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2050



The future of livestock in

NIGERIA

Opportunities and challenges
in the face of uncertainty



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AFRICA
SUSTAINABLE
LIVESTOCK
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Preface


Nigerian decision makers have to grapple 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 Nigerian society, in ways that are often unpredictable.

Take the livestock sector: its development is fundamental to support the transformation of the country in a sustainable way socially, environmentally and from a public health perspective. In 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 support a sustainable growth of livestock into 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 humbly admit that we can neither easily predict nor precisely plan the long-term future of livestock in Nigeria.

The Government of Nigeria, 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. They discussed past and projected trends of societal and livestock dynamics, current policy priorities, technology uptake and institutional changes and other. Stakeholders did not predict or forecast with accuracy the future of the cattle and poultry sectors in Nigeria, but generated evidence on alternative, yet all plausible futures.

The report “The future of livestock in Nigeria: Opportunities and challenges in the face of uncertainty” looks out to 2050 and presents alternative scenarios, or plausible portrays, of the future of the cattle and poultry sectors in Nigeria. It provides invaluable insights to decision-makers on actions to take today to make the Nigerian 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 in dynamic and rapidly changing societies, such as that of Nigeria.

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



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Executive summary

Nigeria's population will grow swiftly and transform extensively in the next three decades. Between 2015 and 2050 the population will double to almost 400 million and the number people living in urban areas will triple from the current 94 million to 280 million. GDP per capita will almost triple up to around 7 137 USD PPP. As a result of these changes, the demand for livestock products will rise exponentially: projections suggest that poultry meat, beef and milk consumption will grow by 253, 117 and 577 percent, respectively (FAO GPS, 2018).

The livestock industry will radically transform to respond to the increasing demand. The Agricultural Promotion Policy and the National Livestock Transformation Plan are guiding the transformation of the livestock sector up to 2020 and 2027, respectively. In the longer term, however, this transformation is uncertain: not only will it be shaped by how Nigeria's overall economy and governance will change, but will also have large societal impact, beyond the livestock sector per se. Livestock, in fact, support the livelihoods of many Nigerian and have both positive and negative impact on the environment and public health.

To address the uncertainty the future will bring about, the Federal Ministry of Agriculture and Rural Development, the Federal Ministry of Health, the Federal Ministry of Environment, the FAO, the private sector, the civil society and other stakeholders gathered to articulate four long-term scenarios for the livestock sector in Nigeria in 2050.

These scenarios are plausible stories about the future of the livestock sector and its possible impact on society including on public health, environment and livelihoods. There are two scenarios where livestock production increases tremendously, one with moderate and one with high level of intensification. In two other scenarios, with limited resources and policy support, livestock production levels remain low, with a significant presence of the extensive production system. Even though very different in many outcomes, the scenarios point to some common opportunities and challenges associated with the transformation of the livestock sector.

Meeting the increased demand for animal source foods will involve rapid growth in herd size and productivity, often associated with intensification. In certain scenarios, the poultry population may increase up to 900 million birds from 180 million today, while the cattle population may double up to 37 million heads. The structure of the sector might also change tremendously: for example, the share of cattle in intensive systems changes from 1 percent today up to 33 percent in some scenarios, which involves significant increases in average productivity. The growing demand for animal food and the transformation of the livestock sector represent major developmental opportunities for the country as livestock farmers, input suppliers, animal health service providers, processors, wholesalers, retailers and other stakeholders could significantly expand their business. However, these opportunities come coupled with some major challenges that, if not properly addressed, risk jeopardising the development of the livestock sector and have broader negative impacts on public health, the environment and livelihoods.

DEVELOPMENTAL OPPORTUNITIES

The huge rise of demand for animal source foods presents great business opportunities for farmers and other value chain actors and can support broader societal development through employment generation and poverty reduction, food security and nutritional benefits.

NEGATIVE TRADE BALANCE

The impressive population growth and income increase that the country is foreseen to experience will result in such high demand for animal food that even with significant improvement of livestock productivity, some level of import may be needed for certain livestock commodities in the future.

EMERGING AND RE-EMERGING INFECTIOUS DISEASES

Due to growth in animal and human population, urbanization and more movement of people, there will be increased risk of emergence and spread of zoonotic diseases. There will also be higher interaction between wildlife and livestock, increasing the risk of emerging infectious diseases (EIDs). Even in the best-case scenarios, stakeholders concluded that EID outbreaks have dreadful consequences within and outside the livestock sector. Besides the direct impacts, such as animal loss, production loss, and increased human healthcare cost, EID outbreaks can result in trade bans, closure of businesses, decrease in tourism, political instability and social unrest.

ANTI-MICROBIAL RESISTANCE (AMR)

Even in the best scenarios, the presence of AMR has devastating consequences. Already today, some diseases like Bovine Tuberculosis (TB) are difficult to treat in animals and human because of AMR, and prevalence is high: an expert elicitation protocol carried out in 2017 suggests a prevalence rate of Bovine TB of 10.7 percent in cattle keepers. The Nigerian government established the Antimicrobial Action Plan, and the severity of this issue in the future scenarios suggest that this plan should be implemented as soon as possible.

NATURAL RESOURCE DEPLETION AND CLIMATE CHANGE

In all scenarios, the competition for land, feed and water is fierce. In the favorable scenarios, increased consumption of animal source foods and high level of production pose an immense environmental challenge. In less appealing scenarios, bad management and lack of regulations result in high greenhouse gas emission levels, land degradation, water and soil pollution and increased biodiversity loss. These trends will be exacerbated by the consequences of climate change, such as reduced precipitation, increased temperature, deforestation and flooding.

LIVELIHOODS AND EMPLOYMENT

As livestock production systems become more efficient and concentrated, there are less direct livelihoods opportunities from livestock. Some smallholders might decide or be forced to exit the sector. Existence of alternative employment opportunities is essential for a smooth transition. The employment challenges are likely to be higher in good scenarios due to the bigger shift towards intensive production systems.

URBANIZATION AND EMERGENCE OF MIDDLE-SCALE PRODUCERS

A high level of urbanization occurs in all scenarios, leading to the emergence and concentration of middle-scale commercial farms in and around urban centers to satisfy the growing demand for animal source foods. The uncontrolled growth of medium-scale farmers around urban areas is anticipated to pose major environmental and public health threats because high density of and contacts between humans and animals are major hot spots for outbreaks and spread of emerging infectious diseases. In addition, raising animals and processing livestock products in 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 Nigeria may prioritize certain investments within the existing policy framework. 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. Of course, reliable information is the foundation of design and implementation of effective policies and planning for livestock development. Currently, available livestock data is scarce: the last national livestock census for example was carried out in 1991.

