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AFRICA
SUSTAINABLE
LIVESTOCK
2050



The future of livestock in
KENYA

Opportunities and challenges
in the face of uncertainty



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AFRICA
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2050



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KENYA

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Preface

Leaders from all walks of life have to contend with so many uncertainties from multiple directions that prioritizing interventions and holding a straight course prove a daunting task. In the next decades, population growth, urbanization, smart technological innovations and adoptions, increased movements of people and goods, not to mention climate change, will thoroughly transform Kenyan society, in ways that are often unpredictable.

The livestock sector, whose development is fundamental to support the transformation of the country in a sustainable way from a socially, environmentally and from a public health perspective, is anticipated to go through major transformations in the coming decades. Under these circumstances, a robust analysis of livestock production systems and value chains, an understanding of trends in consumption of animal source foods, and an assessment of returns to different investments are essential to formulate and prioritize policy actions. However, this alone does not ensure that policies will be resilient to a future that, to a large extent, is uncertain. Take a moment and ponder over these questions: in the next three decades, how will technology uptake affect livestock productivity? How will the feed-food competition unfold? How will livestock value chains transform to satisfy the demand of an increasingly affluent and urbanized population? We must admit that we can neither accurately forecast nor precisely plan the long-term future of livestock by merely relying on predictive analytics. However, by exploring how the many unknowns might unfold to result in different futures for both the country and the livestock sector,

we can get a better understanding of emerging opportunities and challenges and provide evidence for strategic policy decisions to take today that support sustainability in the long-term.

The Government of Kenya, with support from FAO and USAID, engaged a multitude of stakeholders in a conversation around the knowns and unknowns of the future of the cattle and poultry sectors in the country, such as past and projected trends of societal and livestock dynamics, current policy priorities, technology uptake and institutional changes. Stakeholders did not predict or forecast the future of the cattle and poultry sectors with accuracy, but generated evidence on alternative, yet all plausible futures. The report “The future of livestock in Kenya: Opportunities and challenges in the face of uncertainty” looks out to 2050 and presents alternative scenarios, or plausible portraits, of the future of the cattle and poultry sectors in the country. It provides invaluable insights to decision-makers on actions to take today to make the Kenyan cattle and poultry systems more robust and resilient to an uncertain future, and sustainable from a social, environmental and public health perspective. It makes a strong case to broaden our perspective and take a forward-looking approach when designing policies and investments targeting dynamic and rapidly changing societies, such as that of Kenya.

We are grateful to stakeholders from across Kenya, and to FAO and USAID in particular, who provided the invaluable expertise and knowledge that underpin this report.



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Executive summary

Kenya is in the midst of unprecedented demographic, socio-economic, policy and technological transformations. In the next three decades, the country population is expected to double (96 million) and nearly 50 percent of the people to live in urban areas vis-à-vis 27 percent today. GDP per capita is projected to increase by over 140 percent by 2050. As a consequence, the demand for animal source foods will exponentially increase. In response to this demand, the livestock sector will deeply transform. Available projections suggest that, between 2015 and 2050, not only the cattle and chicken population will increase by 94 and 375 percent, respectively, but there will also be major productivity gains.

By 2050 the livestock sector will supply an additional 7.8 million tonnes of milk, beef and chicken meat to the population, an increase of about 150 percent with respect to today (FAO GPS, 2018).

Presently, there are several policies and strategies guiding the development of the country and its livestock sector, such as the Kenya Vision 2030, the Medium Term Plans for its implementation, the Big Four Agenda, the Agriculture Sector Transformation and Growth Strategy and the National Livestock Policy. Apart from the Kenya Vision 2030, these plans, policies and strategies are short to medium term and attempt to mainly address current issues and constraints. The transformation of the livestock sector, however, is expected to be so rapid that existing policies and strategies might become inadequate in few years' time to steer a sustainable growth of livestock.

The Government of Kenya – represented by the Ministries of Agriculture, Livestock, Fisheries and Irrigation, Environment and Forestry, and Health – and the Africa Sustainable Livestock 2050 of the Food and Agriculture Organization of the United Nations (FAO) have thus engaged stakeholders to articulate long-term livestock scenarios for 2050, that is to explore emerging long-term opportunities and challenges and inform the policy debate. These scenarios are four plausible stories about the future: they build on information on past

trends and long-term projections on societal and livestock dynamics to describe alternative possible structures of the cattle and poultry sectors and their likely impacts on public health, the environment and livelihoods.

Livestock production systems in the different futures show marked variation. For example, not only the cattle population can either moderately or significantly increase in the different scenarios, but the share of cattle may increase from 10 to 45 percent in intensive systems and decline from 48 to 7 percent in extensive systems. In two scenarios, production levels increase tremendously, but with different level of intensification. Conversely, in two other scenarios, production levels remain low, with extensive production systems continuing dominating the livestock production landscape.

Even though different, the scenarios indicate that in all cases the growth transformation of the livestock sector will bring about major developmental opportunities and challenges for society in the future decades.

BUSINESS OPPORTUNITIES

The expected growth in demand for beef, milk and poultry meat will provide major business opportunities for cattle and poultry farmers who will invest to increase herd/flock size and improve productivity. This, in turn, will generate business opportunities for value chain actors, such as input and service suppliers, traders, processors, wholesalers and retailers of animal source foods (ASFs). Most importantly, consumers may benefit from the availability of affordably priced ASFs in the market. However, these opportunities come with some major challenges that, if not properly addressed, risk jeopardizing the development of the livestock sector itself and having negative impacts on public health, environment and livelihoods.

ZOONOSES AND (RE-)EMERGING DISEASES

Increased interactions between a large animal and human populations and wildlife will increase the risk of emergence and spread of zoonotic diseases, including emerging and re-emerging infectious diseases. With the current densities of 85 people/km² and 30 cattle/km², a recent Rift Valley fever outbreak has spread fast and wide throughout the country with a case fatality rate in humans of 23 percent. In 2050, with human and animal densities expected to double, the impact of such an outbreak on society could be even higher. This negative impact on society, which might even result in restriction of people's movement, closure of business and public offices, trade bans, decrease in tourism and social unrest, will be particularly high in rapidly expanding, heavily populated urban areas.

ANTIMICROBIAL RESISTANCE (AMR)

Even in the best scenarios, AMR has devastating consequences. Already today, specific infectious diseases cannot be or are difficult to treat with commonly available first and second-line antimicrobials as the pathogens have developed resistance to antibiotics, such as some strains of Salmonella and E. coli. This is happening in both animals and humans. The Government of Kenya has formulated a National Policy on Prevention and Containment of Antimicrobial Resistance and is implementing it through a National Action Plan. The effective implementation of this plan is of paramount importance as, in the future scenarios, the risk of large improper use of antimicrobials in animals will increase because farmers will have to deal with an increased risk of zoonotic diseases while at the same time attempting to fully tap into the growing business opportunities provided by the expanded market for animal source foods.

The growth and transformation of the livestock sector will bring about major developmental opportunities and challenges for society in the future decades



NATURAL RESOURCES DEPLETION AND CLIMATE CHANGE

Because of increased animal and human population density, it will be increasingly challenging for farmers, pastoralists and other operators to access productive inputs, starting with land, feed and water. Natural resources are limited and will be increasingly scarce on a per capita basis in the future. The current average land holding per household is about 5.1 ha and will reduce by about 180 percent to reach 1.8 ha in 2050. At the same time, the agricultural area may reduce significantly because of urbanization, industrialization and land degradation. In good scenarios, point-source pollution associated with intensification and concentration of livestock will become a major concern, while in bad scenarios overgrazing, land degradation and increased greenhouse gas emissions from poorly productive animals is a serious issues. Climate change will exacerbate these challenges, because of the anticipated decrease in average precipitation between today and 2030 and increased average temperature, which might go up by 2.8 degrees by 2060.

LIVELIHOODS AND EMPLOYMENT

The transformation of the cattle and poultry sectors might result in less livelihoods opportunities for livestock farmers. Because of increased competition to access productive inputs, starting with land and water, smallholders might in fact decide or be forced to exit the livestock sector altogether. This will be the case also in good scenarios, because of major shift towards capital intensive and labour saving production systems. The creation of alternative employment opportunities will be essential for avoiding increased levels of poverty and food insecurity in the future. This will largely depend on how the overall economy of Kenya will be in 2050.

MIDDLE-SCALE FARMERS IN URBAN AND PERI-URBAN AREAS

A high level of urbanization occurs in all scenarios, leading to the emergence and concentration of middle-scale commercial farms in and around urban centres to satisfy the growing demand for animal source foods. This is anticipated to pose major public health and environmental threats. On the one hand, high density of and frequent interactions between humans and animals are major determinants of outbreaks and spread of emerging and re-emerging infectious diseases.

On the other hand, concentration of animals and processing of livestock products in urban and semi-urban areas, especially slaughtering, can result in water and soil contamination, leading to further health threats.

NEXT STEPS

Cognizant of the above, the Government of Kenya may wish to prioritize certain investments within the existing policy framework to establish strong foundations to tap into emerging livestock-related opportunities and effectively deal with coming challenges and threats. It might also appreciate what additional actions, if any, should be taken today to ensure a sustainable livestock in the long term, which provides affordable animal source foods to the growing population while having marginal or no negative impact on the environment and public health.

Introduction

Kenya society and economy will grow swiftly and transform extensively in the next three decades: the country population is anticipated to reach 96 million in 2050, vis-a-vis 47 million today, and the size of the economy to more than double. Such a pace of change is unparalleled in Kenya's history.

Along this transformative process, the demand for animal source foods will exponentially increase and livestock likely to become the most important sector of agriculture. The growth and transformation of the livestock sector will be unprecedented. It will pose immense puzzles to society, being livestock a cornerstone for livelihoods and food security, environmental sustainability and public health. These include emerging challenges, which escalate as years pass and in the medium to long-term risk to undermine sustainable development, and uncertain one-off events with great disruptive impact not only on the livestock sector but also, and more broadly, on society as a whole.

How can Kenya be prepared for and take action to ensure sustainable livestock production and value chains in 2050?

This is the question at the basis of this report. In the last 18 months, the Ministries of Agriculture, Livestock, Fisheries and Irrigation, Health, and Environment and Forestry have joined forces with the FAO Africa Sustainable Livestock 2050 (ASL2050) to engage a multitude of stakeholders in an evidence-based conversation around the long-term future of Kenya, and of its livestock sector in particular. The consensus stakeholders reached is presented here.

This report portrays Kenya's possible livestock futures: it sheds light on opportunities, emerging challenges and uncertain disruptive events associated with a transformed livestock sector, and identifies priority areas for action to take today for a sustainable livestock in the long-term.

What are scenarios?

Scenarios are plausible snapshots of the future that help focus thinking on key factors driving long-term changes and identify emerging opportunities, challenges and threats. They are constructed by engaging stakeholders in a conversation on available information on anticipated trends, such as population growth and climate change, and unpredictable dimensions of the future, such as the level of market integration and technology development and adoption.

There are multiple scenario building methods. Stakeholders used the double uncertainty matrix to formulate four plausible livestock scenarios for 2050: they agreed upon two key uncertainties that will shape the future and explored how their interactions with known trends result in significantly different futures.

Scenarios build on the premise that the future is still in the making and can be actively shaped by anticipating emerging opportunities, challenges and threats, and by taking strategic action today that supports resilience and sustainability in the long-term.

Kenya today: a country with good prospects

Kenya faces a variety of developmental challenges, starting with poverty and inequality. In the coming decades the country could become one of Africa's success stories because of its youthful and skilled population, an active private sector, improved infrastructure, a new constitution, and its catalytic role in East Africa.

Kenya today

Kenya is a lower-middle income country with a population of 47 million and a GDP per capita of USD 1 450 per year. Agriculture is a major contributor to the economy, contributing about 32.6 percent to the Gross Domestic Product (GDP) and 58.2 percent to employment (GoK, 2017a; WB, 2019). Industry and services contribute around 19 and 45.4 percent to GDP, respectively.

The country agricultural sector is heterogeneous, comprising small through medium to large farmers and farms with different levels of efficiency. Smallholders, however, dominate the agricultural landscape. They mainly cultivate maize, beans, potatoes, and keep cattle, small ruminants and poultry.

Agricultural productivity is constrained by a variety of institutional and economic bottlenecks, as well as by agro-ecological constraints with 80 percent of the total agricultural land being arid or semi-arid (Alila and Atieno, 2006). Kenya has 27.5 million ha of agricultural land (48.6 percent of total land area) and of this 5.8 million ha is arable. Cereal crop production currently covers roughly 2.8 million ha (WB, 2011a).



Out of 47 million people, 17 million (36.1 percent) are estimated to live under the poverty line (WB, 2018c). Most of poor are in rural areas. Undernourishment affects 19.1 percent of the population, with wasting and stunting in children being at 6 percent and 37 percent, respectively.

Life expectancy is 67 years (69 for women, and 65 for men). The diseases that cause most deaths are: diarrheal diseases, usually symptoms of an infection of the intestine, HIVS/AIDS, lower respiratory infections, ischemic heart diseases, cerebrovascular diseases and tuberculosis. There are about 2 physicians per every 100 000 people in the country. Thirty percent of the population have access to at least basic sanitation services (e.g. sewage collection and solid waste handling) and 58 percent access drinking water from an improved source. On average, the government spends USD 70 per person per year on health (WB, 2018a).

Kenya's arid and semi-arid lands (ASALs) occupy 89 percent of the country land area and are subject to severe degradation, such as in in pastoral systems. However, Kenya forest cover is recovering from a deforestation trend of many years and currently stands at 7 percent of the land area. The government's target is to attain 15 percent forest cover by 2022. There are a number of recognized threatened species, including 30 mammals, 43 birds, 73 fishes and 234 higher plants (WB, 2018b). Around 70 percent of natural disasters are weather-related and Kenya is scored 4 out of 5 in its ability to cope with climate change (WB, 2011b).



