand will provide incentives for livestock farms and farmers to expand their livestock assets and increase production and productivity and tap into the growing market for animal source foods.

Changing livestock systems will have far-reaching effects on society: not only will they provide food and employment to the growing population but will also result in novel interactions between people and productive resources leading to major threats on public health, people's livelihoods and the environment. This brief presents evidence of the impact of the Kenya cattle sector on three societal dimensions, including livelihoods, the environment and public health.

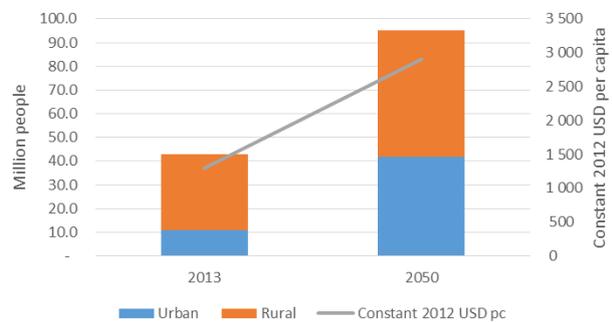


Figure 1. Population and income growth projections for Kenya (Source: National Accounts, UN Population Fund, SSP Public Database, V1.1 <https://tntcat.iiasa.ac.at/SspDb>)

Cattle production systems in Kenya

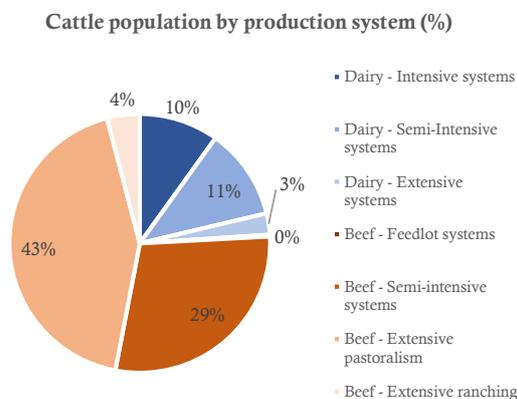


Figure 2. Cattle population distribution by production system (Source: stakeholder consultation)

Cattle is by far the most important livestock sub-sector in Kenya. It contributes over 80 percent to the value added of livestock and around a quarter of agriculture (KNBS, 2018). Farmers raise cattle, both beef and milk animals, in different production systems. Dairy animals are around one quarter or the total including the intensive, semi-intensive and extensive systems. Beef population represents around three quarters of total cattle and includes the extensive pastoralism and extensive ranching, semi-intensives systems and feedlots (Table 1). Figure 2 presents the proportion of animals by production system, figures 3 and 4 presents the distribution of the production systems across the country. Near half the population is the extensive systems, being extensive pastoralism the wider (43 percent). Beef production in extensive pastoralism and semi-intensive production together are close to the three quarters of the total cattle population of the country and are mainly raised in the ASAL areas. Extensive dairy systems are the predominant in North and south Rift valley areas, while semi-intensive systems are spread in all regions where crop farming is also practised. Intensive systems are predominant in Mount Kenya and central Rift Valley regions, and present in many urban and peri-urban zones.