Introduction

The Nigerian society and economy will grow swiftly and transform extensively in the next three decades: the country's population is anticipated to reach almost 400 million in 2050, vis-à-vis 190 million today, while the size of the economy is expected to grow more than six-fold. Such a pace of change is unparalleled in the country's history.

Along this transformative process, the demand for animal source foods will exponentially increase and livestock will likely 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 Nigeria 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 Federal Ministry of Agriculture and Rural Development, the Federal Ministry of Health and the Federal Ministry of Environment 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 Nigeria, and of its poultry and cattle sectors in particular. The consensus stakeholders reached is presented here.

This report portrays Nigeria's possible livestock futures: it sheds light on 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 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.

Nigeria today: Africa's largest economy

With a population of around 190 million people, Nigeria is the most populous nation in Africa. It is a lower-middle income country with a per capita income of about USD 2 000 per year. Diversifying the economy by decreasing the oil sector's dominance is a key development objective for a sustainable future of the country.

URBANIZATION

49.5%
of the population
dwells in urban areas

AGRICULTURE

Dominated by
smallholders,
it contributes about

21%
to GDP
36%
to employment
60%
to non-fuel
export value

CROPS

The country's
agricultural sector is
heterogeneous.
Main crops are
cassava,
yams,
maize and rice

LIVESTOCK

Smallholders keep
cattle,
small
ruminants,
equine and
poultry

GDP per capita

1 968 USD
or **5 875 USD**
PPP per year

POPULATION

190 million



Livelihoods



53%
of the population lives
under the poverty line
Most of the **poor**
live in rural areas



More than
4 out of
10 children
under age 5
are **stunted**

Public health



Life expectancy is
54.7 (male) and
55.7 (female) years



Major causes
of deaths are
infectious
diseases:
lower respiratory infectious
diseases, HIV/AIDS, malaria
and diarrheal diseases.



Environment



126 animals and
205 plants species
are **threatened**
with **extinction**



The forest area
decreased by **62%**,
between 1990 and 2015



64% of land
is at risk of
desertification

Livestock today

Agriculture is a key sector to invest in for Nigeria to diversify the economy away from the oil sector. The sector used to be the mainstay of the economy before the discovery of oil, and still is an important source of livelihoods for a large part of the population. The livestock sector is an integral part of agriculture and vital to the socio-economic development of the country, though its productivity currently is very low. It contributes around 1.7 percent to the national GDP and around 9 percent to the agriculture value added.

Recent estimates indicate that Nigeria's national herd comprises 18.4 million cattle, 43.4 million sheep, 76 million goats and 180 million poultry¹ (FMARD, 2017). The majority of animals are raised in extensive production systems comprising smallholders and nomadic herders. Large commercial holdings are currently rare but expanding, especially in the poultry subsector. Total production of milk, meat and eggs amounts to 0.5 billion litres, 1.4 and 0.6 million tonnes per year, respectively.

Importation of food amounts up to 3-5 billion USD per year, out of which milk accounts for 1.3 billion USD (NLTP, 2019). Including net trade, the per capita food supply of animal source foods is 8 litres of milk, 9 kg of meat and 3.5 kg or 55 eggs per year. Consumption levels of milk and meat are lower than the continental averages that are 44 litres and 19 kg, respectively (FAOSTAT, 2019). Statistics on total production and consumption levels, depending on the source, vary significantly and, in addition, do not account for the value of organic fertilizers and that of draft power provided by animals.

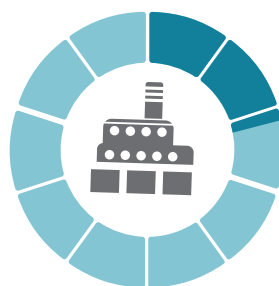
The next sections focus on the dairy cattle and poultry subsectors: the dairy sector has the largest demand-supply gap; the poultry sector regularly face the challenge of outbreaks of highly pathogenic avian influenza. Both are top policy priorities.

13 million households own livestock



42%
of population

Agriculture value added



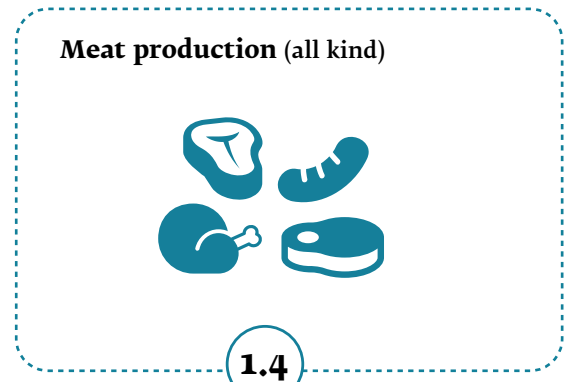
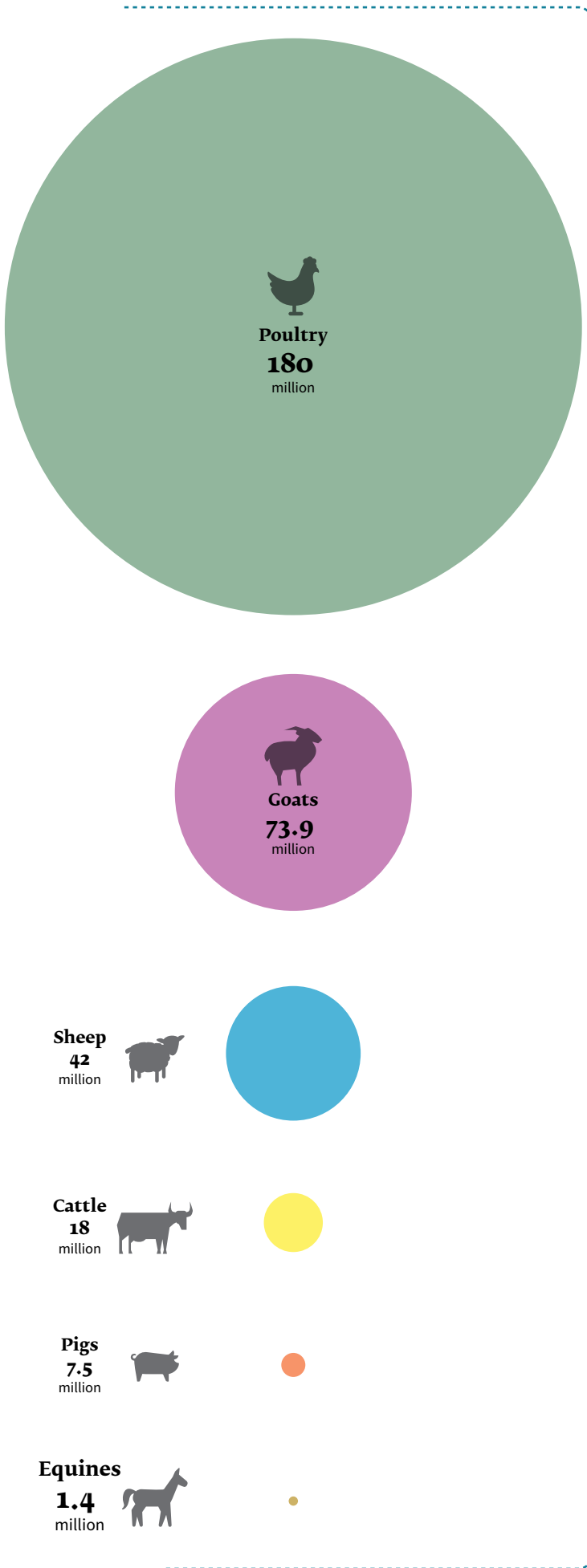
21%
of gross domestic product