URBANIZATION

Roughly, **27%** of the population dwells in urban areas

GDP per capita

1 450 USD
or **3 160 USD**
PPP per year

POPULATION

47 million

AGRICULTURE

Dominated by smallholders, it contributes about

33% to GDP
58% to employment
50-65% to export value

LIVESTOCK

Smallholders and other operators mainly raise **cattle, small ruminants and poultry**

CROPS

Main staples and cash crops include **maize, beans, potatoes and bananas**



Livelihoods



36% of the population lives under the poverty line. Most of the **poor** are in rural areas



19% of the population is undernourished and about **4 out of 10 children** under age 5 are **stunted**

Public health



Life expectancy is **67** (69 for women, and 65 for men)



Infectious diseases are the major cause of death: diarrheal diseases, HIV/AIDS, lower respiratory infections, and tuberculosis, but also ischemic heart and cerebrovascular diseases



Environment



Around **70 %** of **natural disasters** are **weather-related**



Forests cover **7%** of the land area



About **30%** of the **landmass** in pastoral systems is subject to **severe degradation**

Livestock today

Livestock production is an integral part of the agricultural sector. Kenya has a vibrant livestock sector that accounts for about 4.4 percent of the country GDP (USD 3.4 billion, in 2017) or about 14.2 percent of the agricultural value added (GoK, 2018). The sector employs 50 percent of the agricultural labour force and generates a significant number of jobs along the value chain.

About 60 percent of the livestock population is found in the arid and semi-arid lands (ASALs) where 90 percent of the population raise animals both for milk and beef production. In the high rainfall areas, the sector provides employment and income mainly through dairy, poultry and pig production (GoK, 2019).

The country's animal population comprises 18.8 million cattle (14.3 million beef cattle and 4.5 million cows), 26.7 million goats, 18.9 million sheep, 3.2 million camels, 44.6 million poultry, 1.9 million donkeys, 0.5 million pigs and an undetermined number of companion, game and aquatic animals (GoK, 2017b). Cattle and poultry – the focus of this report – contribute about 70 percent to the total animal production output, estimated at USD 1 622 billion in 2016.

The livestock sector contributes about 2 percent to the country's export earnings. Dairy, beef and chevron account for about 30, 15 and 26 percent of livestock export value. Other exported products include hides and skins and live animals. Kenya imports low volumes of livestock products and live animals (OEC, 2016; FAOSTAT, 2019).

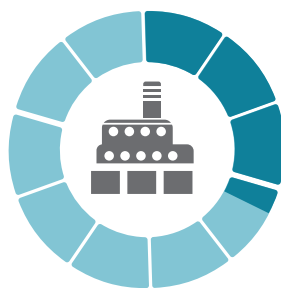
The total supply of animal source foods in the country, including of net trade, translates in a per capita consumption of 15.6 kg of meat, 121 litres of milk and 45 eggs per year (GoK, 2017b; FAO, 2019a; Bosire *et al.*, 2017). Cattle products, beef and cow milk, contribute for almost 80 percent of all meat and milk consumption. Market transactions are largely in urban areas as self-consumption of animal source foods dominates in rural areas.

7 million households own livestock



60%
of population

Agriculture value added

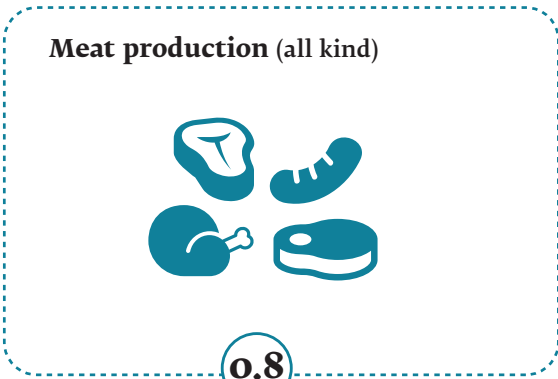
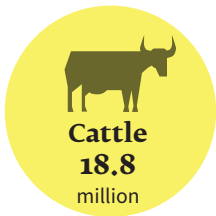
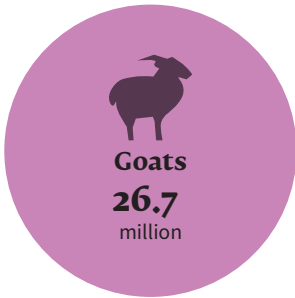
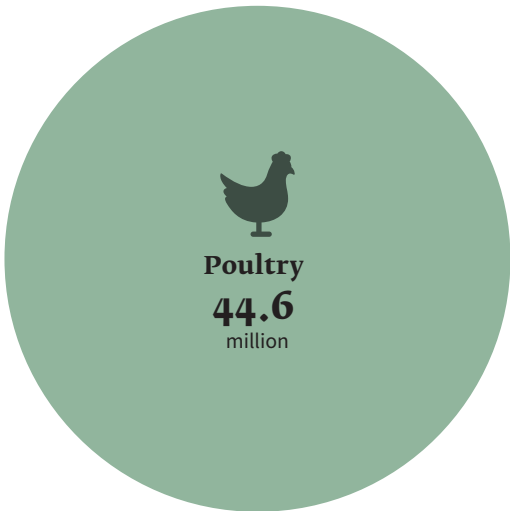


32%
of gross domestic product

Livestock value added



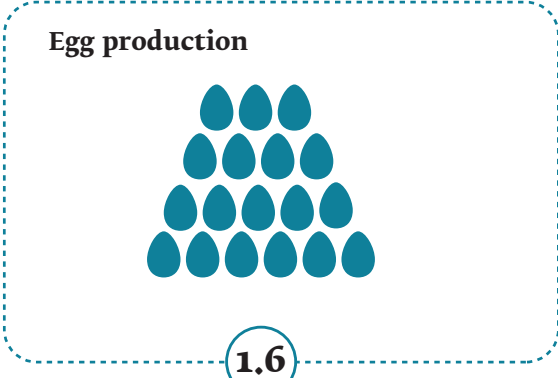
14%
of agricultural gross domestic product



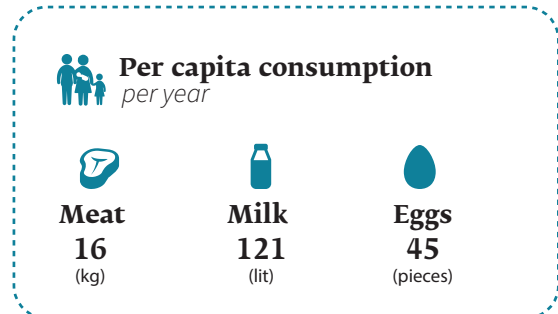
million tonnes



billion litres



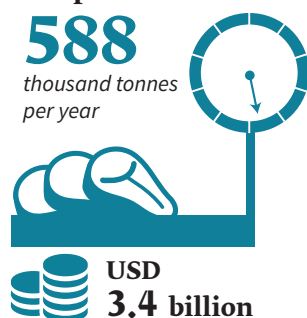
billion pieces



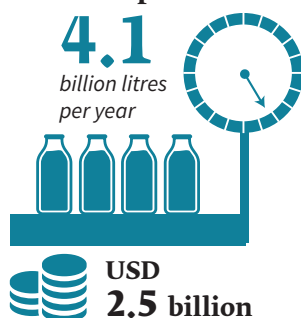
Cattle today

There are about 18.8 million cattle in Kenya of which 76 percent are beef cattle and 24 percent are cows. Beef is largely produced in arid and semi-arid areas (ASALs), where about 36 percent of the Kenya population live. Dairy production is concentrated in high potential agroecological zones where fodder and pastures are available. These areas include central parts of the country, the central Rift Valley and western parts of Kenya. While beef animals are kept by small, medium and large farmers, 95 percent of dairy farmers keep an average of just 3 cows.

Beef production

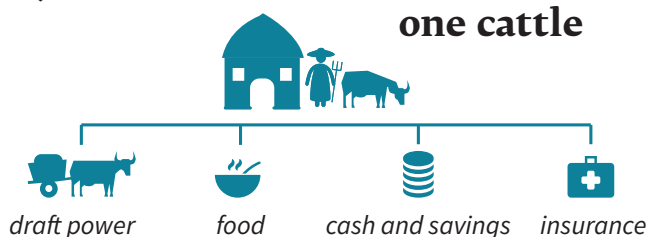


Cow milk production



About 3.6 million households keep at least one cattle, which support their livelihoods through the provision of meat, milk, cash, draft power, hauling services, insurance and social capital. Per capita annual consumption of milk (121 litres) and beef (11.3 kg) is one the highest in sub-Saharan Africa. Eighty-six percent of households across all the income groups consume fresh milk, and 45.8 percent of Kenyans consume beef and veal.

3.6 million households own at least one cattle



Cattle production systems are varied. The beef cattle production systems comprise: pastoral, semi-intensive (agro-pastoral), ranching systems and feedlots. Dairy cattle are raised in intensive, semi-intensive and extensive production systems.

● Pastoral

This is a low-input low-output subsistence production system, practiced in arid and semi-arid areas. Pastoralists keep indigenous breeds, with herds varying from 20 to several hundred heads that rely entirely on communal grazing areas and water sources. Milk and beef are the main products.

● Agro-pastoral

Agro-pastoralists tend their animals in semi-arid areas and also practice some cropping. Animals graze and are also fed with crop residues and by-products and provide manure and draft power to increase crop productivity. Milk and beef are the main products.

● Ranching

It is a highly commercial large-scale system, with ranches keeping an average of 1 000 heads of cattle. Most ranches have infrastructure for disease control, feeding and water storage. Beef is the main product, which targets prime local and export markets.

● Feedlots

It is a commercially-oriented production system in which animals are kept for a short period (about 3 months) during which they are first fattened and then sold to prime local and export beef markets. It is a capital-intensive system.

● Intensive dairy

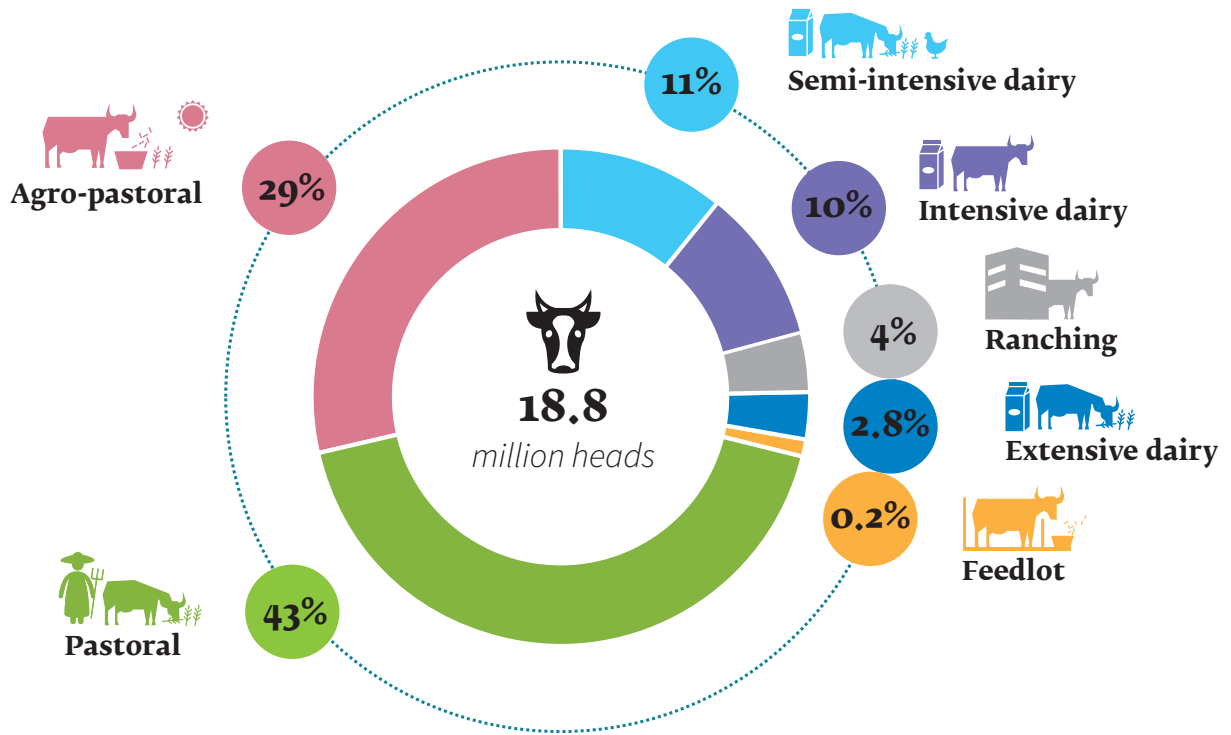
It is a highly intensive milk production system, in which exotic cows are stall-fed on high quality feed, concentrates and supplements. Intensive dairy farms are largely located in the mid- and high-altitude agro-ecological zones and about 85 percent of them keep a herd of between 5 to 15 cows.

● Semi-intensive dairy

In semi-intensive dairy production systems, farmers keep between 3 to 20 cows that are part of a larger, mixed herd of animals, comprising also small ruminants and chickens. Dairy cows graze at daytime and are provided with some feed supplements, especially when in milk.

● Extensive dairy

It is a pasture-based production system practiced in large fenced farms, where between 20 – 200 dairy cows graze on natural or improved pastures. Animals are provided with mineral and hay supplementation during dry periods.

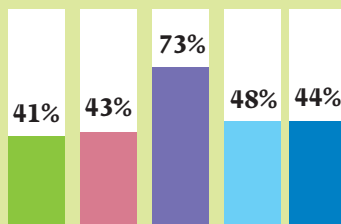


Livelihoods



About **3.6 million households** keep cattle, which contribute from 40 to 73 percent to their total income.

Cattle income as % of total household income



- pastoral systems
 - agro-pastoral systems
 - intensive dairy system
 - semi-intensive dairy systems
 - extensive dairy systems
- (ranching and feedlots systems = no data)*

Cattle contribute to **food security** and **nutrition** through the provision of beef and milk to the population

Per capita consumption of beef and cow milk is **11.3 kg** and **121 litres** per year, respectively

Public health



Cattle can negatively impact on public health through **zoonotic diseases**, which jump from animals to humans

USD 4.8 billion

The combined cost of **brucellosis** and **bovine tuberculosis** on the livestock sector and human health amounts to 14 percent of the cattle value added or USD 4.8 billion per year



Inappropriate use of **antibiotics** in cattle farms can result in **antimicrobial resistance in humans**. The fight against infectious diseases, the major cause of death in Kenya, might become a daunting challenge

Environment



Cattle are the **largest user of land** among all livestock and a **major user of water**. Over 60 percent of the cattle herd is reared in fragile arid and semi-arid areas, where **overgrazing** contribute to land degradation. Cattle also contribute to loss of biodiversity and emissions of **greenhouse gases**.