Table 1. Kenya cattle production systems

Beef animal population: 14 million beef cattle	
Pastoralism (extensive system)	Pastoralism is a low-input low-output subsistence system, with indigenous cattle relying entirely on communal grazing areas and water sources. Pastoralism, including transhumance and nomadic pastoralism, is practiced in arid and semi-arid areas. Livestock density in pastoral areas is low, at about 11 Tropical Livestock Unit.
Ranching (extensive)	Ranches are made up of large land areas and have large herds, including local, crossed and exotic breeds. Most ranches have infrastructure for disease control, feeding and water storage. It is a highly commercial system targeting prime local niche and export markets and, as such, contributes to the Kenya export revenue.
Agro pastoralism (semi-intensive)	Agro-pastoralists keep a mixed herd, including beef cattle, and feed animals with crop residues and other products. They make use of animal manure and draft power to increase crop productivity. Agro-pastoralism is a low-input low-output system, subsistence oriented, and mainly practiced in semi-arid areas. Animal densities range from 20 tropical livestock unit per km ² in the lowlands to 50 in the highlands.
Feed lot (intensive)	This is a commercially-oriented system in which animals are kept for a short period (about 3 months) during which they are fattened and sold to niche/prime beef markets. It is both a capital and labour-intensive system, with significant investments in feeding and animal health. There are two different feed lot systems – one focusing on fattening dairy culls and dairy bull calves, the other fattening beef breeds.
Dairy animal population: 4.5 million dairy cows	
Intensive (zero grazing) dairy system	In intensive dairy systems, farmers keep stall fed exotic cattle and sell most of the milk produced to the market. While the average herd size varies, in most cases farmers keep few dairy animals and also a few acres of land, which allows a close livestock-crop (mainly maize) integration. Intensive dairy farms are concentrated in the mid- and high-altitude agro ecological zones, where cereal and cash crops are grown. In particular, they are predominant in Mount Kenya and central Rift Valley regions, and present in many urban and peri-urban zones in humid and sub-humid areas of the country.
Semi-intensive (semi-grazing)	This is the most popular dairy system. Farmers let the animal graze at daytime and provide feeding at night, including supplements during milking. Farmers keep crosses of the dairy breed of cattle, and dairy animals are part of a larger herd, including other animals such as chicken, sheep, goats, donkeys and, occasionally, pigs. Semi-intensive dairy systems are concentrated in Mount Kenya, the central and north Rift Valley and in the coastal regions, but present in all areas where crop farming is practiced, such as the western and Nyanza regions.
Extensive (controlled and uncontrolled)	This is a pasture/based production system and practiced in large farms (controlled grazing with large herds) and in marginal and communal grazing lands (uncontrolled grazing smaller herds). Animals are both exotic and improved. Under controlled grazing, animals are placed on natural and improved pastures using paddocks or strip grazing and supplemented with high quality fodder, mineral licks and commercial concentrates. Uncontrolled grazing is characterized by free grazing in natural pastures. This system is found in North and South Rift Valley, Eastern and Coast Regions.

Source: ASL2050 FAO (2017). *Africa Sustainable Livestock (ASL) 2050 Livestock production systems spotlight Cattle and poultry sectors in Kenya*. FAO. Nairobi

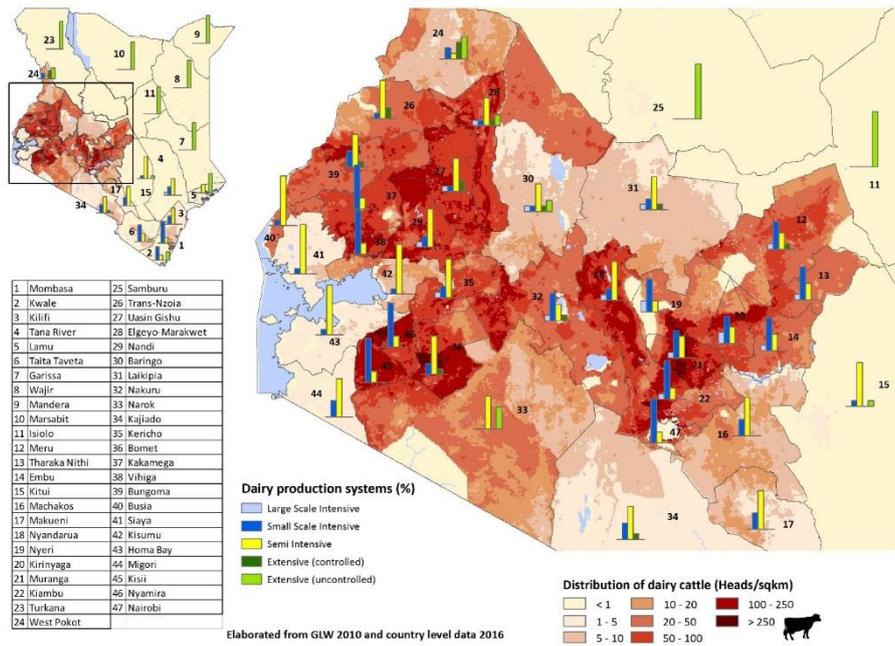


Figure 3. Map of dairy cattle production systems in Kenya, Source: GLW and stakeholder consultation.