Livestock value added



9%
of agricultural gross domestic product

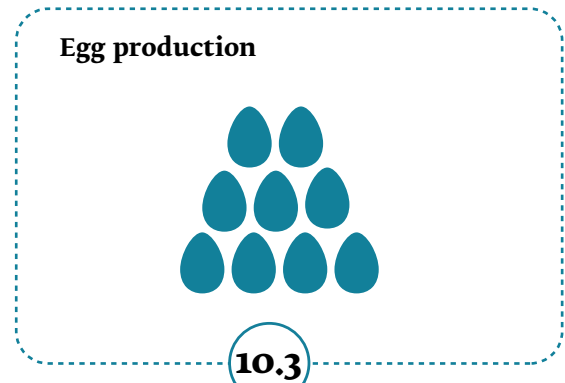
¹ In this document, poultry refers to chicken that represent the largest part of the sector. Only one subsector has been chosen due to data availability.



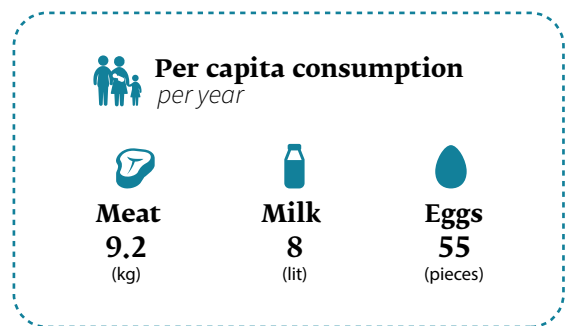
million tonnes



billion litres



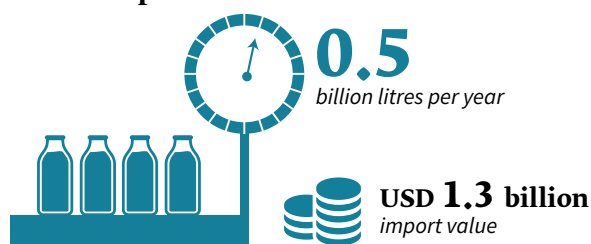
billion pieces
(650 thousand tonnes)



Cattle today

There are about 18.4 million heads of cattle that are predominantly managed in large herds by semi-sedentary and transhumant pastoralists. The aggregate demand for milk and dairy products is estimated at 1.3 million tonnes out of which only 0.5 million tonnes are covered by domestic production. About 1.3 billion USD is spent annually on importation.

Cow milk production



Most cattle are dual-purpose indigenous breeds: they produce the largest part of the milk in the country. Dairy production is mainly subsistence oriented and milk production per cow per annum is about 213 litres (Makun, 2018).

There are three cattle production systems in Nigeria: the extensive or pastoral system, the semi-intensive or agro-pastoral system and the intensive or commercial system.

● Pastoral

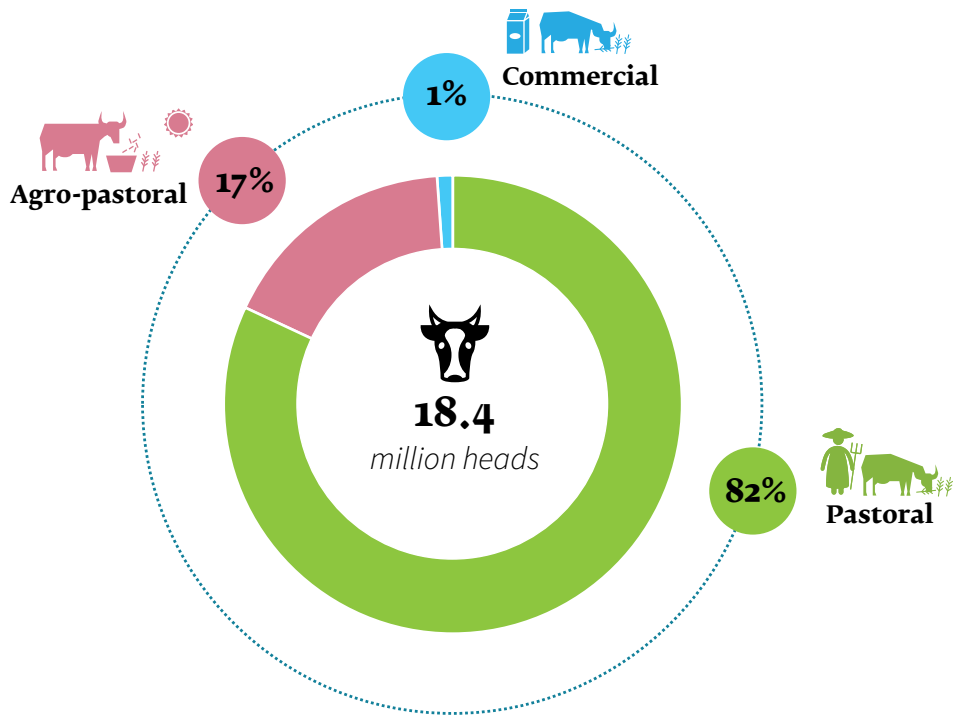
In the pastoral systems, farmers move cattle from place to place in search of pastures and water. Herd size ranges from 100 to 300 heads of indigenous breeds. Production is subsistence oriented and animals are kept on uncultivated pastures and rely on grazing without any feed supplements. Main products include beef, milk, blood, hides, manure and horns. This system is characterised by low milk productivity: about 0.5-1 litre per cow per day over the lactation period. This system is dominant in Northern Nigeria.