Cattle water consumption, including for feed and fodder production, amounts to **8 percent** of the total **water withdrawal** of the country

Greenhouse Gas Emissions from cattle (CO₂e)

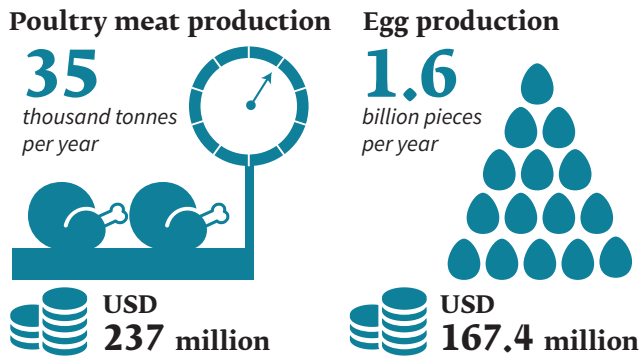
million tonnes

Systems:

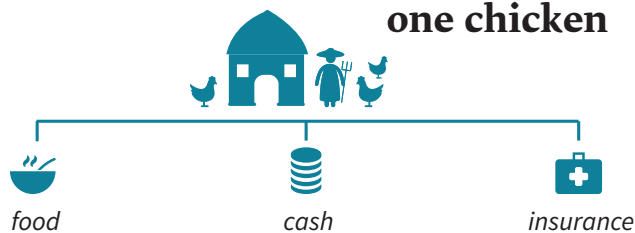
- pastoral = **11.4**
- agro-pastoral = **7.9**
- ranching = **1.1**
- feedlots = **0.1**
- intensive dairy = **4.0**
- semi-intensive dairy = **2.6**
- extensive dairy = **0.7**

Poultry today

Kenya has an estimated 43.8 million chicken contributing 5.1 percent of the total livestock value added (GoK, 2017a). The poultry sector is highly heterogeneous and produces more than 35 000 tonnes of meat and 1.6 billion eggs (FAOSTAT, 2019a).



5.5 million households own at least **one chicken**



About 5.5 million households, close to half of the Kenyan households, keep poultry. In rural areas, about 75 percent of households keep chicken, and 96 percent in Nyanza and Western Kenya (Okitoi *et al.*, 2000; Njenga, 2005). Poultry is an important source of nourishment through the provision of meat and eggs. The sale of birds provides immediate cash in case of need. While poultry generate both meat and eggs, the analysis in this report focuses on chicken meat, though in backyard systems dual purpose birds are raised. Focusing on poultry for meat production has facilitated engaging stakeholders in an evidence-based conversation around the future of the poultry sector in Kenya. The main conclusions, however, largely apply for egg production too.

● Intensive

This production system is market-oriented, intensive in management and practised in urban and peri-urban areas, such as around Nairobi, Mombasa, Nakuru and Kisumu. Exotic chicken (largely exotic hybrids) are raised in confined structures, properly fed and vaccinated. Broilers are sold within 5–8 weeks.

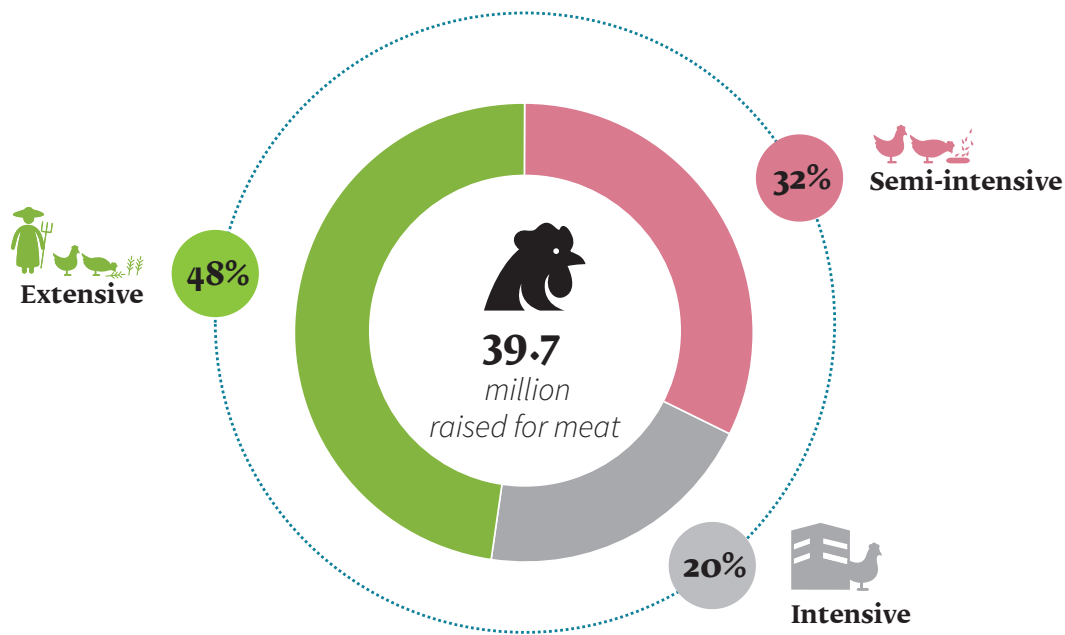
● Semi-intensive

In this production system, practiced throughout the country, farmers keep improved chicken in confined simple structures; birds scavenge during the day and are also provided with some feed supplements; vaccination against major diseases is common but bio-security practices are limited. Farmers sell most of the birds after growing them for between 4 and 6 months, though some are self-consumed.

● Extensive

The extensive chicken production system is a low-input low-output system where indigenous birds are left to freely roam for feed. Farmers rarely vaccinate the birds or treat them when they are sick. Women and children are responsible for the birds, who are mainly kept for egg production though they are also sold opportunistically, when the need arises, in informal markets. Although popular throughout the country, the free ranging system is more common in western Kenya regions, some parts of lower eastern, North Rift areas and in coastal areas.

There are three major chicken (meat) production systems in Kenya, with the extensive production system being the dominant one.

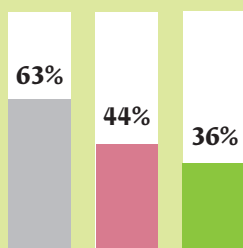


Livelihoods



About **5.5 million households keep poultry**, which contribute from 36 to 63 percent to their income

Poultry income as % of total household income



- intensive systems
- semi-intensive systems
- extensive systems

Poultry contribute to **food security** and **nutrition** through the provision of meat and eggs and is a sort of insurance to be cashed in time of need

Per capita consumption of poultry meat and eggs is **0.6 kg** and **45 eggs** per year, respectively

Public health



Poultry can have negative effects on public health through **zoonotic diseases**, which are transmitted from chicken to humans

USD PPP 1.1 billion } Total cost of salmonellosis

The cost of salmonellosis, a food-borne zoonotic disease, is about **17 percent** of the total value of **poultry production**. Its **impact on public health** is around **0.4 percent** of the **Kenyan GDP**.



Inappropriate use of antibiotics in poultry farms, particularly in semi-intensive and intensive production systems where farmers are market-oriented, might result in livestock driven **antimicrobial resistance in humans**

Environment



The poultry sector does currently have a **limited negative impact** on the environment. Birds need little water and only a small share are grown in intensive systems, where there are issues related to **soil and water pollution from inappropriate management of poultry litter**

As few birds are raised in intensive systems, and hence fed with industrially produced feed, the contribution of the poultry sector to **greenhouse gas emissions are limited**

Greenhouse Gas Emissions from poultry (CO₂e) thousand tonnes

- Systems:
- intensive (broiler) = **139**
 - semi-intensive = **56**
 - extensive = **68**

Kenya in 2050: knowns and unknowns

The way Kenya and its livestock sector will be in 2050 depends on the interactions between known factors, including existing long-term policies and strategies and megatrends, and uncertain factors, such as consumers' behaviour and government accountability.

Knowns

Long-term policies and strategies

The **Kenya vision 2030** – implemented through a series of Medium Terms Plans (MTP 2008/12, MTP II 2013/17 and MTP III 2018/22) – aims to transform Kenya into an industrialised middle-income country ensuring high quality life to all its citizens. Over and above the current MTP III, the President’s **Big 4 priority agenda** (2019/22) is focusing on enhancing food security, affordable housing, manufacturing and universal health, modelled around Public-Private Partnerships (PPP).

The **Agriculture Sector Development Strategy** (ASDS – 2010/20), the **Food and Nutrition Security Policy**

(2011) and the **Kenya Climate Smart Agriculture Implementation Framework** (2018/27) guide the growth and transformation of the agriculture sector. They aim at enhancing sustainable agricultural productivity for food and nutrition security. They are complemented by the **Agriculture Sector Transformation and Growth Strategy** (ASTGS – 2019/29) that emphasises the importance of modernizing agriculture and shifting towards more value addition for attaining 100 percent food and nutrition security.

The **National Livestock Policy** (revised 2019) is the overarching framework that guides the development of the livestock sector in Kenya. The policy aims at supporting a transformation of the sector from subsistence to commercial undertaking with the objective to improve the livelihoods of smallholder farmers and pastoralists, enhance food and nutrition security for all Kenyans, and contribute to increased agro-industrialization and inclusive economic growth through the generation of employment opportunities along the livestock value chain.

Megatrends, 2015-2050

POPULATION

+100%
from **47** to **96** million



The demand for livestock products will increase and by 2050 most of livestock products will be marketed and consumed in urban areas

URBANIZATION

+250%
from **12** to **44** million



CLIMATE CHANGE

Temperatures will be much warmer



Changed rainfall pattern and frequent extreme weather events will make livestock production increasingly challenging

TECHNOLOGY

Big data and automation technologies will improve productivity in all sectors



Livestock production and husbandry practices, livestock products and livestock value chains will be markedly different than today

Consumption of livestock products } 2015-2050 in thousand tonnes



beef +230%
from 485 to 1 602



poultry meat +240%
from 27 to 92

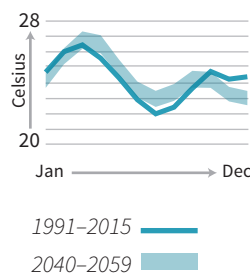


milk +140%
from 4 736 to 11 341



eggs +175%
from 89 to 245

Past and projected average monthly temperature



Technology development

will change the way individuals and organizations, including the government, will behave, work and interact



Unknowns

Peace and stability, the role of Regional Economic Communities, the market size of artificial meat, and the use of drones for the provision of livestock services are examples of unpredictable factors that will shape the future.

However, there are two bottom line uncertainties that will largely shape how Kenya will be in 2050: the governance system and the economic system.



GOVERNANCE SYSTEM

Governance is the manner in which the government guides, through its institutions and rules, the political, social and economic activities. At the extremes, the governance system can be either good or bad.

Good governance

“High levels of accountability and responsibility. Stable institutions”

Bad governance

“Corrupted and highly unstable institutions”



ECONOMIC SYSTEM

The economic system is the manner in which resources are allocated to produce, distribute and trade goods and services. At the extremes, the economic system could be either good or bad.

Good economic system

“Vibrant, thriving and diversified economy”

Bad economic system

“Unidimensional, fragile and weak economy”

Pairing the good and bad governance and the good and bad economic system uncertainties allows constructing four possible scenarios for Kenya in 2050.

The four scenarios shed light on how the known and unknown factors of the future might differently interact to result in alternative, yet all plausible futures for Kenya and its livestock sector.

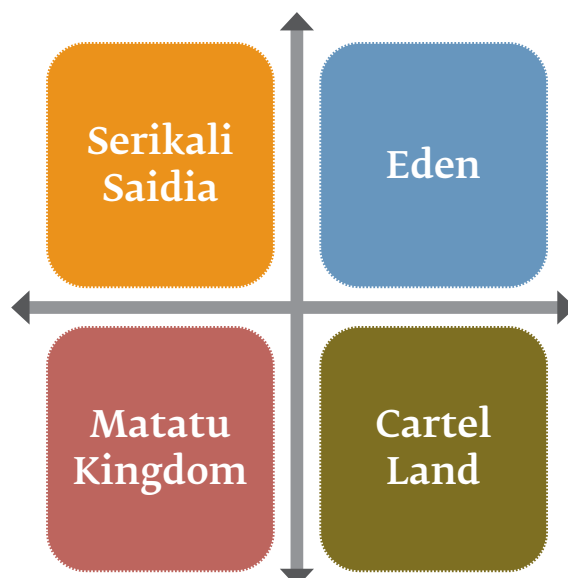
SCENARIO NAMES

EDEN: the good-governance good-economy scenario. Eden is the ideal garden which depicts a delightful nation abounding with happiness and contentment, peace and prosperity.


CARTEL LAND: the good-economy bad-governance scenario. Cartel is a group of producers that attempts to increase their collective wealth without any attention to the needs and wills of most of the population.

SERIKALI SAIDIA: the good-governance bad-economy scenario. It refers to the story of a woman, Jane Anyango Adika, who, after a flood destroyed her village in the Kano region, cried to the government for help as she did not have sufficient resources to get along on her own.

MATATU KINGDOM: the bad-governance bad-economy scenario. It refers to the Matatus, the privately owned vans and minibuses used as public transport by many Kenyan. They are too often driven flouting traffic rules scrambling for passengers.



Kenya 2050 scenarios

Governance system 

SERIKALI SAIDIA

Kenyans struggle to cope with the harsh reality of a stagnant economy in spite of all good intentions of the government to improve their lives. Given the weak economy, private sector investment is almost absent. The livestock sector, poorly productive because of lack of finance, is unable to satisfy the demand for animal source foods of the population and generates negative impact on the environment and public health.




Economic system



MATATU KINGDOM

Many Kenyans are poor and the middle class is shrinking. Public institutions are poorly funded and the government is inefficient and unable to provide even basic services to the population. The business environment is unfriendly resulting in little private sector investment. Livestock contribute to grassland degradation and biodiversity loss; make inefficient use of water; negatively affect public health because of zoonoses and livestock-driven anti-microbial resistance; and marginally support people's livelihoods.

Governance system 

+ Governance system

EDEN

Kenya is a high income country with a technological and entrepreneurial-based economy driven by services and industry. Its citizens are well-off and enjoy a stable progressive democracy. The country's livestock sector is an exemplary model of sustainability: strong public institutions, effective public and private animal health services and educated farmers ensure sustainable livestock production systems with limited if any negative impacts on the environment and public health.