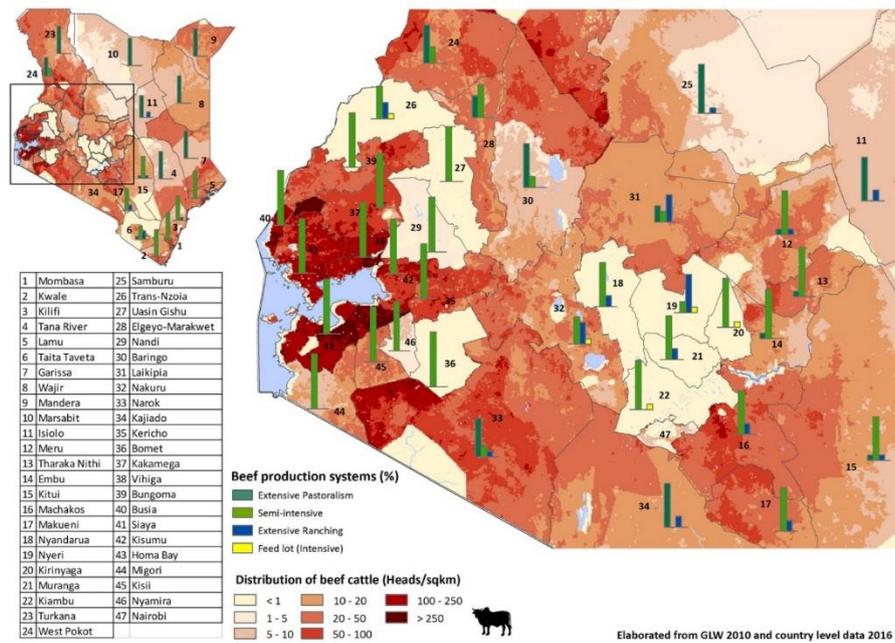


Figure 4. Map of beef cattle production systems in Kenya, Source: GLW and stakeholder consultation.

Poultry production systems in Kenya

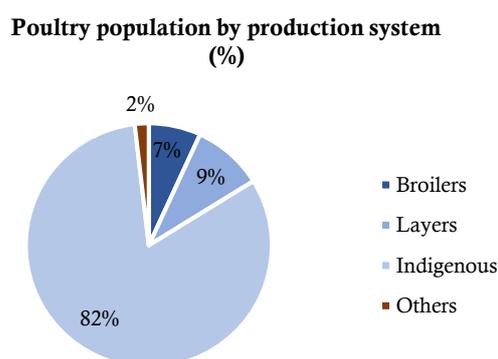


Figure 5. Proportion of different poultry types (Source: stakeholder consultation)

Poultry represents around 8 percent of agricultural GDP in Kenya (FAO, 2017). It is a sector highly heterogeneous producing more than 25 000 tonnes of poultry meat and 1.3 billion eggs.

Indigenous chicken represent the great majority of poultry population (82 percent). Figure 5 presents the proportion of different poultry types and Table 2 and figure 6 the existing meat production systems and geographical distribution, respectively. Poultry meat production systems in Kenya include free-range; semi-intensive poultry system; and intensive

commercial systems. Extensive systems are spread all over the country.

Table 2. Kenya meat poultry production systems

Bird population: 39 million meat or dual purpose chickens	
Intensive production system (broiler farming)	Broiler farming in Kenya is practised in urban and peri-urban areas, such as around Nairobi, Mombasa, Nakuru and Kisumu. This system requires little space and exotic birds – mainly sourced locally or imported from Uganda – kept in large hangars and fed compounded feed. This system is market-oriented. It is estimated that over 3 million broiler chickens are raised in Kenya, in small, medium and large farms. Flock sizes per cycle vary from 50–500 (small scale) through 500-10 000 (medium) to over 10 000 (large and integrated farms). The system is market-oriented.
Semi-intensive production system	Farmers keep flocks of 30 to 100 birds confined in simple structures. The birds are both indigenous and exotic, and provided with feed supplements. Farmers sell most of the birds, though some are self-consumed. Semi-intensive production system is practiced throughout the country. The exact number of semi-intensive farms is not known, though experts estimate they likely keep up to a third of all chickens in the country.
Extensive system (free-range)	This is a low-input low-output system where birds are left to freely roam for feed. Farmers keep flock ranging from 5 to 30 local birds, often managed by women and children. It is a subsistence-oriented system, with little and opportunistic informal marketing. Although popular throughout the country, free ranging is predominant in western Kenya regions, some parts of lower eastern, north Rift areas and coastal areas.