● Agro-pastoral

In the agro-pastoral systems farmers are engaged in growing crops and raising livestock. They keep mainly indigenous breeds, with herd size ranging from 20 to 100 heads. Dairy production's objective can be self-consumption or commercial. Family labour is mainly used and animals rely on grazing on demarcated rangelands and supplementary feeds. This system is present in the southern regions.

● Commercial

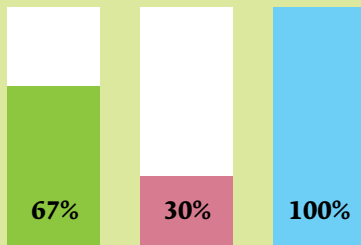
In commercial systems, dairy animals are raised for maximum milk output and they are kept indoors in sheds or paddocks. Farmers keep mainly exotic breeds, with herd size ranging from 50 to 1000 heads, and give them high quality feed. Feed comes from cultivated pastures (intensity is in feed production where pasture of high quality forages are grown). The majority of the commercial dairy farms are located in the North Central region.



Livelihoods



Income (%) from livestock among cattle keepers



- Pastoral
- Agro-pastoral
- Commercial

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

Per capita consumption of milk is **8 litres** per year.

Public health



While contributing to health via providing nutritious milk and meat, cattle can negatively impact public health through **zoonotic diseases**, which jump from animals to humans.



USD PPP
12 billion

The total cattle and human health cost of **brucellosis** and **bovine tuberculosis** amounts to about **5 percent of agriculture value** added.



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 Nigeria, might become a daunting challenge.

Environment



Cattle are a **major user of land and water**.

The average water consumption per kg of live cattle is lower in Nigeria than the world average. However, due to **low productivity levels** the **water consumption per litre of milk** produced is **higher**.

The Nigerian dairy sector generates **about 34.4 MtCO₂eq.** of Greenhouse Gas Emissions per year. Emission per litre of milk produced decreases with intensification.

Greenhouse Gas Emissions from cattle (CO₂eq per litre of milk)

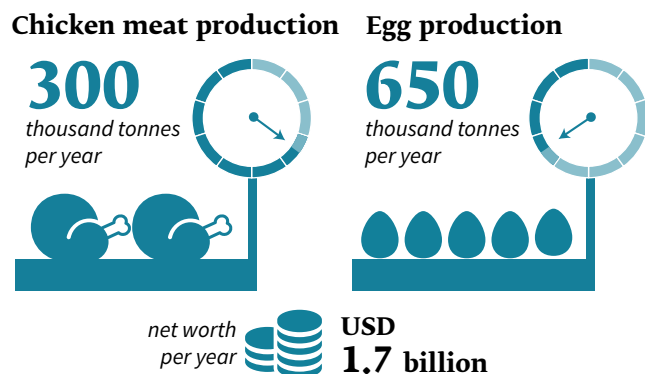
Production systems:

- Pastoral = **5 kg**
- Agro-pastoral = **1 kg**
- Commercial = **1 kg**

Poultry (chicken) today

Due to data availability and to avoid complexity, this and the next sections focus on chicken and, in the following, poultry refers to this subsector. The Nigeria poultry industry comprises about 180 million birds in three production systems: the extensive or free-range system (46 percent of the standing population), semi-intensive (33 percent) and intensive systems (21 percent).

Over 70 percent of Nigerians directly or indirectly derive livelihoods from the poultry industry. Total annual production of poultry meat and eggs is estimated at 300 and 650 thousand tonnes, respectively. Poultry is the most commercialized of the agricultural sectors, with a net worth of USD 1.7 billion per year (FRN, 2007). However, the sector has been seriously constrained over the years by Newcastle Disease, Infectious Bursal disease and, since 2006, by outbreaks of Highly Pathogenic Avian Influenza.



● Extensive

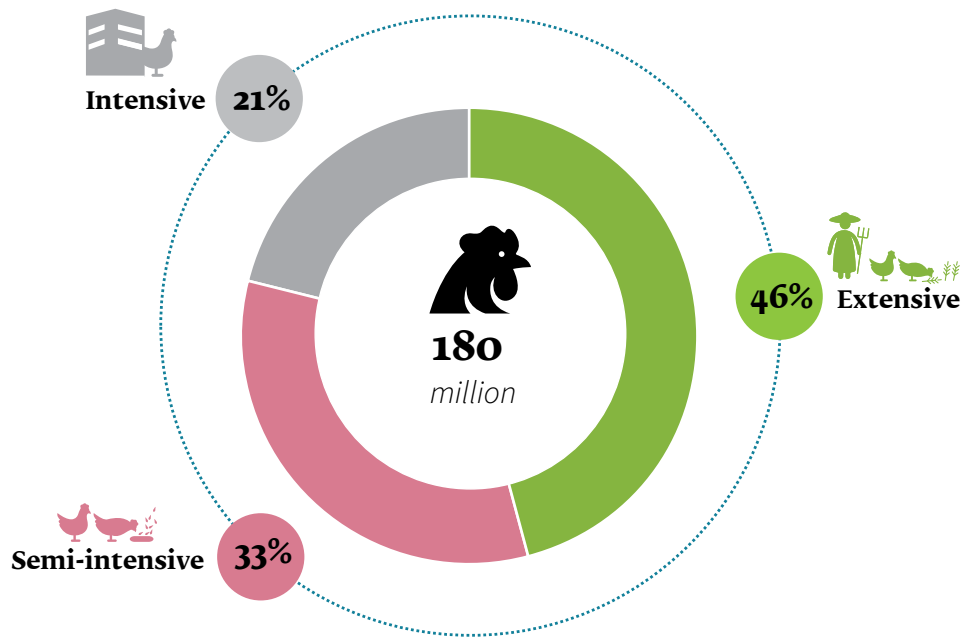
In the extensive production system, farmers keep indigenous birds left to roam around and scavenge for food and water. Flocks contain birds of different species and varying ages. There may be rudimentary shelters, though most birds roost outside in trees and nest in the bushes. Production is subsistence-oriented, mainly for family consumption. This system is present mainly in the northern regions of the country.