+ Economic system

CARTEL LAND

Despite the thriving economy, inequality is high with few well-off Kenyans and most of the population grappling with meagre disposable incomes. An inefficient government is unable to provide public goods and services to its citizens. There is a dual livestock sector, comprising few large corporations, which tend to overexploit natural resources, and millions of poor smallholders who survive tending few poorly productive animals.

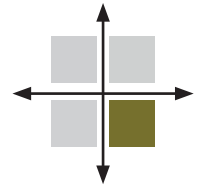


- Governance system

Kenya in 2050: cattle scenarios



The alternative futures of Kenya will shape the development of its cattle sector. Different futures will result in different cattle production systems and value chains and diverse impacts on livelihoods, the environment and public health.

Cattle in Cartel Land



CONSUMPTION

Aggregate consumption for milk and beef is higher than in past, mainly driven by a larger population. However, the share of households consuming milk has not changed significantly with respect to today because, despite a thriving economy, high income inequality reduces the purchasing power of the typical Kenyan. In addition, weak food safety regulations often result in citizens consuming poor quality animal source foods.

Per capita consumption <i>per year</i>		Today	2050
 beef (kg)		11.3	12 ↑
 milk (lit)		121	126 ↑

PRODUCTION

Trade ↓

The cattle population has increased by 90 percent with respect to today. Milk and beef production have increased to reach about 17 thousand and 2 thousand tonnes, respectively. However, beef production does not meet the internal demand and Kenya is a net beef importer and, while milk production is significantly higher than consumption, Kenya is not able to benefit from export market opportunities due poor regulations and quality standards.

CATTLE POPULATION AND PRODUCTION SYSTEMS

There is a marked increase of the number of cattle in intensive and semi-intensive dairy systems, which account for 35 percent of the national herd and 90 percent of the milk output. The share of cattle in feedlot systems has increased from 0.4 to 14 percent of the national herd and accounts for about 53 percent of the total beef output. The shift towards intensive production is associated with a reduction in the availability of grazing land and, as a result, the pastoralist sector is less relevant than today though it remains a key source of livelihoods for households in arid and semi-arid lands. There is an increased number of peri-urban and urban farms.

PRODUCTIVITY

In intensive and semi-intensive beef and dairy systems productivity is higher than today due to technology adoption, breed improvement, mechanization and improved feeding. However, most of smallholder farmers are quite inefficient and poorly productive and the market for both dairy and beef is predominantly informal, with low sanitary and quality standards.

Livelihoods



Income from cattle is **higher** than today in **intensive and semi-intensive systems** but lower in pastoral systems, where farmers find it increasingly difficult to derive a livelihoods from their animals. Some **jobs** have been created **along the livestock value chains** serving urban markets, but **wages remain low**.

Public health



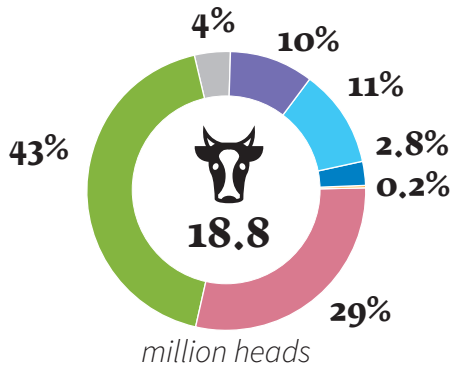
Human and animal population growth, the expansion of cities and the emergence of peri-urban farms result in **high risk of emergence and transmission of zoonoses**. Intensive and semi-intensive farmers have incentives to use antibiotics both for growth promotion and prophylaxis to supply urban dwellers, with the government unable to monitor their proper use. **AMR is a serious concern**.

Environment

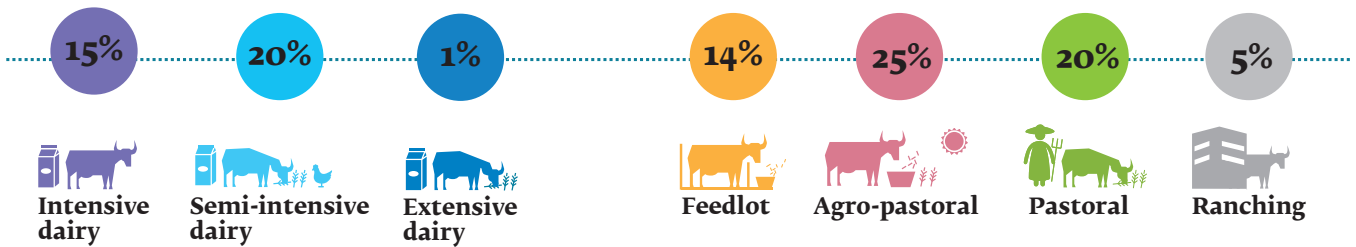
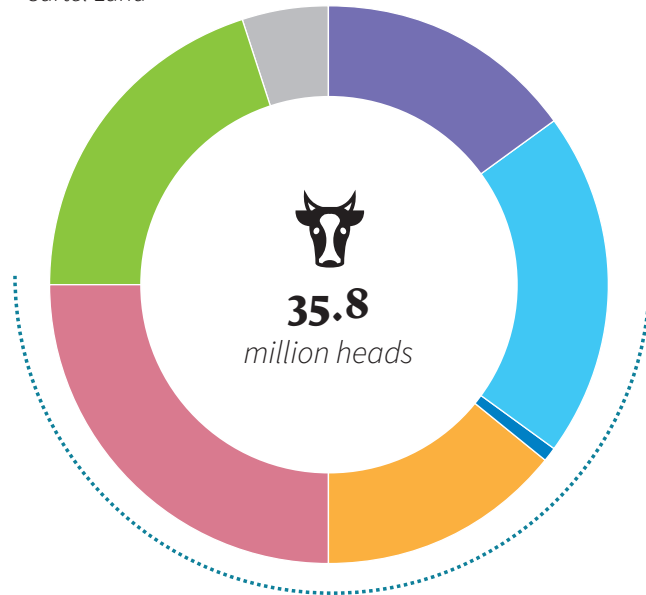


Growth in the number of cattle results in a **high negative impact on the environment**. In extensive systems, overgrazing and conflicts over natural resource use loom large; in intensive systems, there is high point source pollution of soil and water because of inappropriate manure and waste management. The cattle sector continues to be a major contributor to greenhouse gas emissions.

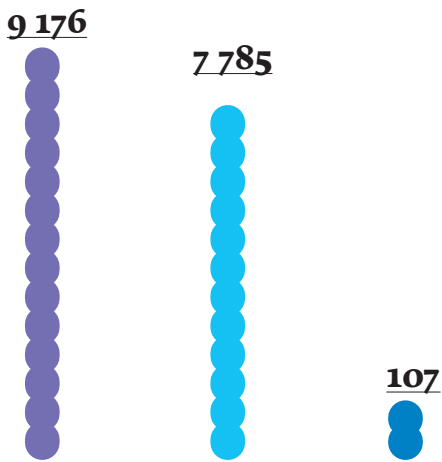
2015



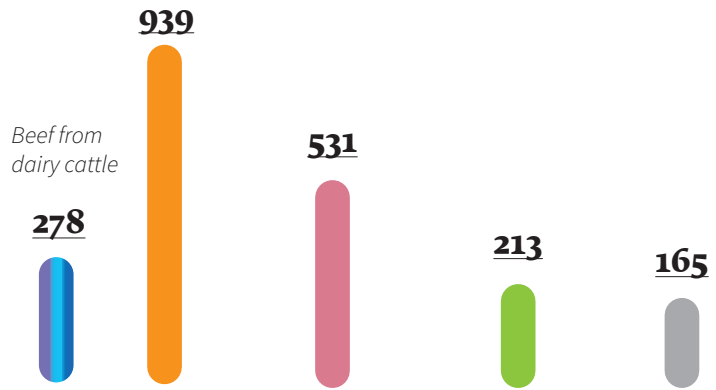
2050
Cartel Land



Cow milk production
(1 000 tonnes)



Beef production
(1 000 tonnes)

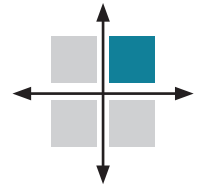


Challenges

High densities of animals and humans, especially in peri-urban areas, and weak public animal and human health services, make high the risk of emergence and spread of zoonoses, including emerging and re-emerging infectious diseases. At the same time, the weak enforcement of rules and regulations results in major negative impacts on



livestock on the environment, high prevalence of foodborne diseases, the use of counterfeit veterinary drugs, and livestock-driven AMR due to inappropriate use of antibiotics by farmers.

Cattle in Eden



CONSUMPTION

Kenya is a high-income country and approximately half of the population belongs to the middle-class. There is a high demand for safe, nutritious and healthy animal source food, including beef, milk and other dairy products.

Per capita consumption <i>per year</i>		Today	2050
 beef (kg)		11.3	30 ↑
 milk (lit)		121	180 ↑

PRODUCTION



Kenya livestock production meets consumer demand. Beef and milk production have increased by over 900 and 400 percent with respect to today, respectively. Kenya is a major exporter of cattle products in the region, in the range of 0.9 and 2.4 million tonnes of milk and beef per year, respectively.

CATTLE POPULATION AND PRODUCTION SYSTEMS

With respect to today, the cattle population has more than doubled and intensification is much higher. The dominant (and more productive) systems are the intensive ones, both beef and dairy, followed by semi-intensive production systems and ranching. Pastoral and agro-pastoral production systems contribute little to the national beef and milk production: they are testimonies of traditional practices and provide premium organic products to consumers.

PRODUCTIVITY

Cattle systems are efficient and productivity is very high. The adoption of effective practices all along the cattle value chain ensures that good quality dairy and beef products are available on the market. The consumption has shifted from raw and fresh products to processed milk and beef products, such as low-fat milk, cheese, yogurt and sausages.

Livelihoods



There are less people directly deriving a livelihood from cattle than today. However, their **income is high** and additional **jobs** have been created along the **cattle value chain**, such as in processing and marketing. In addition, the availability of good quality beef and milk products in the market has increased **food security and nutrition** for the Kenya population.

Public health



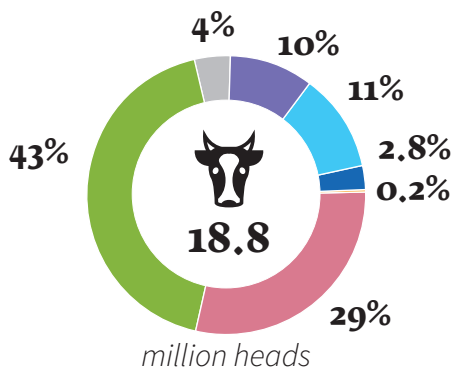
There is an effective and efficient coverage of animal health services and **bio-security measures are widely adopted**. The risk of emergence and spread of animal diseases, including zoonoses, is minimal. There is a **judicious use of antimicrobials** in livestock farming and consumers are fully aware of AMR.

Environment



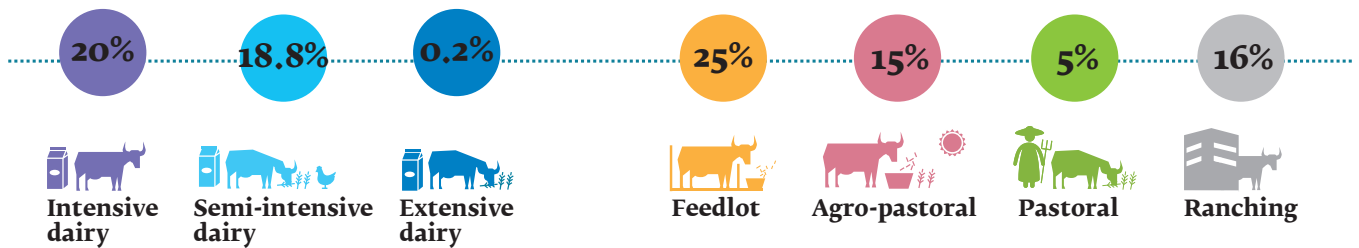
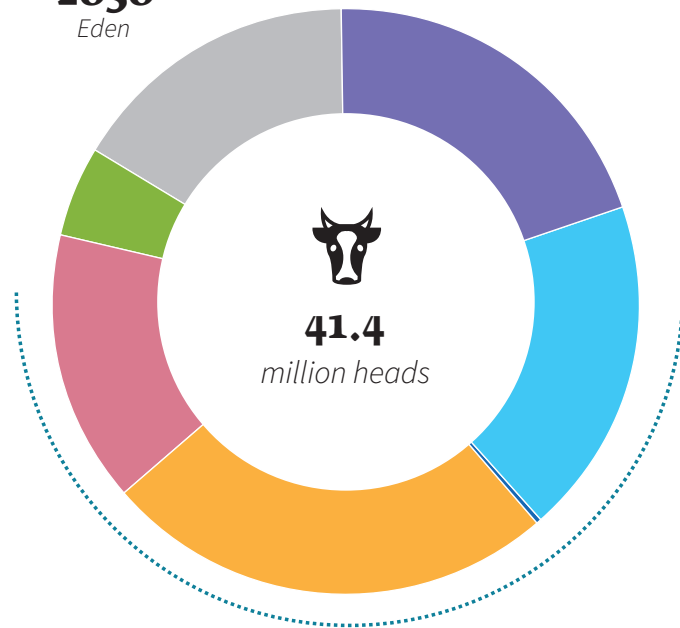
The high level of production, largely from intensive and intensive production systems, result in a **high demand for natural resources**, including land and water. However, because of an efficient government, cattle production systems are largely sustainable, with **limited negative impacts on soil and water**. In addition, improved efficiency has reduced the contribution of greenhouse gases emissions per unit of product. Recycling and reforestation programmes are in place.

2015



2050

Eden



Cow milk production

(1 000 tonnes)

16 569



9 812



42



Beef production

(1 000 tonnes)

3 573

Beef from dairy cattle

485



466



72



742

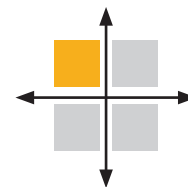


Challenges

While an efficient cattle production system is good for society, the Eden scenario also presents some challenges. First, there will be a significant reduction in the number people deriving a livelihood from cattle in 2050 vis-à-vis today, which requires the generation of alternative employment opportunities along the livestock value chain and elsewhere. Second, while



intensive systems are highly efficient, their negative impact on soil and water and public health could be significant and hence the government needs to closely and constantly monitor and assess their environmental performance and their compliance with biosecurity and biosafety rules and regulations.