Source: ASL2050 FAO (2017). *Africa Sustainable Livestock (ASL) 2050 Livestock production systems spotlight Cattle and poultry sectors in Kenya*. FAO. Nairobi

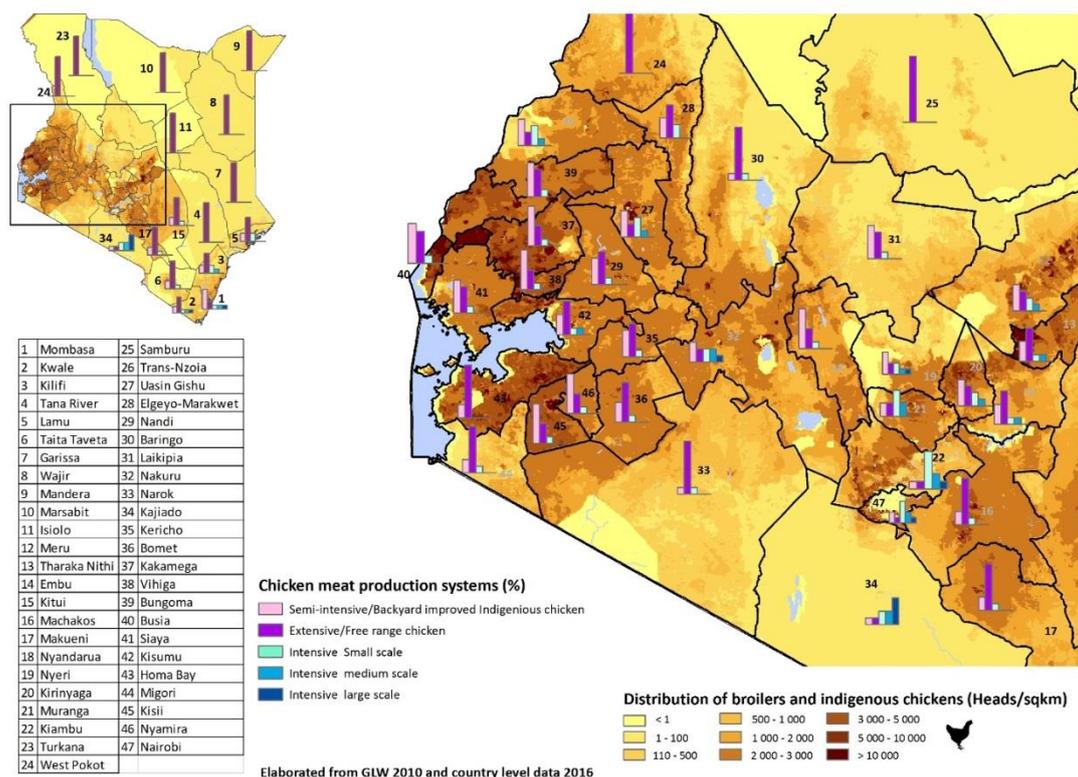


Figure 6. Map of poultry production systems in Kenya. Source: GLW and stakeholder consultation.

Cattle systems and livelihoods

Thirty eight percent of households in Kenya keep cattle, providing them with income, food, draft power, insurance and savings, social capital and other goods and services. In addition, a multitude of people are employed along the livestock value chain, such as abattoir workers, traders, veterinarians, breeders, wholesalers and retailers.

Table 3. Income sources (%) for cow-keeping households (Source: Income from other activities calculated from Rural Livelihoods Information System (RuLIS) (FAO, forthcoming). Livestock income calculated using the Kenya Integrated Household Budget Survey 2005-06 (GoK, 2014))

	Livestock	Crop	Self-employment	Wages	Transfers
Dairy Int	73%	11%	3%	11%	3%
Dairy Semi-int	48%	24%	4%	15%	8%
Dairy Ext	44%	27%	6%	11%	10%
Beef Past	41%	26%	7%	12%	11%
Beef AgroP	43%	29%	6%	15%	5%

Table 3 shows the different income sources for households keeping cattle in the different production systems. Cattle appears as a major source of income. In all production systems, livestock is the biggest income contributor to household income, surpassing the contribution of crops, self-employment wages and transfers.

Cattle also provide meat and milk to the population. Figure 7 shows that 65 percent of milk is marketed and more than one quarter is consumed at home in Kenya. Milk represents a significant source of nutrients for households keeping cows, even if they have limited economic capacity.