● Semi-intensive

Farmers in semi-intensive poultry systems keep flocks of about 50–2 000 birds, including both improved and unimproved breeds. It is a small-scale business based on family labour and locally available feed resources, often complementary to other farming activities. Housing for birds is not elaborate (wooden/metal cages are used to provide the flock with shelter) and some commercial feeds are used. The small-scale poultry producers tend to sell live birds through informal marketing channels. Semi-intensive poultry farms are mainly located in the southern regions of the country.

● Intensive

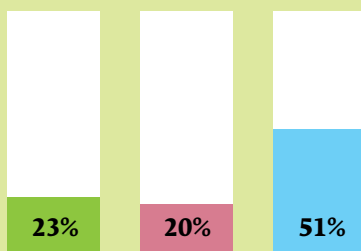
In intensive systems, farmers keep more than 2 000 exotic birds of one species, producing either meat or eggs for the market. The system ranges from medium to large-scale commercial enterprises and high premium is given to stock breed, feeding, housing and health services. The more advanced integrated holdings use automated chain feeding and watering systems. This system is dominant in the southern regions of the country.



Livelihoods



Poultry keeping households derive between **20 to 51 percent** of their income from livestock related activities.



- Extensive systems
- Semi-intensive systems
- Intensive systems

Poultry contribute to **food security** and **nutrition** through the provision of meat and eggs to the population.

Per capita consumption of poultry meat and eggs is **1.8 kg** and **3.5 kg** per year, respectively.

Public health



While contributing to health via providing nutritious meat and eggs, poultry can be a **source of zoonotic diseases**. For example, 0.5 percent of consumers were infected by Salmonellosis from poultry in 2016.

USD PPP 918 million } Total cost of salmonellosis



The total poultry and human health cost of **Salmonellosis** in 2016 is estimated to equal about **0.4 percent of agriculture value added**.



Inappropriate use of antibiotics in poultry farms can result in antimicrobial resistance in humans.

Environment



Intensive poultry production systems might **pollute soil and water** through inappropriate waste management and contribute to **greenhouse gas emissions** (broilers more than layers) through manure (N₂O) and feed production.

In current poultry production systems, while rainwater consumption per bird (8 353 m³ per ton of live weight) is higher than the world average (2 765 m³), groundwater consumption and water pollution are lower.

Poultry production systems emit a total of **1.3 MtCO₂eq. per year**. Intensive and semi-intensive systems account for 85% the emissions and the extensive systems for 15%.

Nigeria in 2050: knowns and unknowns

The way Nigeria 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 and unpredictable factors, such as consumers' behaviour and Government accountability.

Knowns

Medium and long-term policies and strategies

The country's medium-term development strategy is guided by the **Economic Recovery and Growth Plan** (ERGP, 2017–2020). It aims at *“increasing national productivity and achieving sustainable diversification of production, to significantly grow the economy and achieve maximum welfare for the citizens, beginning with food and energy security”*.

The **Agriculture Promotion Policy** (APP, 2016–2020) or Green Alternative builds on the evidence that there are two major gaps in Nigeria agriculture today: the inability to meet domestic food demand and the inability to export quality agricultural products. It aims thus at improving productivity of a number of commodities to meet both internal demand and tap into export market opportunities.

The **National Livestock Transformation Plan** (2019–2028) aims at ensuring the livestock sector becomes a catalyst for building national prosperity. It proposes strategic interventions to support improved performance and sustainability of livestock production and value addition. A key intervention is the establishment of ranches, aimed at mitigating the escalating crisis between settled-farmers and pastoralists that could undermine the entire development of the livestock sector.

Megatrends, 2015-2050

POPULATION

+109%
from **190** to about
400 million



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

URBANIZATION

+197%
from **94** to **280 million**
(2017 to 2050)



CLIMATE CHANGE

Average temperatures will be higher than today



Changed rainfall pattern and increasingly 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 +196%
from 470 to 1 393



poultry meat +207%
from 353 to 1 085

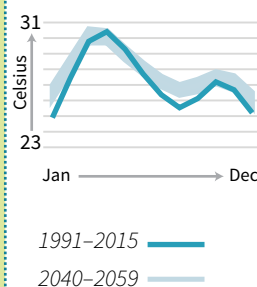


milk +158%
from 1 639 to 4 226



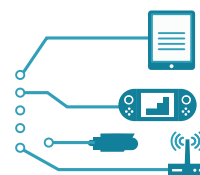
eggs +195%
from 702 to 2 069

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 Nigeria will be in 2050: the governance and the economic system.



GOVERNANCE SYSTEM

Governance is the manner in which the government guides – through policies, institutions, investments and rules and regulations – social behaviour and economic activities. At the extremes, the governance system can be either good or bad.

Good governance

“accountable, just and equitable”

Bad governance

“corrupt, nepotistic and oppressive”



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

“flourishing, stable and efficient economy”

Bad economic system

“failing, unstable and inefficient economy”

Pairing the good and bad governance and good and bad economic system uncertainties allows constructing four possible scenarios for Nigeria 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 Nigeria and its livestock sector.

SCENARIO NAMES

GLIDING EAGLE

The good-governance-good-economy scenario. The name refers to the eagle in Nigeria’s country logo, representing pride as it “glides” towards a prosperous future.

NIGERIA ARISE

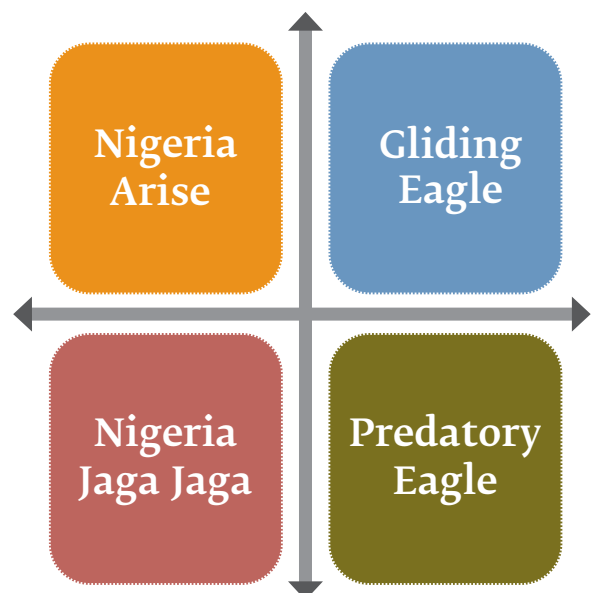
The good-governance-bad-economy scenario. The name refers to the hope that good governance can give when the economy is struggling, foreseeing a future where the country may “arise” from its current status.