Cattle in Serikali Saidia



CONSUMPTION

The low purchasing power and the high prices of beef and milk make it a challenge for the population to consume animal source foods. With respect to today, the share of households consuming livestock products has decreased and there have not been any major changes in the levels of per capita consumption of beef and milk. However, as the Kenyan population is larger than today, the aggregate consumption of beef and milk is higher.

Per capita consumption <i>per year</i>		
	Today	2050
 beef (kg)	11.3	11
 milk (lit)	121	122

PRODUCTION

Trade 

Because of low investments in the cattle sector, national milk production cannot meet the domestic demand and Kenya is a net importer of milk. On the other hand, the country has some surplus beef that, because too expensive for local consumers, is exported to neighboring countries. Imports and exports are well-regulated.

CATTLE POPULATION AND PRODUCTION SYSTEMS

The cattle population has increased by 60 percent since 2016 to reach 30 million heads in 2050. Most of the cattle are in the semi intensive and extensive production systems, which account for about 80 percent of the total herd and contribute about 30 and 80 percent to the national milk and beef supply, respectively. Due to the lack of major investments, there is no any major expansion of the intensive dairy and the feedlot systems.

PRODUCTIVITY

Productivity is low and the slight increase in aggregate production is largely due to an increased cattle population rather than to improved efficiency. A good governance system ensures that both farming and marketing are better regulated than today. However, the lack of finance makes it a challenge for many operators to comply with existing rules and regulations, which would yet allow sustainably increasing productivity and production levels.

Livelihoods



There is an increased number of cattle keepers who, however, keep a smaller herd than today. This, coupled with increased competition to access land and water, makes it a **challenge for farmers to derive a decent livelihoods from cattle**. Indeed, **semi-intensive and extensive systems** are increasingly **subsistence-oriented**, providing little income to households.

Public health



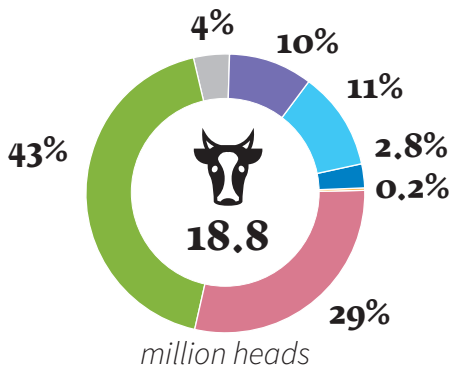
There is limited public and private investment in disease control measures resulting in **high disease incidence and higher risk of emergence and spread of zoonoses**. **Antimicrobials use is high** in cattle farms, because of high disease risk and limited government resources to ensure farmers and other operators comply with existing rules and regulations. This contributes to **AMR in humans**.

Environment

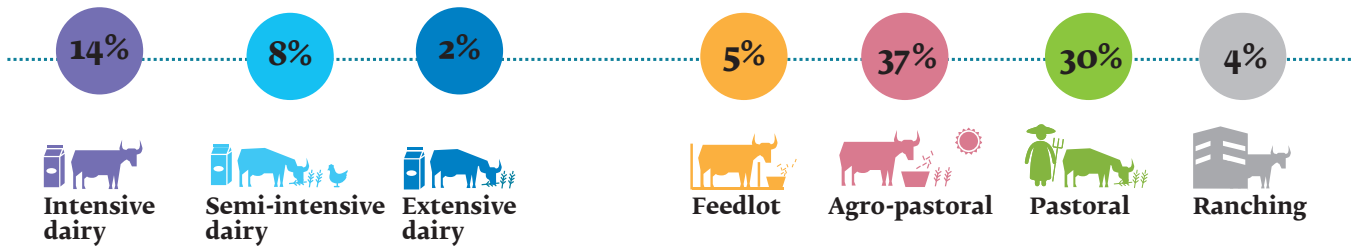
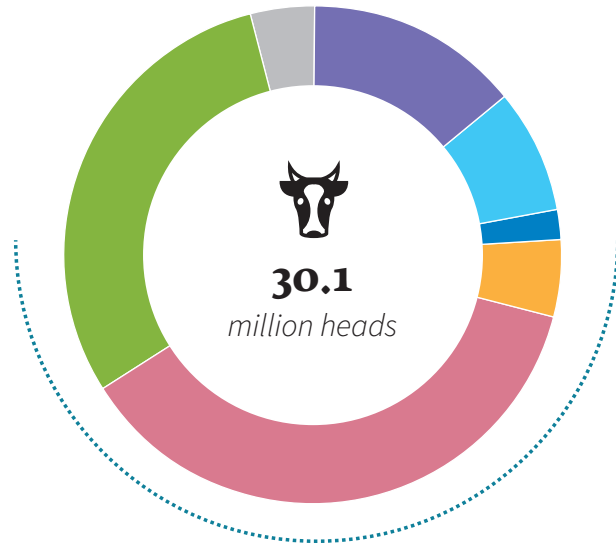


An increased number of cattle in extensive production systems results in **high grassland degradation**. The government has put in place some land consolidation initiatives and re-forestation programmes, whose implementation largely depends on availability of donor funding. Because of low productivity, there's **no any reduction in greenhouse gas emissions** from cattle, which is high because of the large animal population.

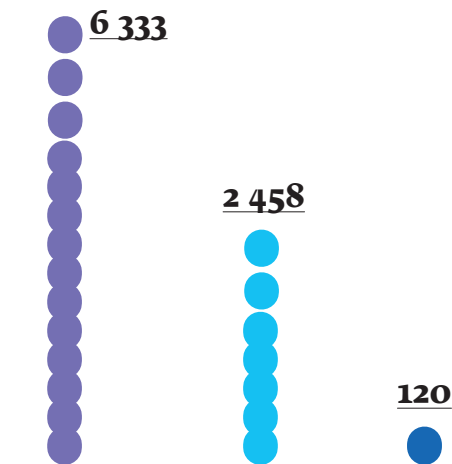
2015



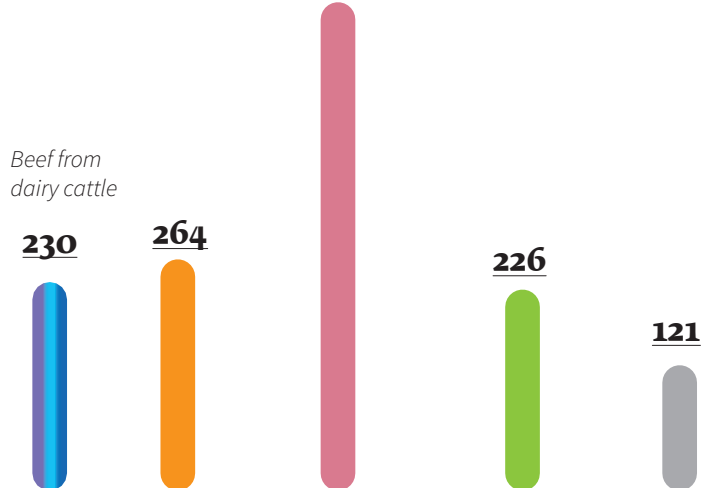
2050
Serikali Saidia



Cow milk production
(1 000 tonnes)



Beef production
(1 000 tonnes)

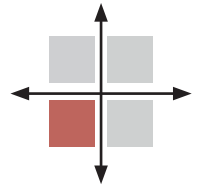


Challenges

The major challenge in this scenario is due to the large number of animals with little availability of public and private resources for their sustainable management. In particular, the government is ill-resourced to fully implement disease control programs and hence the risk of emergence and spread of animal diseases, including zoonoses and emerging



infectious diseases, is high. However, due to donors' trust in the good governance, foreign aid is likely to be available in case of an environmental or public health crisis.

Cattle in Matatu Kingdom



CONSUMPTION

In Matatu Kingdom, the socioeconomic situation of the country is deplorable and the per capita consumption of beef and milk is lower than today. In aggregate, however, because of a larger population, the total consumption of livestock products is higher.

Per capita consumption <i>per year</i>		Today	2050
 beef (kg)		11.3	10 ↓
 milk (lit)		121	118 ↓

PRODUCTION



Production of beef and milk has increased with respect to today, by 57 and 52 percent respectively. This increase notwithstanding, the country production is unable to satisfy the national demand and Kenya is a net importer of both beef and milk.

AND PRODUCTION SYSTEMS

The cattle population has increased by 50 percent with respect to today. Semi-intensive and extensive production systems dominate, accounting for over 80 percent of the total cattle population. Semi-intensive producers, however, keep smaller herds than today. Extensive pastoralism has declined because of the reduced availability of communal grazing land. There are few intensive dairy farms and beef ranches, which are controlled by the few investors with good political connections.

PRODUCTIVITY

Productivity is very low because of lack of both government investment and private finance. With respect to today, major productivity parameters for beef and milk, such as carcass weight and milk yield, have declined.

CATTLE POPULATION

Livelihoods



Cattle production is largely subsistence-oriented and, although more households are engaged in the sector, their **income from beef and milk is limited**. As the value chains are hardly developed, there are **not many off-farm jobs** along the value chain. Availability of beef, milk and dairy products in the market is limited, with high level of **food insecurity and undernourishment**.

Public health



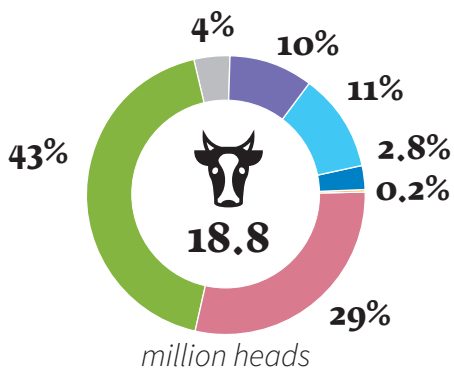
Veterinary services are not readily accessible and, when available, they are very expensive. Lack of finance prevents farms to adopt good biosecurity practices. Several **animal diseases are endemic** and the **risk of emergence and spread of zoonotic diseases**, including emerging infectious diseases, **is high**. Farmers have incentives to make **ample use of antibiotics** for disease prevention, though these are not always readily available in the market.

Environment

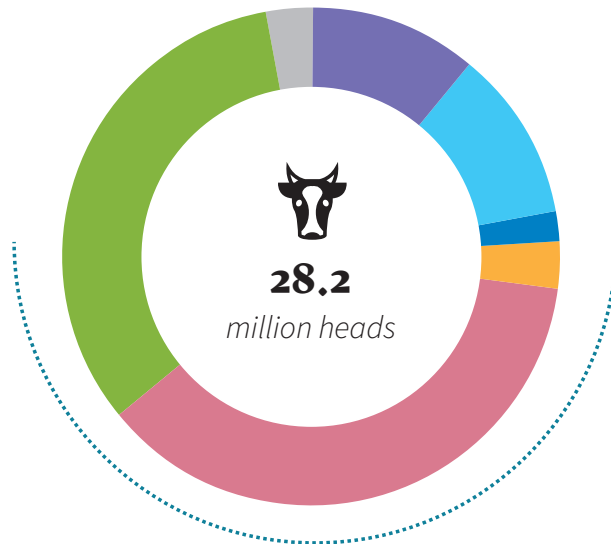


The overall impact of the cattle sector on the environment is much higher than in the past due to the lack of good rules and regulations and limited farmers' investments. In particular, **pasture lands are over-grazed and there is high biodiversity loss**. As animals are largely raised in extensive and semi-intensive production systems and are not much productive, **emissions of greenhouse gases from cattle are high**.

2015



2050
Matatu Kingdom



11%

11%

2%

3%

37%

33%

3%



Cow milk production

(1 000 tonnes)

4 349



3 075



123



Beef production

(1 000 tonnes)

Beef from dairy cattle

183



111



522



209



71



Challenges

Major challenges in *Matatu Kingdom* include the massive increase in human population and the expansion of impoverished semi-intensive livestock farms; increased risks of (re)-emerging zoonotic diseases in the face of extremely weak public animal health services; and degradation of natural resources. Moreover, the expansion of the informal

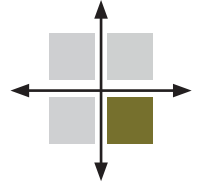
sector makes disease surveillance and control difficult to implement. The low consumption of animal source foods increases food insecurity and widespread malnutrition reduces the capacity of the population to deal with shocks.

Kenya in 2050: poultry scenarios

The alternative futures of Kenya will shape the development of its poultry sector*. Different futures will result in different poultry production systems and value chains and diverse impacts on livelihoods, the environment and public health.

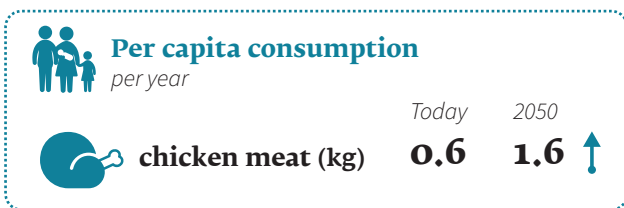
* Poultry in Kenya is largely synonymous with chicken. The poultry scenarios, therefore, refer to the future of the chicken sector.

Poultry in Cartel Land



CONSUMPTION

The total demand of chicken meat has increased with respect to today driven by population growth and the increased income of the elites. However, because of the unequal income distribution, many households continue consuming a small amount of poultry products. The size of the fast food market has even declined with respect to today due to a shrinking middle class and a widening low-income class.



PRODUCTION

Trade =

Chicken meat production has increased since 2016 to reach 170 000 tonnes in 2050 and the country is largely self-sufficient. However, there's no any significant export of poultry products because of low quality and sanitary standards.

POULTRY POPULATION AND PRODUCTION SYSTEMS

The chicken population has grown by over 350 percent with respect to today, reaching about 178 million birds. About 50 percent of all birds are raised in capital intensive poultry farms. Semi intensive (20 percent) and extensive (30 percent) systems are inefficient because of the limited availability of public services, including veterinary services. However, in urban and peri-urban areas, where most population lives, some small-scale and middle-scale farmers have been able to set up efficient poultry enterprises.

PRODUCTIVITY

Productivity is low. In large intensive farms – with genetic improved birds, automation and enhanced biosecurity measures – productivity is partially compromised because of limited access to quality inputs and poor regulations. In semi-intensive and extensive production systems, farmers do not have access to government and private services, which constraints productivity. Poultry meat is marketed through a mix of formal and informal channels.