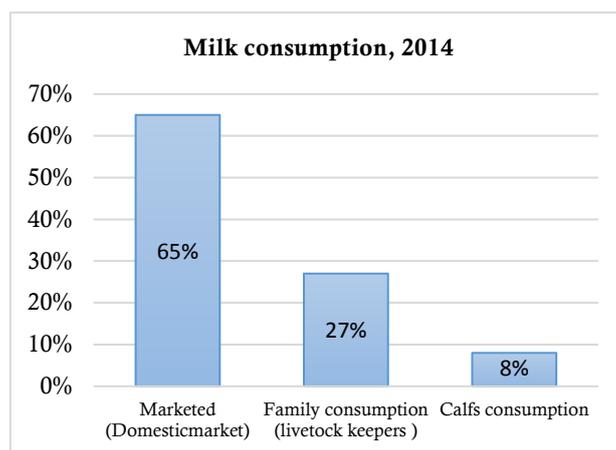


Figure 7. Proportion of milk marketed, consumed at home and fed to calves.) Source: GoK (2010)

Poultry systems and livelihoods

Approximately 75 percent of rural households keep poultry in Kenya (FAO; 2007) and from the ASL2050 Livelihoods spotlight, it is estimated that over 20 million keep some bird at the household.

Table 4. Income sources (%) for poultry-keeping households (Source: Income from other activities calculated from Rural Livelihoods Information System (RuLIS) (FAO, forthcoming). Livestock income calculated using the Kenya Integrated Household Budget Survey 2005-06 (GoK, 2014))

	Livestock	Crop	Self-employment	Wages	Transfers
Intensive Broiler	63%	1%	2%	31%	3%
Backyard semi-intensive	44%	28%	9%	8%	9%
Free-range	36%	28%	8%	16%	11%

Table 4 shows that poultry-keeping households are obtaining their income mainly from livestock, especially in intensive systems. In all production systems, livestock is the biggest income contributor to household income, surpassing the contribution of crops, self-employment wages and transfers. Poultry also provide meat and eggs to the population, a source of nutrients for households keeping poultry, even if they have limited economic capacity.

Cattle and Poultry - Livelihoods: Emerging challenges

- *As Kenya grows and develops, most households will become net buyers of animal source foods, particularly of semi-processed and processed livestock products.*
- *As Kenya grows and develops, the most efficient farmers are expected to expand their livestock operations, increasingly sell livestock products to the market, and improve their livelihoods.*
- *As Kenya grows and develops, for a large share of small scale farmers will become irrational to raise animals – as cheap proteins will be available on the market. They will exit the livestock sector and look for alternative sources of employment*
- *As Kenya grows and develops, the livestock sector will intensify and be more concentrated.*
- *As Kenya grows and develops, jobs will be created along the livestock value chains, providing some, but not necessarily many opportunities for employment*

Cattle systems and the environment

Cattle production systems impact on the natural environment: livestock depend on land and water availability, and at the same time emits polluting materials.

The cattle sector in Kenya is a major user of land and water, though a big part of these would hardly be used for other purposes. Figure 8 presents the water footprints per production system. The green water footprint represents rainwater and accounts for most of the consumption. Blue and grey water measure withdrawal from ground and surface water and water pollution, respectively. Intensive systems are more efficient in terms of water use. Blue water is almost unused and pollution (grey water) is non-existing. In the grazing systems, the use of green water is the highest. However, the opportunity cost of the used water is much lower in pastoral systems.

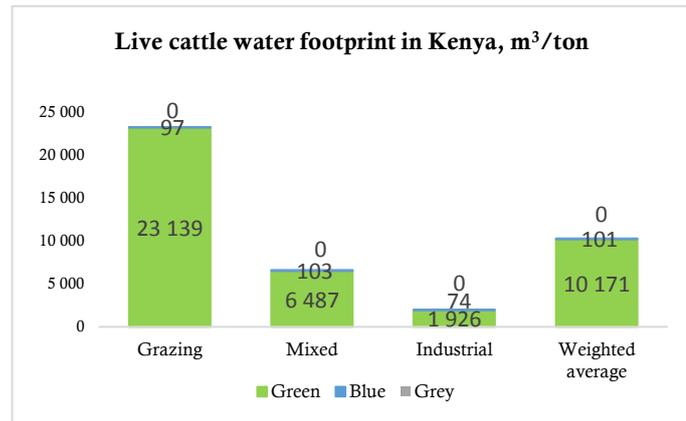


Figure 8. Live cattle water footprint (green, blue and grey), m³ per ton (Source: Mekonnen and Hoekstra, 2010)