PREDATORY EAGLE


The bad-governance-good-economy scenario. Another reference to the eagle in the national logo, but in this case, as a predator, depicting the situation where few ‘predators’ enjoy the benefits of the strong economy while the majority of the population is struggling.

NIGERIA JAGA JAGA

The bad-governance-bad-economy scenario. ‘Jaga jaga’ is Nigerian slang for ‘out of place’, referring to the worst possible scenario where both the economy and the political situation is bad and nothing is order.

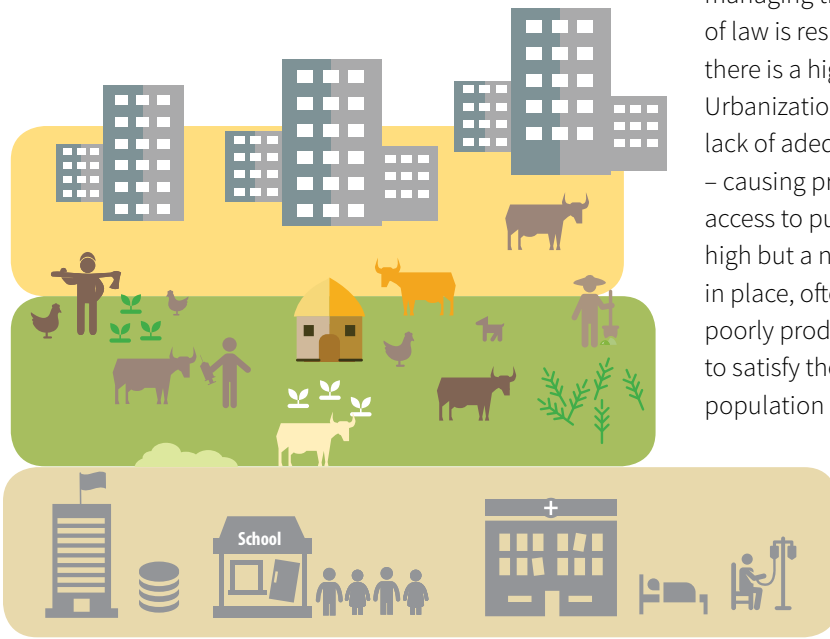



NIGERIA 2050 scenarios

Governance system 

NIGERIA ARISE

The economy is weak but the Government is efficiently managing the country with scarce resources. The rule of law is respected, the political situation is stable and there is a high participation of citizens in governance. Urbanization has significantly increased, but due to lack of adequate resources the infrastructure is poor – causing problems with traffic in bigger towns – and access to public services is poor. The poverty rate is thus high but a number of programs targeting the poor are in place, often backed by donors. The livestock sector, poorly productive because of lack of finance, is unable to satisfy the demand for animal source foods of the population of 400 million people. The country is a major importer of livestock products.




Economic system 



NIGERIA JAGA JAGA

There is complete disregard of the rule of law and the political situation is instable. The safety of citizens is not guaranteed and there is low participation in democratic processes. The country's economy is stagnant; unemployment is widespread; the poverty rate is high and per capita income low; life expectancy is low and diseases widespread; the environment is polluted. 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

GLIDING EAGLE

The country's governance is good and the economy is thriving. The rule of law and human rights are respected, the participation of citizens in the democratic process is high and the political situation is stable. The middle class represents the largest part of the population and per capita income is high; the economic is diversified and trade is booming, with a favourable balance of payments. The country's livestock sector is an exemplary model of sustainability, providing affordably-priced and healthy food to the population while at the same time having minimum negative effects on the environment and public health.



+ Economic system

PREDATORY EAGLE

The country's economy is booming but only a small group benefit from it as there is high inequalities. Human rights are not respected and there is a complete disregard of the rule of law. Participation of citizens in the democratic process is low. Public services are of bad quality and there are no social safety nets protecting the poor. There is a dual livestock sector, comprising few large corporations, which tend to overexploit natural resources, and millions of poor smallholders who survive tending a few poorly productive animals.

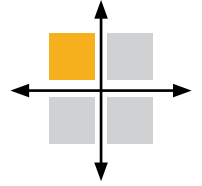


- Governance system

Nigeria in 2050: cattle scenarios

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

Cattle in Nigeria Arise



CONSUMPTION

In this scenario, per capita consumption of milk has increased to about 16 litres per year, resulting in 6.4 million tonnes of aggregate demand. A larger share of households consume milk with respect to today, a result of decreasing inequalities due to the inclusive governance system. Even though the economy is not thriving, consumers are aware of food safety issues and all actors along the value chain tend to comply with existing rules and regulations.



PRODUCTION

Trade balance ↑

Milk production is estimated to reach about 4 million tonnes, a tremendous increase from 2015. Production, however, does not meet the demand of 6.4 million tonnes and imports continue although trade balance improves: less than 40 percent of the demand is satisfied via imports. The quality of milk and milk products is good as milk processing, which improves quality, is common.

CATTLE POPULATION AND PRODUCTION SYSTEMS

The cattle population has increased by 40 percent with respect to today, reaching 25.7 million heads. Most of the dairy cattle are raised in the commercial sector that in Nigeria Arise accounts for 10 percent of the national herd and provides 80 percent of the country's milk production. The contribution of the pastoral sector to total milk production has significantly decreased though pastoralism remains the largest production system in terms of cattle population (66 percent).

PRODUCTIVITY

Production has marginally increased with respect to today in all production systems. It has increased the most in the commercial and agro-pastoral sectors.

Livelihoods



There are **more cattle farmers than today**, and a larger cattle population, especially in the commercial and agro-pastoral systems. However, there are no significant changes in income levels and **the cattle contribution to household livelihoods remains as of today** due to lack of investment.