Livelihoods



There is **shift in employment from extensive to intensive production systems**, with additional jobs created along the value chain. However, **wages are low and working conditions are poor** because of ineffective rules and regulations. At the same time, the inability of the government to provide services to smallholder farmers in extensive systems has resulted in **reduced livelihoods**.

Public health



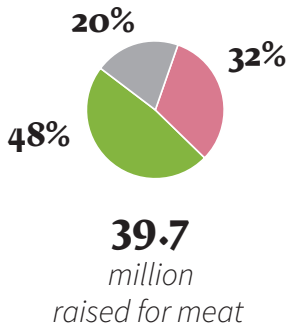
The huge increase in chicken population in intensive and semi intensive systems results in frequent interaction between birds and humans. Because of a weak governance system, the **risk of outbreak and spread of poultry diseases, including zoonoses**, is higher than in the past. This provides incentives to farmers to make ample **use of antibiotics**, contributing to AMR in humans. Informal chicken markets and slaughter facilities have **poor sanitary standards** multiplying the risk of zoonotic and **food-borne diseases**.

Environment

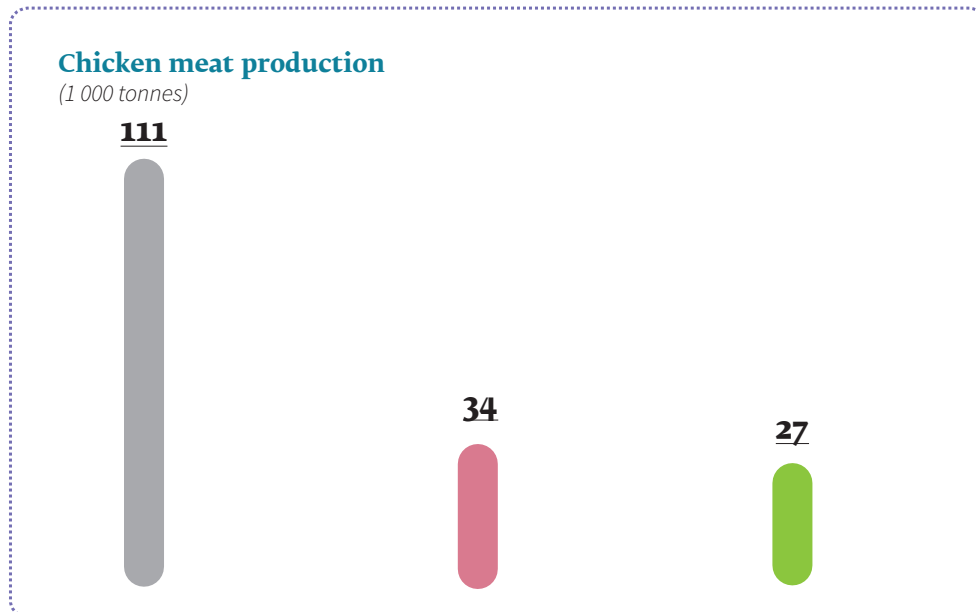
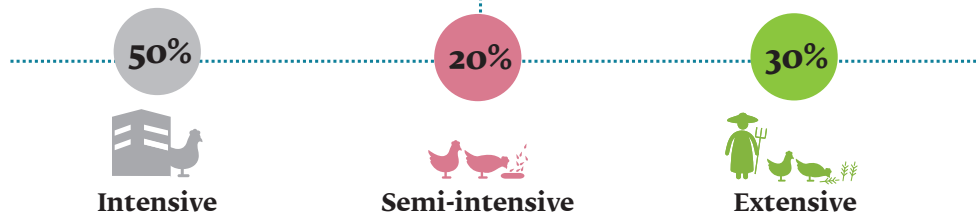
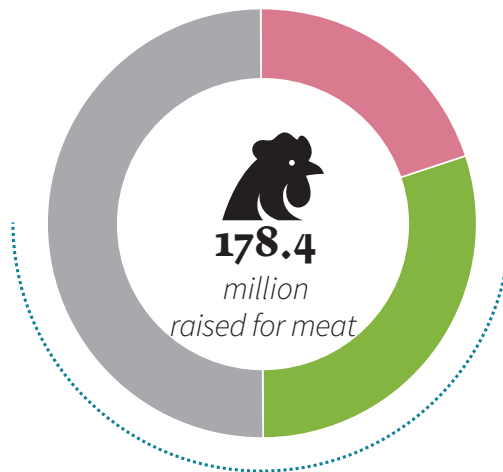


Concentration of poultry in intensive and semi-intensive systems result in **higher soil and water pollution** because of inappropriate waste management, as rules and regulations are weak and loosely enforced. In addition, there is an **increase of greenhouse gas emissions from poultry** due to the higher demand for commercial feed.

2015



2050
Cartel Land

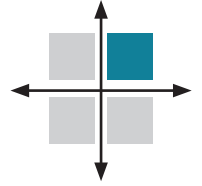


Challenges

The major challenges this scenario pose are the high risk of zoonotic diseases, including emerging and re-emerging infectious diseases, increased use of antibiotics in poultry farming, and hence of AMR in humans, and high level of environmental pollution. These risks are higher in urban and peri-urban areas, where a number of semi-intensive poultry

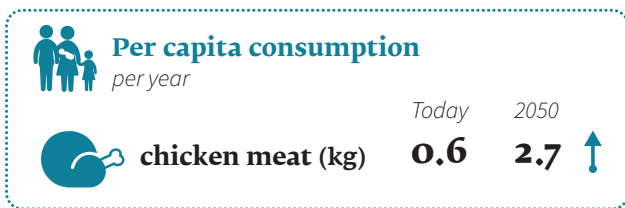
farmers are located. They are largely associated with the intensification of the poultry sector in a weak institutional and regulatory framework.

Poultry in Eden



CONSUMPTION

In the Eden scenario, per capita consumption of chicken meat has tremendously risen with respect to today. There is a large and well-off population that can regularly afford consuming livestock products, including poultry meat and eggs. Poultry products are safe and of good quality and available in a multitude of retail forms.



PRODUCTION



Kenya is not only self-sufficient but also a net exporter of high-quality poultry meat to the international market. Poultry production reaches 279 000 tonnes and exports of poultry meat are about 70 000 tonnes per year.

POULTRY POPULATION AND PRODUCTION SYSTEMS

The chicken population has increased by over 450 percent with respect to today to reach 218 million birds. Most of the increase has occurred in the intensive production system, which accounts for 70 percent of the total chicken population and 77 percent of all chicken meat production. The semi-intensive production system accounts for 20 percent of the national flock and 18 percent of total production. The extensive system has become marginal.

PRODUCTIVITY

There has been major increases in productivity with respect to today. Exotic breeds, high-quality feed, effective biosafety and biosecurity measures as well the adoption of good technology and good practices have all contributed to improved productivity. The marketing of chicken products is efficient.

Livelihoods



The share of population keeping chicken has decreased as many farmers have exited the poultry sector. However, **intensive poultry systems** are generating **high income for producers** as well as a number of **well paid jobs along the value chain**. Poultry farmers in semi-intensive systems keep highly productive birds that significantly support their livelihoods.

Public health

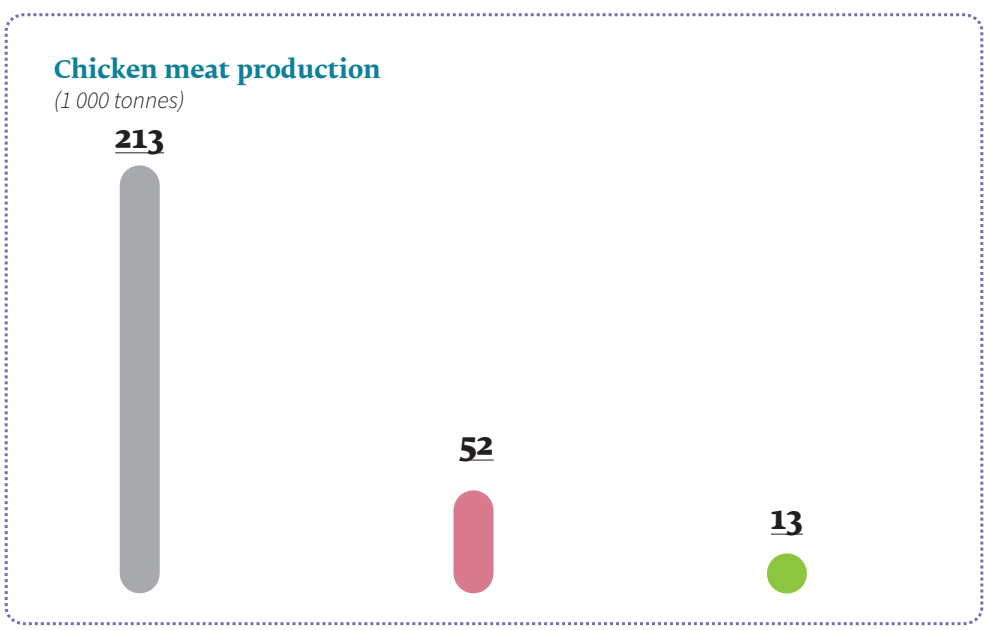
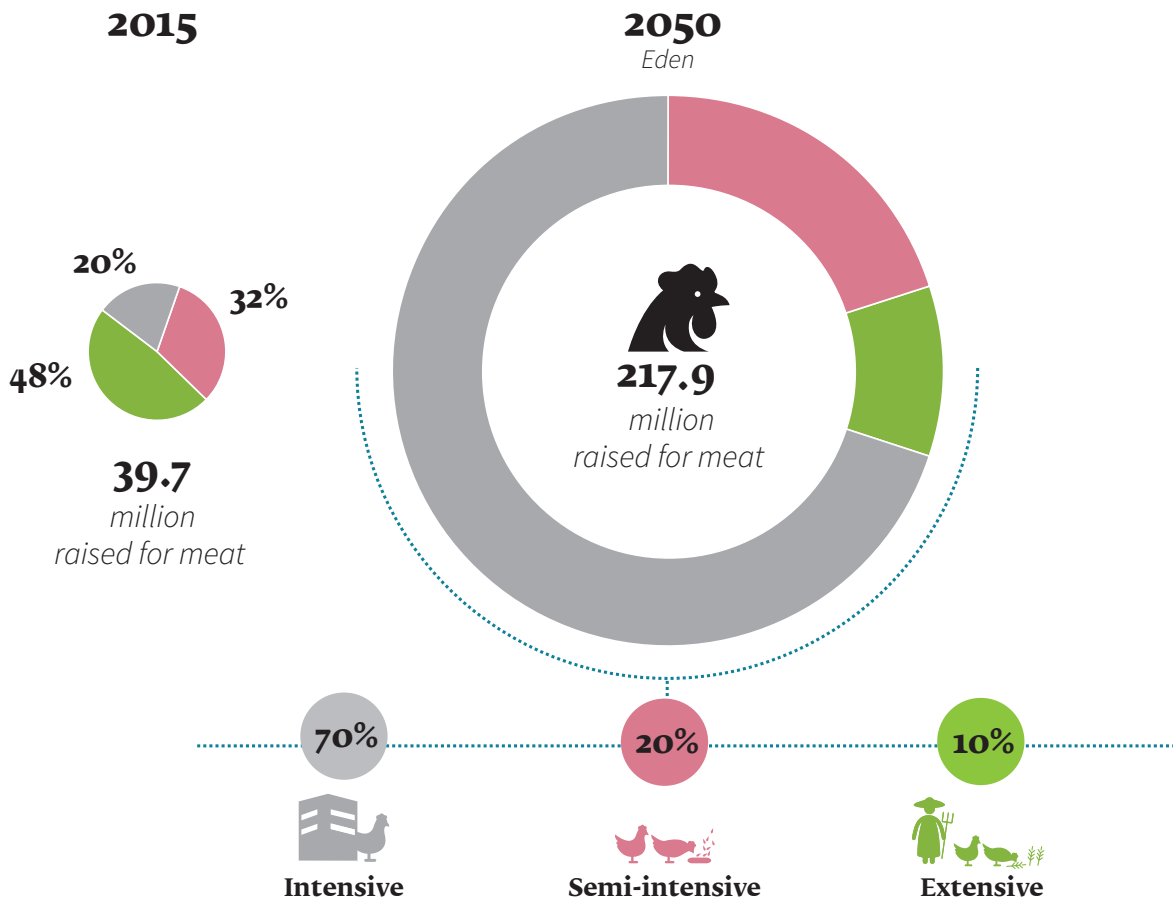


The country does have a strong capacity to control public health threats thanks to an efficient system of animal health services and regulations. The **prevalence of poultry diseases**, including zoonoses, is **lower than today**, and **outbreaks of zoonoses are rare**. There is a **judicious use of antimicrobials** in poultry farming.

Environment



Effective rules and regulations ensure poultry production systems have a limited negative impact on the environment. However, the tremendous increase in the chicken population in **intensive systems** poses environmental risks. On the one hand **inappropriate waste management** might result in **soil and water pollution** and, on the other, the increased number of birds result in **increased greenhouse gas emissions** largely associated with feed production.

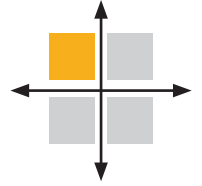


Challenges

A rapid shift from extensive to semi-intensive to intensive production systems generates a series of challenges for society. First, a number of small scale poultry producers will be forced to exit the sector and to look for alternative employment opportunities; second, even with an efficient

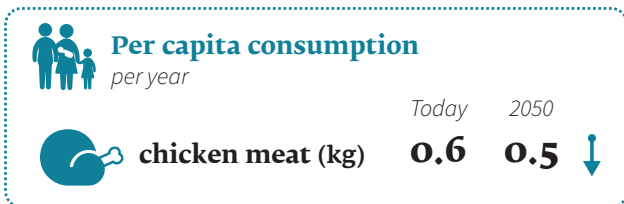
government, intensive production systems pose risks for the environment – potentially polluting soil, water and air – and might make an inappropriate use of antibiotics, thereby contributing to AMR in humans.

Poultry in Serikali Saidia



CONSUMPTION

Per capita consumption of chicken meat has marginally declined (by about 15 percent) with respect to today. This is due to low consumer purchasing power, limited production and high price of chicken meat. However, aggregate consumption has increased driven by population growth.



PRODUCTION

Trade ↓

Production of chicken meat has increased by 40 percent with respect to today, reaching about 50 000 tonnes. At this level of production, given aggregate demand, Kenya is not self-sufficient but a net importer of poultry meat.