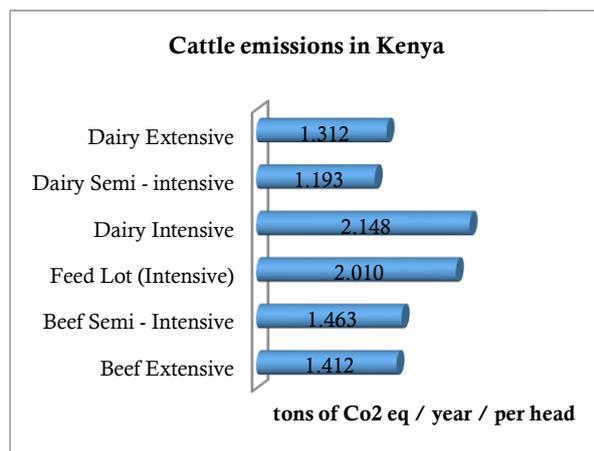


Figure 9 Total GHG emissions per head in CO₂ equivalent (Source: GLEAM)

grassland status, both positively and negatively. For example, extensive systems are part of biodiversity but overgrazing can reduce natural habitats and cause soil degradation. But continuous faecal material dropping by grazing livestock can also make more fertile grasslands.

Poultry systems and the environment

The poultry sector in Kenya uses mainly green water, which represents rainwater and accounts for most of the consumption. Figure 10 presents as well blue and grey water pollution. Grey water accounts the water pollution. Water pollution might be due (e.g.) to faecal contamination of water.

Poultry production also contributes to greenhouse gas emissions. Emissions in intensive systems are higher on a per animal basis (Fig. 11).

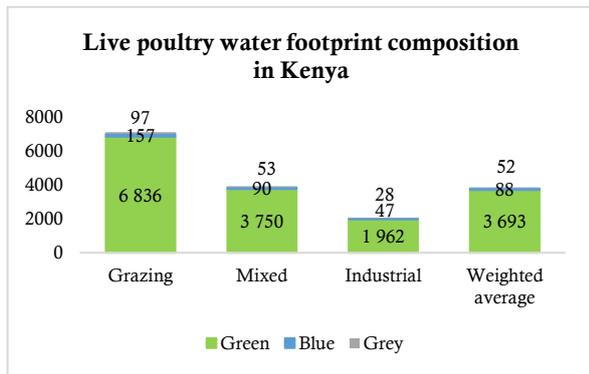


Figure 10. Live poultry water footprint (green, blue and grey), m³ per ton (Source: Mekonnen and Hoekstra, 2010)

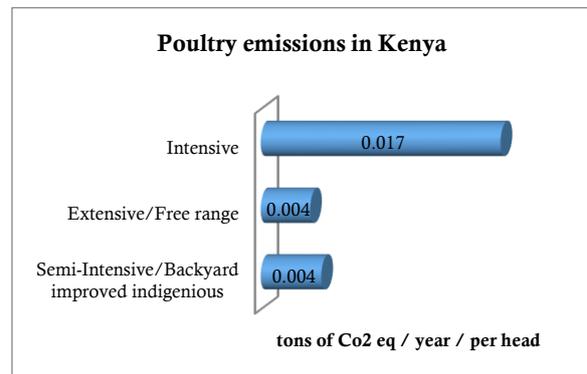


Figure 11. Total GHG emissions per head in CO₂ equivalent (Source: GLEAM)

Cattle and Poultry - environment: future challenges

- As Kenya grows and develops, the livestock sector will intensify and be more integrated.
- As Kenya grows and develops, demand for cattle production inputs, such as feed and water, will increase.
- As Kenya grows and develops, green-house emissions per unit of beef, chicken meat and milk will reduce.
- As Kenya grows and develops, soil and water pollution from livestock will intensify, making waste management a growing challenge.

Animal and human health: the impact of zoonoses in cattle

Cattle can also have negative impact on public health, particularly through zoonotic diseases that jump the animal-human species barrier. Figure 12 shows the variance of prevalence by production system estimated through an expert elicitation protocol, for two main zoonoses: Brucellosis and Bovine tuberculosis. There is large variation across diseases and production systems. Extensive systems show higher prevalence rates for Brucellosis.