Public health



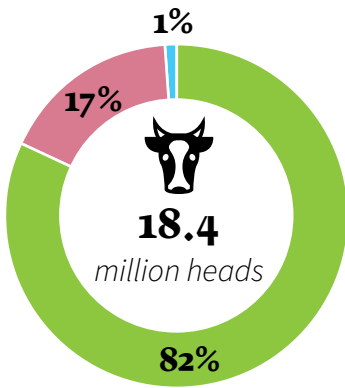
Even though rules and regulations are good, there is limited public and private investment in disease control measures resulting in **high disease incidence and higher risk of emergence and spread of zoonoses**. Antimicrobial use is high in cattle farms, because of high disease risk and limited Government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

Environment

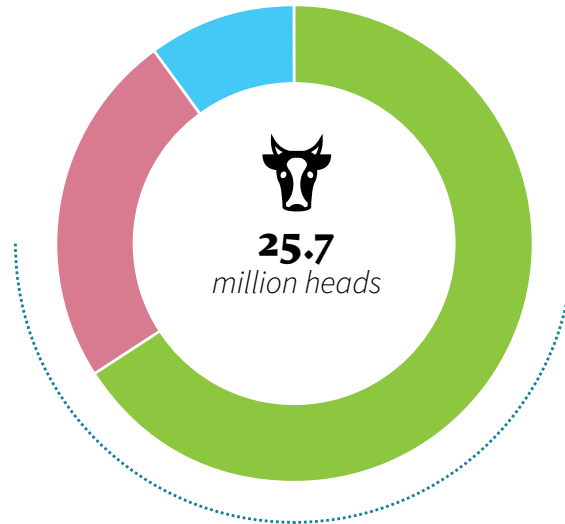


The increased cattle population results in **higher pressure on natural resources, including land and water**. As resources are limited to ensure that regulations are complied with, there are high **risk of grassland degradation and pollution of soil and water** in agro-pastoral and commercial production systems. **Greenhouse gas emissions have increased** because of the larger cattle population, though the **emissions per unit of produce have decreased** because of improved efficiency in production.

2015



2050
Nigeria Arise



66%



Pastoral

24%



Agro-pastoral

10%



Commercial

Milk production

(1 000 tonnes)

340



495



2 899

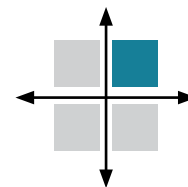


Challenges

The main challenge this scenario presents is associated with a large cattle population with limited resources available for its management, including resources for the Government to ensure rules and regulations are complied with. There will be more frequent contacts between animals, humans and wildlife, which will increase the risk of the emergence and spread of zoonoses and emerging infectious diseases. As a

result farmers might have incentives to use antimicrobials for prophylaxis, which contributes to antimicrobial resistance in humans. At the same time, farmers might adopt environmental unfriendly but economically advantageous farming practices,

Cattle in Gliding Eagle



CONSUMPTION

In this scenario, the population is better off than in 2016 and per capita milk consumption is around 28 litres per year, resulting in about 11.2 million tonnes of aggregate demand. The share of households regularly consuming milk has increased with respect to today and the share of undernourished diminished. Cattle products are safe, healthy and traded through formal channels.



PRODUCTION

Trade balance ↑

Milk production meets the demand of 11.2 million tonnes, with 9.8 million tonnes of milk produced by the commercial dairy sector. Nigeria is no longer an importer of milk.

CATTLE POPULATION AND PRODUCTION SYSTEMS

The national cattle herd has doubled to 37 million heads. The commercial sector has experienced the biggest expansion: one third of the national herd is kept in this production system, with respect to one percent in 2016. The agro-pastoral systems have also increased from about 3 million heads to more than 9 million heads. The number of cattle kept in pastoral systems has not changed.

PRODUCTIVITY

The cattle sector is highly productive, and particularly the commercial systems. Productivity has however increased in all systems with respect to today, because of availability of both public and private goods and services along the value chain. While the contribution of livestock to agricultural value added has increased, its contribution to GDP has decreased, because of a diversified economy in which services and industry contribute the most to the value of production.

Livelihoods



The cattle sector provides **well-paid jobs** to a wide range of people along the value chain, especially in the expanded **commercial sector**. The **income contribution of cattle** related activities is **higher** than in 2016 also in agro-pastoral and pastoral systems due to productivity improvements in all of the production systems. **Per capita consumption of milk is sustainable**: it equals the average consumption of a Sub-Saharan African citizen in 2016.