POULTRY POPULATION AND PRODUCTION SYSTEMS

The chicken population has doubled vis-à-vis today. The low-input low-output extensive production system dominates, accounting for 60 percent of all chicken and 43 percent of all meat production. The average flock is smaller than today and indigenous breeds dominate. The intensive and semi intensive production systems have declined and represent 15 and 25 percent of the chicken population, respectively.

PRODUCTIVITY

Although there exist robust laws and regulations, lack of finance limits significant investments in breeding, housing, feeding and health: poultry productivity is thus low. For the same reason, value chains are well regulated but not fully functional, with mixed effects on food safety and quality.

Livelihoods



The **number of poultry-keeping households has increased** in all production systems, but the average flock is smaller than today and productivity is low. **Poultry contribution to household income is low. Per capita consumption of poultry meat is low** and not many households consume chicken meat on a regular basis. There are **limited employment opportunities along the poultry value chain.**

Public health



Lack of finance in both the public and private sector results in limited availability of animal health services, and in the adoption of **minimal biosecurity measures** especially **in the extensive and semi-intensive production systems.** There is **high prevalence of endemic poultry diseases** and high **risk of emergence and spread of emerging infectious diseases.** Farmers have incentives to use antibiotics for disease prevention, though these are not necessarily readily available on the market.

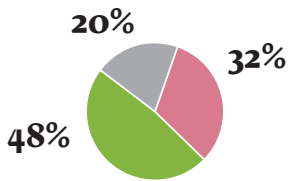
Environment



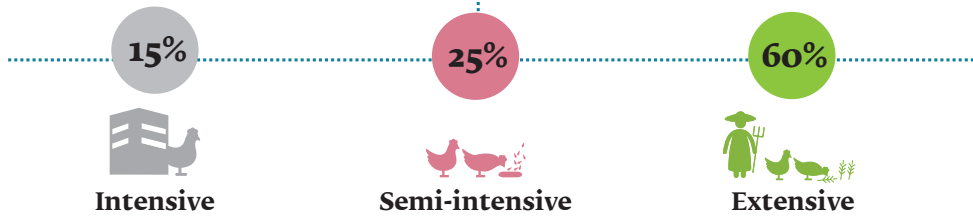
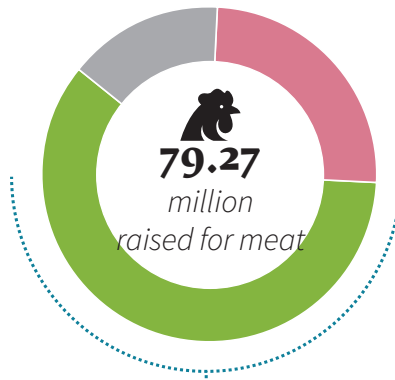
In spite of the existence of good rules and regulations, poultry production systems have **negative impacts on the environment.** Not only farmers have limited finance to adopt good practices but also the government lack resources to monitor compliance with existing rules and regulations.

2015

2050
Serikali Saidia

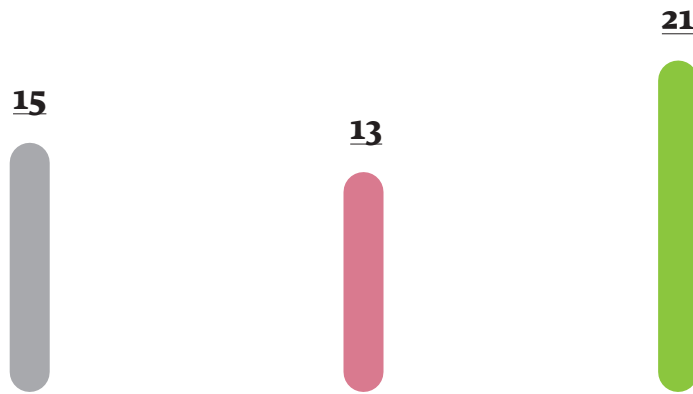


39.7
million
raised for meat



Chicken meat production

(1 000 tonnes)

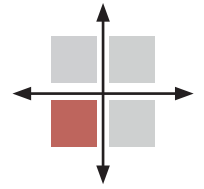


Challenges

The capacity of the private sector to implement and of the government to monitor the adoption of good practices along the poultry value chain is a major challenge in Serikali Saidia. There is thus high risk of emergence and spread of animal diseases, including emerging infectious diseases that might jump to humans. Because of the risk of disease outbreaks,

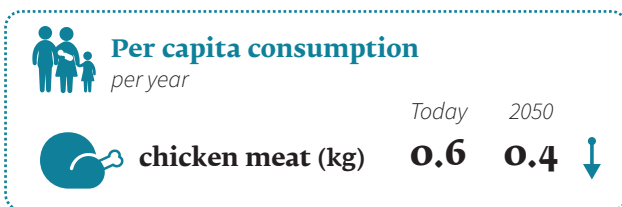
farmers have incentives to use antibiotics for prophylaxis, which might contribute to antimicrobial resistance in humans. On the other hand, in spite of the government good intentions, limited income and food availability contribute to food insecurity and poor health.

Poultry in Matatu Kingdom



CONSUMPTION

In Matatu Kingdom, the poor governance and economic situation of the country translate into a per capita consumption of poultry products lower than today. Because of the weak governance system, food borne diseases are common, limiting the contribution of animal proteins to health and nutrition.



PRODUCTION



Chicken meat production has increased by about 20 percent with respect to 2016, reaching about 43 000 tonnes per year. The national production is unable to fully satisfy the demand for poultry meat, which is in any case limited.

POULTRY POPULATION AND PRODUCTION SYSTEMS

The chicken population has nearly doubled with respect to today and has reached 75 million birds. A particularly impoverished semi-intensive poultry production system dominates, accounting for about 60 percent of the birds and over 60 percent of the total production. This system is a sort of an improved free-ranging system where farmers confine their birds at night to prevent petty theft. Both the extensive system (30 percent of all birds) and the intensive system (10 percent) play a smaller role than today.

PRODUCTIVITY

Because of lack of finance, both in the public and private sector, productivity has greatly declined with respect to today and the poultry sector is on the verge of collapse. Informal marketing and slaughtering are common practices resulting in substantial food losses and waste, and compromising food safety.

Livelihoods



The number of poultry keeping households has marginally increased in intensive and semi-intensive systems and declined in extensive systems. **Poultry's contribution to household income has declined** due to small flocks with low productivity. **Per capita consumption** of poultry meat has also **declined**. There are limited **employment opportunities along the value chain**.

Public health



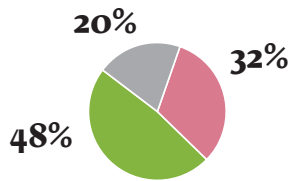
High densities of birds and humans, **minimal biosecurity measures** at farm level and along the value chain **increase the risk of emergence and spread of zoonotic diseases**. Farmers have incentives to **use antibiotics for prophylaxis**, which are often of poor quality or counterfeited. There is **little food safety**.

Environment



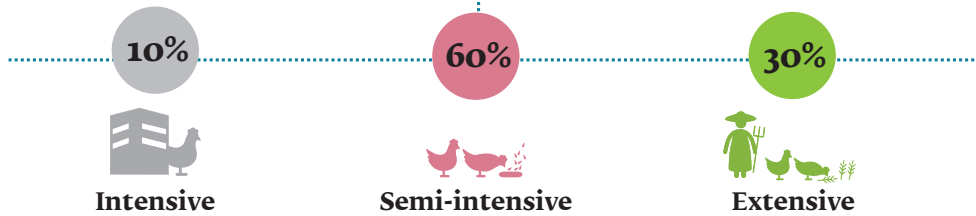
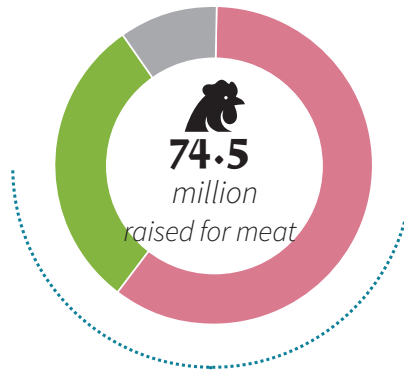
Farmers are unable to properly manage poultry waste and the government has little capacity to enforce any laws and regulations. There is thus significant **point source pollution of soil and water** in semi-intensive and intensive poultry production systems. At the same time, total greenhouse gas emissions from poultry systems have remained constant over time, as intensive and semi-intensive systems are limited in size.

2015



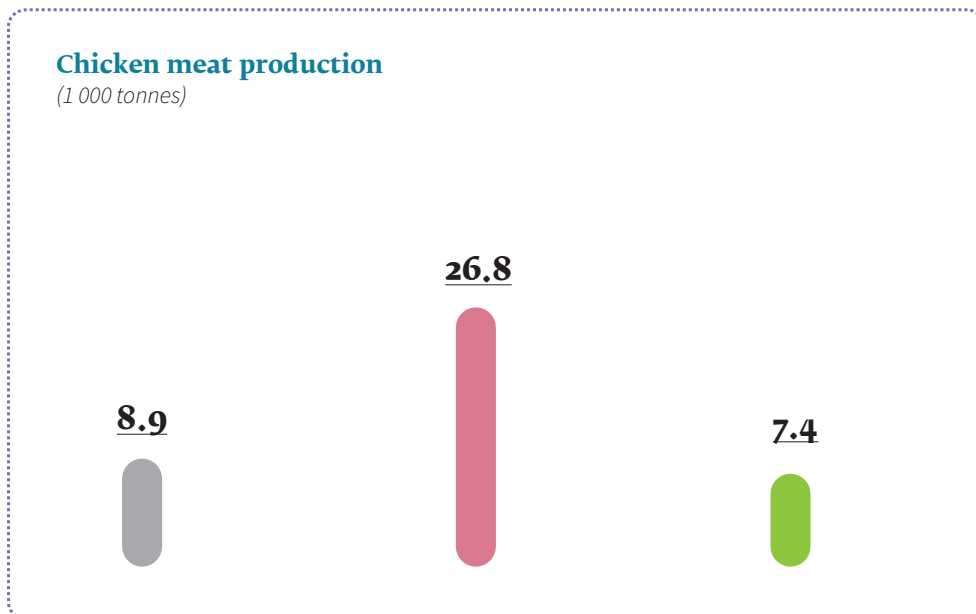
39.7 million raised for meat

2050
Matatu Kingdom



Chicken meat production

(1 000 tonnes)



Challenges

There are two major challenges in Matatu Kingdom. The first is controlling an outbreak of a highly infectious zoonotic diseases that, in a weak economic and institutional system, may easily become an epidemic and, in the worst case scenario, turn into a pandemic. The risk of food borne diseases is also high, because of malfunctioning value chains.

The second major challenge relates to livelihoods, with widespread poverty and food insecurity that can exacerbate any negative public health impacts originating in poultry production systems.

Conclusion

Stakeholders should ensure that policies and programmes effectively deal with zoonoses, emerging infectious diseases and natural resource use along the livestock value chains serving urban areas. This is essential for a sustainable livestock in the future.

Opportunities and challenges

The coming growth and transformation of the livestock sector will have major consequences on Kenya's society in the next decades. As part of the future remains unpredictable, it is difficult to anticipate how the livestock sector will eventually affect people's livelihoods, the environment and

public health in 2050. Portraying alternative development pathways for Kenya and its cattle and poultry sectors, by shedding light on the multitude of future opportunities, challenges and threats, assists in strategically designing policies that are more resilient to an uncertain future.

Livelihoods



- In the future, livestock farmers and other actors along the livestock value chains will face expanding business opportunities, because of the growing demand for animal source foods.
- Smallholder farmers will find it increasingly challenging to derive a livelihood from livestock, because of increased competition to access scarce natural resources and inability to meet food safety standards.
- Many smallholders will exit the livestock sector and, in many cases, will move from rural to urban areas in search for employment opportunities.
- If the livestock sector develops sustainably, consumers will be better nourished and food secure because of the increased availability of affordably-priced animal source foods in the market.

Public health



- The future will be characterized by an increased risk of outbreaks of zoonotic diseases, including emerging and re-emerging infectious diseases (EIDs). The growing animal and human populations, in fact, will result in novel interactions between humans, animals and wildlife. This holds particularly true along value chains serving expanding urban and peri-urban areas.
- There will be increased risk of livestock-driven antimicrobial resistance in humans, with the associated negative impact on society. Either because of stiffer competition or because of the increased risk of zoonotic diseases, farmers will be tempted to imprudently use antibiotics not only to treat sick animals but also as growth promoter and/or for prophylaxis.

Environment



- Expansion of the livestock herd will result in growing demand for and pressure on land for pastures and feed, and in an increased demand for water at farm level and in industries along the value chain.
- Pressure on natural resources will be particularly high in peri-urban areas, where the growing animal and human populations will compete to access scarce natural resources.
- Livestock intensification and concentration might result in increased risk of point source pollution of soil and water and in biodiversity losses.
- A larger herd size, if unproductive, will result in increased greenhouse gas emissions from livestock, exacerbating the negative impacts of livestock on climate change.