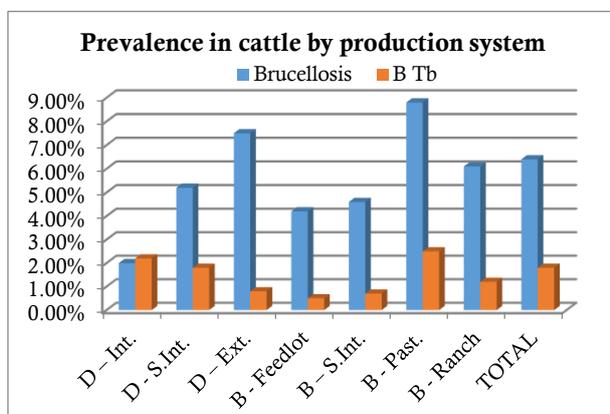


Figure 12. Prevalence rates by cattle production systems for selected zoonoses in Kenya (Source: ASL 2050 Expert Elicitation)

Table 4 presents prevalence and fatality rates for animals and humans for the two selected zoonoses, and tables 5 and 6 the estimated costs of Brucellosis and Bovine TB, respectively. For Brucellosis, the cost of the diseases in human overpasses the yearly budget of the Ministry of Health.

Table 4. Prevalence and fatality rates in cattle (Source: ASL 2050 Expert Elicitation Protocol)

	Cattle population.	Cattle keepers	Consumers
Brucellosis			
Prevalence (cases/total pop)	6.4%	7.1%	0.5%
Fatality rate (deaths/cases)	1.6%	1.0%	0.4%
Bovine TB			
Prevalence (cases/total pop)	1.8%	0.06%	0.03%
Fatality rate (deaths/cases)	23%	8.5%	5.0%

Table 5. Cost of Brucellosis in animals and humans (Source: ASL 2050 Expert Elicitation Protocol)

Value of animals lost due to the disease	82.7	<i>Animal losses as % cattle value added</i>	8.10%
Value of production lost due to the disease	154.8	<i>Animal losses as % MALF budget.</i>	22.55%
Total animal losses (million USD PPP)	237.5	<i>Total social cost (as % of Kenyan GDP)</i>	1.70%
Livestock keepers	3 910.2	<i>Total social cost (as % MoH budget)</i>	139.68%
Consumers	157.7		
Total social cost (million USD PPP)	4 068		
TOTAL (million USD PPP)	4 305.5		

Table 6. Cost of Bovine Tuberculosis in animals and humans (Source: ASL 2050 Expert Elicitation Protocol)

Value of animals lost due to the disease	148.2	<i>Animal losses as % cattle value added</i>	6.00%
Value of production lost due to the disease	27.4	<i>Animal losses as % MALF budget.</i>	16.80%
Total animal losses (million USD PPP)	175.6	<i>Total social cost (as % of Kenyan GDP)</i>	0.10%
Livestock keepers	231.4	<i>Total social cost (as % MoH budget)</i>	11.55%
Consumers	105.1		
Total social cost (million USD PPP)	336.5		
TOTAL (million USD PPP)	512.1		

Animal and human health: the impact of zoonoses in poultry

Poultry production impact on public health positively through better nutrition and income availability and negatively through zoonotic diseases that jump the animal-human species barrier. Figure 13 shows the variance of prevalence by production system estimated through an expert elicitation protocol, for a selected zoonosis in Kenya: Salmonellosis. There is higher prevalence for Salmonellosis in free-range systems in comparison to more intensive ones.

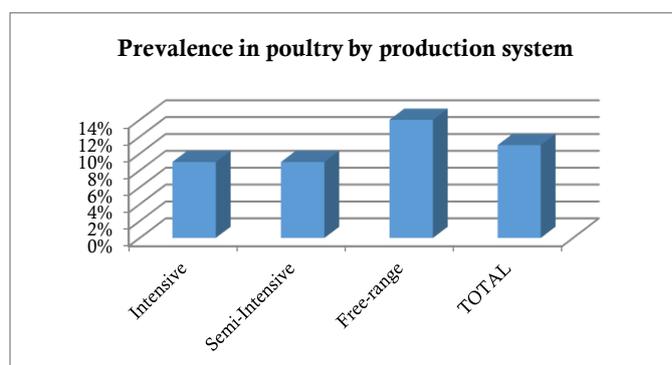


Figure 13. Prevalence rates by poultry production systems for Salmonellosis in Kenya (Source: ASL 2050 Expert Elicitation)

Table 7 presents prevalence and fatality rates for animals and humans for Salmonellosis, and table 8 the estimated costs of the disease in Kenya, which reaches over the 1 000 million USD PPP. The losses in animal production reach the 6 represent of the Kenyan poultry value added. For Salmonellosis, the cost of the diseases in human overpasses by far the costs in animals.