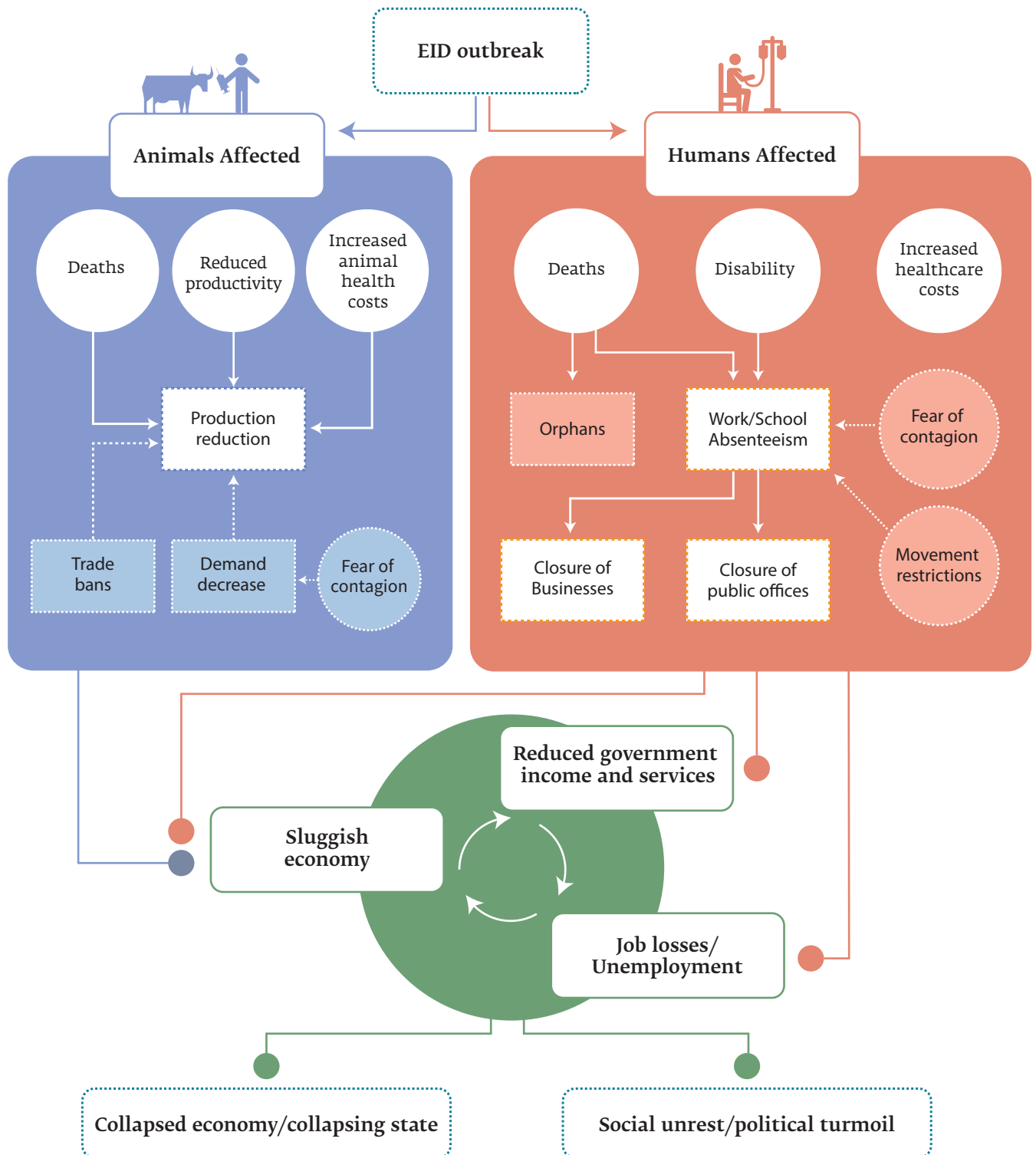
The magnitude of the future livestock-related livelihoods, environment and public health challenges will vary in the different 2050 scenarios. However, two elements deserve closer scrutiny,

including the **increased risk of outbreaks of emerging and re-emerging infectious diseases** and the **ongoing rapid urbanization**.

EMERGING AND RE-EMERGING INFECTIOUS DISEASES (EIDs)

An outbreak of an EID originating in wild and/or domestic animals and that jumps to humans might not only significantly impact the livestock sub-sector, but also result in a high human death toll with broader disruptive impact on society, such as through reduced people’s movement, work absenteeism, closure of businesses and schools,

children losing parents, trade bans, reduction in foreign direct investments, etc. Eventually, EIDs might trigger social unrest and destabilize governments by eroding public trust and confidence and, when spreading rapidly across countries, regions and continents, they can also result in worldwide pandemics.

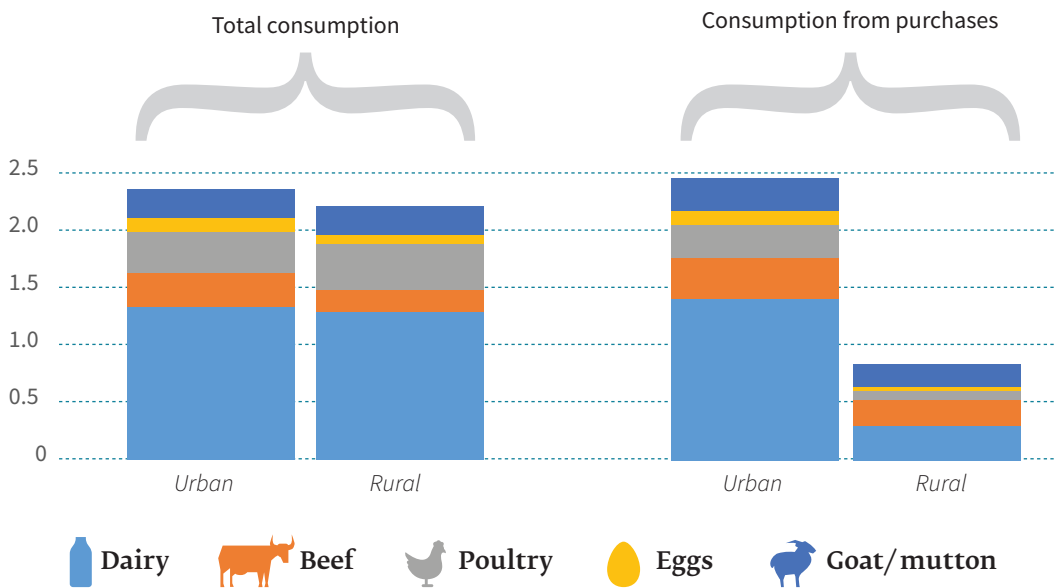


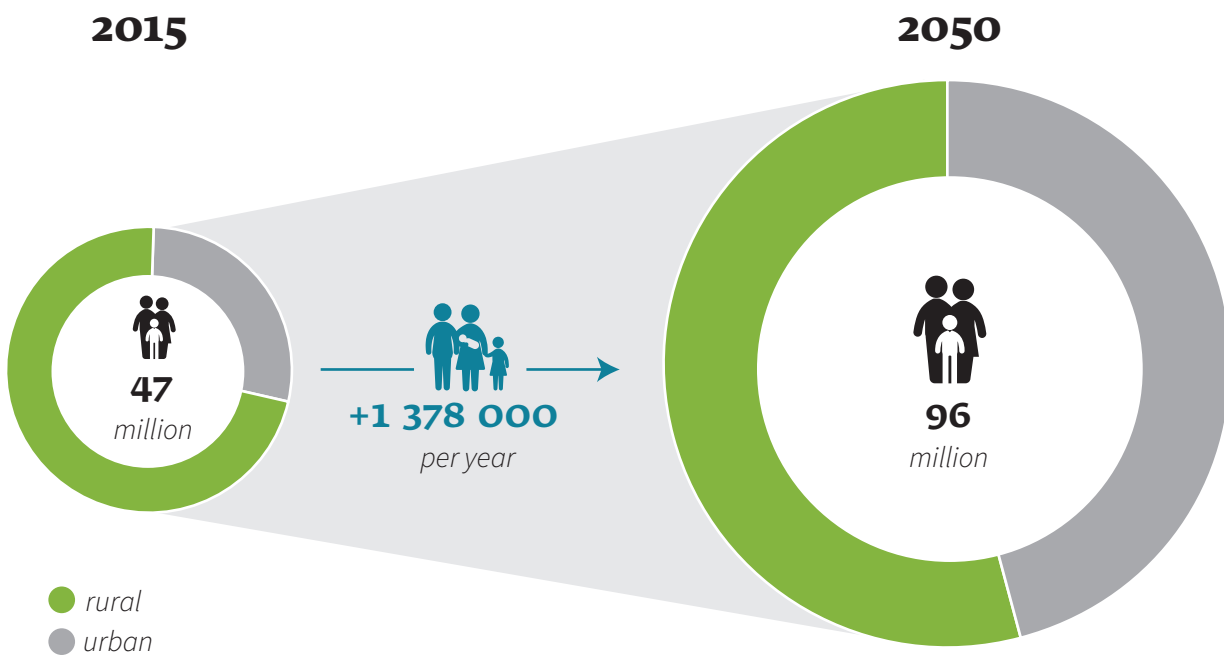
URBANIZATION

The coming transformation of livestock will largely aim at satisfying the demand for animal source foods of a growing urban population. Between 2015 and 2050, 66 percent of the anticipated increase in the Kenya population will occur in urban areas vis-à-vis 34 percent in rural areas, and the average per capita consumption of animal source foods is higher in urban than rural areas. Livestock farms and value chains in peri-urban and urban areas are thus expected to transform more rapidly

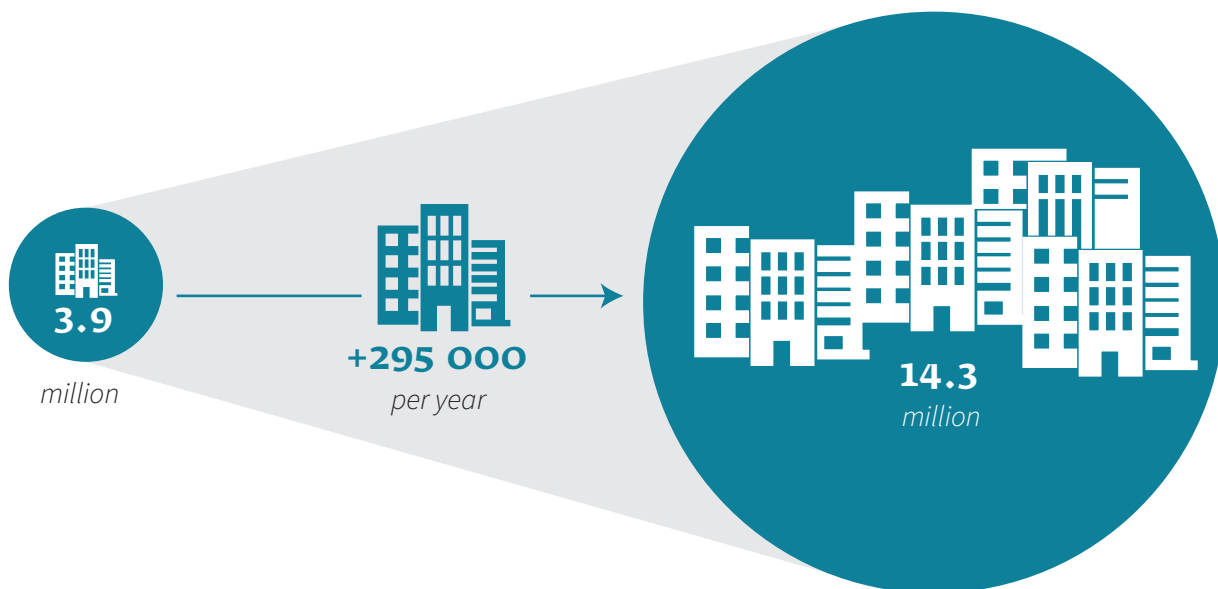
and hastily than anywhere else in the country, exacerbating exponentially the risk of negative impacts of livestock farming on the environment and public health in densely populated areas.

Per capita weekly consumption (kg) of livestock products by rural and urban area





2015-2050 population projections by rural and urban area



Nairobi population, 2010 – 2050

Towards resilient policies

Multiple plausible futures await Kenya and its cattle and poultry sectors, each of them having highly different impacts on society. The future will eventually depend on the interactions between known megatrends – from population growth to technology development – and unpredictable factors of which governance and the economic system are extremely critical. This report presented four internally consistent views of what Kenya and its livestock sector might turn out to be in 2050. None of the alternative scenarios will most likely materialise and the future will comprise elements from all of them. They do, however, point to numerous common social, public health and environmental challenges.

The scenarios convincingly show the escalation of many known challenges such as fierce competition for natural resources, particularly land and water, structural changes in the job market and the increased risks of emergence and spread of zoonotic diseases and livestock-driven antimicrobial resistance. These risks will be better managed in some scenarios than in others; however, unpredictable outbreaks of an emerging or re-emerging infectious disease(s) will not only drastically affect the livestock sector, or one of its subsectors, but also have such negative spillover effects on society to jeopardize years of growth and development.

The scenarios point to an issue that is often overlooked in livestock sector policies and strategies: the increased relevance of urban, peri-urban middle-scale commercial livestock operations. These entities operate closely to fast expanding and densely populated urban areas, and they will become more important as the urban population grows and is better off, increasingly demanding larger quantities of livestock products, especially beef, dairy and poultry products. It is critical that these hotspots of human-animal interaction enter the policy agenda prominently, as any disease outbreak would escalate rapidly in such densely populated areas. In addition, there will also be novel and more frequent wildlife-livestock-natural resource interaction in arid and semi-arid

Urban, peri-urban middle scale commercial livestock operations... will become increasingly important in the future



lands (ASALs) possibly generating unpredictable challenges and threats for sustainable development. Current livestock-related policies, therefore, cannot afford neglecting the ASALs.

Stakeholders should adopt a One Health approach to appreciate the relevance and efficiency of current policies dealing with anticipated challenges in terms of zoonotic diseases, emerging infectious diseases, antimicrobial use and natural resource depletion for farms in urban and peri-urban areas as well as for the ASALs. Making the current policy framework resilient to these anticipated changes is a pre-condition to ensure an expansion of the Kenyan cattle and poultry sectors that provide affordable and healthy milk meat and eggs to the urban population, support the livelihoods in the ASALs, while having minimal negative impact on the environment and public health.

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Data sources

Data and statistics in this report originate from a multitude of sources, including the Kenya National Bureau of Statistics; the Ministry of Agriculture, Livestock, Fisheries and Irrigation; the Ministry of Environment and Forestry; and the Ministry of Health. When national statistics were not readily available, data was sourced from FAOSTAT, the World Development Indicators dataset of the World Bank, the Health Statistics and Information Systems of the World Health Organization, and the Institute for Health Metrics and Evaluation.

An expert elicitation protocol was designed and implemented to gather data on variables for which information was not available from any source, such as the incidence of selected zoonoses among the human population.

The FAO's Global Perspective Studies, the United Nations Population Divisions and Hoornweg and Pope* (2016) provided long-term projections for social, economic and livestock-related variables. When data portraying the current situation of country and its livestock sector differed markedly by source, stakeholders jointly agreed on the statistics to utilize in the report.

Stakeholders, however, never considered conflicting statistics on the current situation a critical issue, as the focus of the scenario exercise was on portraying long-term, alternative development pathways, around which they reached broad consensus.

*Hoornweg D. and K. Pope. 2016. *Population predictions for the world's largest cities in the 21st century*. *Environment & Urbanization*, 29(1): 195-216.

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