Table 7. Prevalence and fatality rates for Salmonellosis in Kenya (Source: ASL 2050 Expert Elicitation Protocol)

	Poultry	Poultry keepers	Consumers
Prevalence (cases/total pop)	11%	0.10%	0.10%
Fatality rate (deaths/cases)	47%	10%	9%

Table 8. Cost of Salmonellosis in animals and humans in Kenya (Source: ASL 2050 Expert Elicitation Protocol)

Value of animals lost due to the disease	18.5	<i>Animal losses as % poultry value added</i>	6.00%
Value of production lost due to the disease	25.6	<i>Animal losses as % MALF budget.</i>	16.80%
Total animal losses (million USD PPP)	44.1	<i>Total social cost (as % of Kenyan GDP)</i>	0.10%
Livestock keepers	823.5	<i>Total social cost (as % MoH budget)</i>	11.55%
Consumers	237.7		
Total social cost (million USD PPP)	1 061.2		
TOTAL (million USD PPP)	1 105.3		

Cattle and poultry - human health: Emerging challenges

- *As Kenya grows and develops, the livestock sector will intensify and be more integrated*
- *As Kenya grows and develops, livestock systems will continue being affected by zoonotic diseases*
- *As Kenya livestock production intensifies, any outbreak of zoonotic diseases is likely to have large negative impact on production and productivity.*
- *As Kenya livestock production intensifies, there is risk of misuse of antibiotics, leading to antimicrobial resistance*

Conclusions

The Kenyan livestock sector has a wide range of effect on society. It contributes to livelihoods, provides food and nutrition, is a major consumer of natural resources, and presents public health threats through zoonoses.

The cattle and poultry sector is anticipated to undergo rapid growth and transformation in the coming decades driven by the anticipated population and economic growth that will result in increased consumption and demand of more high value food products, in particular animal source foods such as meat, milk and eggs. The anticipated demand will provide major incentives for increased production and productivity in the livestock sector. Additionally, the implementation of the Kenya's new Agriculture Sector Transformation and Growth Strategy (ASTGS) , once launched, is expected to spur an upward growth of the entire Apicultural sector.

Available evidence suggests that coming changes in livestock production systems provide both opportunities and challenges to society. For example, intensification can result in higher incomes for farmers, increased availability of animal source foods, lower emission per unit of produce and more efficient response to emerging diseases. However, these changes come coupled with many challenges: the benefit of productivity and income increase will affect relatively fewer farmers, many will be forced to exit the livestock sector and will look for other employment opportunities. Emissions per animal will be lower but will be more concentrated; waste management will become increasingly a challenge and inappropriate use of antibiotics could lead to antimicrobial resistance in humans. Widespread conversion of natural wealth such as forests, wetlands and other natural habitats to accommodate expanding agricultural land base to meet growing food demand, is expected. This is likely to escalate societal conflicts over these resources and more fundamentally,

could likely to lead to novel human-animal-ecosystem dynamics creating new public health threats. Some, such as emerging zoonotic diseases, may have pandemic potential, add to existing food safety hazards and proliferation of antimicrobial resistance pathogens. However, the longer-term future of Kenya's livestock, and of the cattle and poultry sector in particular, is still in the making and can be shaped by informed decisions taken today.

To this aim, the Ministry of Agriculture and Irrigation (State Department of Livestock), Ministry of Health and the Ministry of Environment and Forestry not only are currently implementing policies to address current pressures and constraints, but have also joined forces with the Africa Sustainable Livestock 2050 Project to assess the impact of the current dairy, beef and chicken productions systems on society; articulate alternative long-term (2050) scenarios for these production systems and identify actions to take now that support transformational pathways, which are sustainable from an environmental and livelihoods perspective and safeguard the health of humans and animals.

July 2018. This Summary brief has been written by Stephen Gikonyo (FAO), Ana Felis (FAO) and Ugo Pica-Ciamarra (FAO) under the guidance of the Members of the ASL2050 Kenya Steering Committee. ASL2050 is a USAID-funded policy initiative that is implemented under the umbrella of the FAO Emerging Pandemic Threat Program.



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