Public health

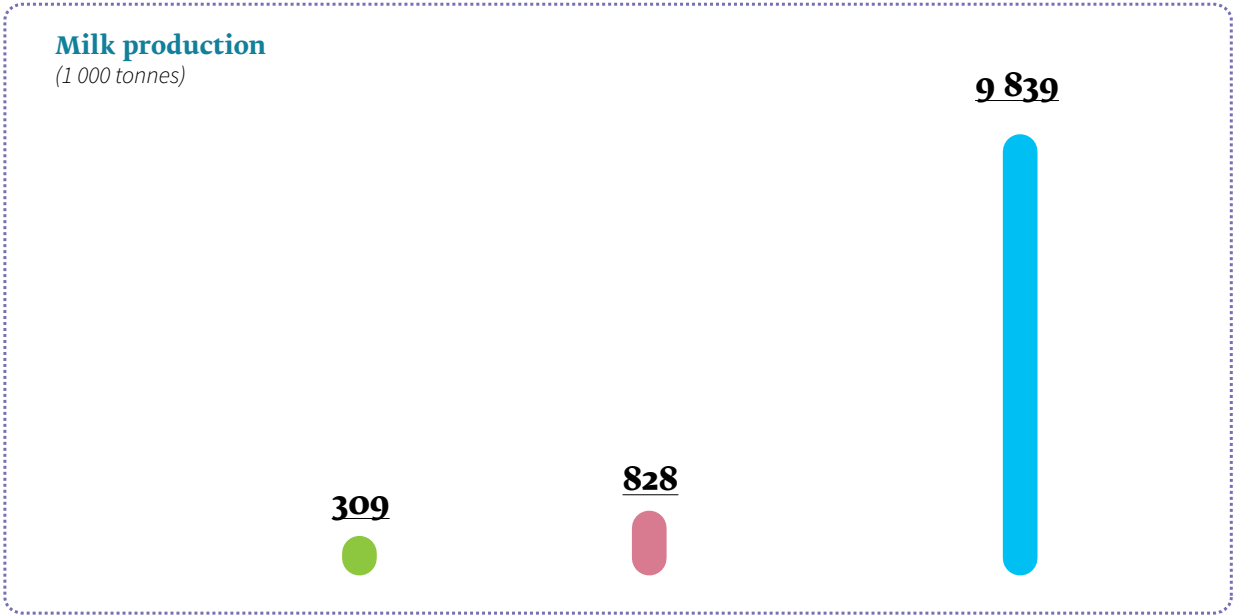
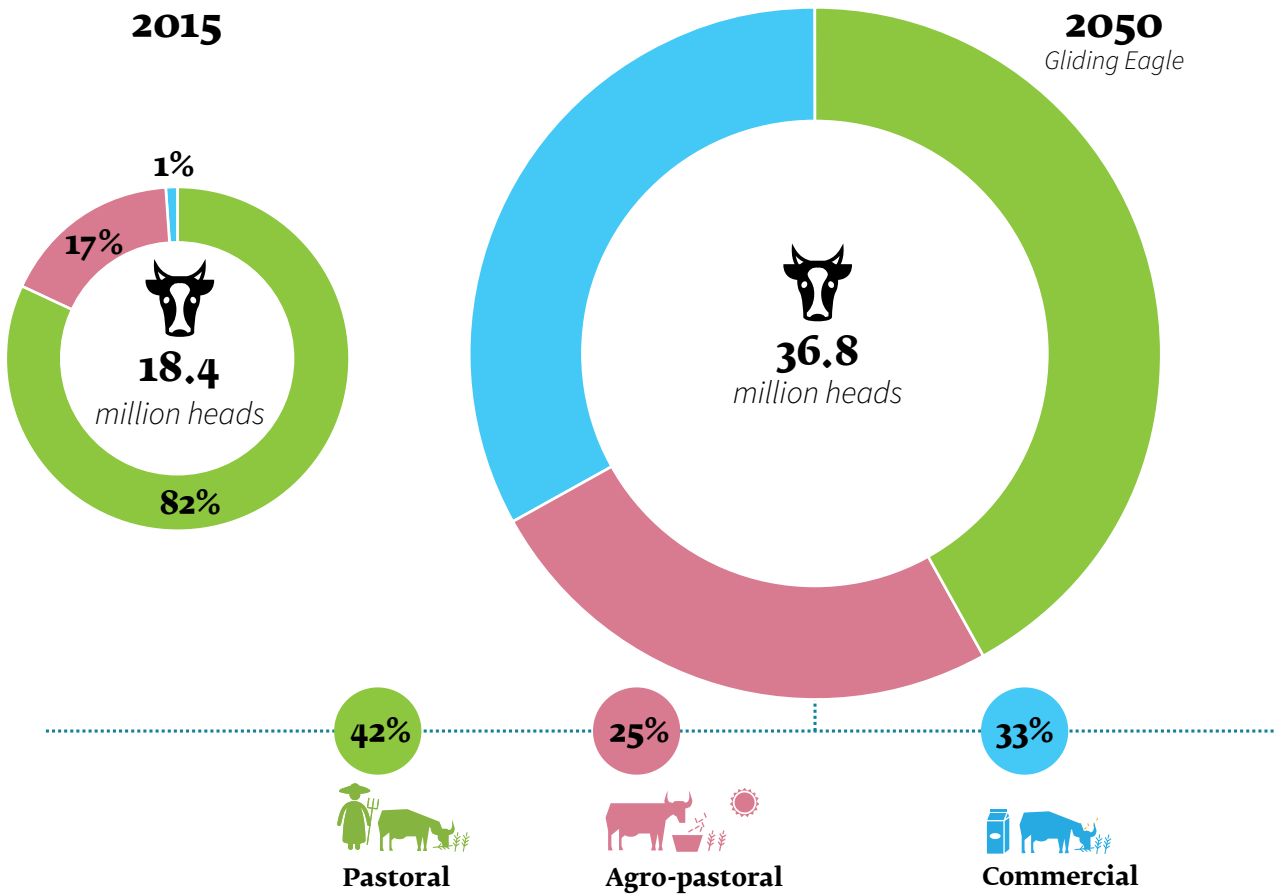


There is an effective and efficient coverage of animal health services and **good bio-security measures** are widely adopted. **The risk of emergence and spread of animal diseases**, including zoonoses, is **minimal** in spite of the large animal and human population. There is a **judicious use of antimicrobials** in livestock farming and consumers are fully aware of AMR. **Good quality and real time data** supports disease surveillance and implementation of prevention measures.

Environment



The large cattle population puts **great pressure on the environment**. As most cattle are raised in agro-pastoral and commercial systems, the risk of point source **pollution of soil and water** is high. On the other hand, while there is an overall increase in greenhouse **gas emissions** from cattle, **emissions per unit of produce are relatively low** because of the high efficiency both in the agro-pastoral and commercial sector.

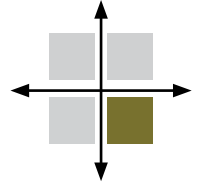


Challenges

While an efficient cattle production system is good for society, the Gliding Eagle 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 commercial systems are highly efficient, their negative impact on soil and water and public health could be significant: 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 Predatory Eagle



CONSUMPTION

In this scenario, the average per capita consumption of milk has decreased to 5 litres per person per year from 8 litres: only the elite can afford consuming milk on a regular basis and most of the population does not consume at all animal source foods. In aggregate, the about 400 million people in the country demand roughly 2 million tonnes of milk per year.



PRODUCTION

Trade balance

Milk production is estimated to reach about 1 million tonnes per year, which only meets about half of the aggregate demand. The remainder is satisfied through imports. Processed dairy products are imported to satisfy the demand of the small wealthy elite.

CATTLE POPULATION AND PRODUCTION SYSTEMS

The total cattle population decreased by about 7 percent from 18.4 to 17 million heads. The number of cattle in the agro-pastoral and commercial systems of production has increased slightly, and their products are largely sold to the small wealthy elite living in major towns. The pastoral system still dominates and any surplus from this production system is traded through informal channels.

PRODUCTIVITY

Daily milk yields in the agro-pastoral and commercial production systems have increased to 2-5 litres and 18 litres per cow per day, respectively. In these systems, farmers have sufficient capital to purchase inputs as well as access private veterinary and other services. There is no any significant productivity improvement in pastoral systems, because of lack of finance and limited public services.

Livelihoods



Not many people keep cattle, whose **contribution to their livelihoods** is limited in **pastoral areas** because of the low productivity. It is higher among agro-pastoral and commercial producers who sell their surplus milk and beef to urban dwellers. **Per capita consumption of milk** is about 5 litres per person per year, which **marginally supports livelihoods.**

Public health



There is limited public and private investment in disease control measures resulting in high disease incidence and **high 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.**

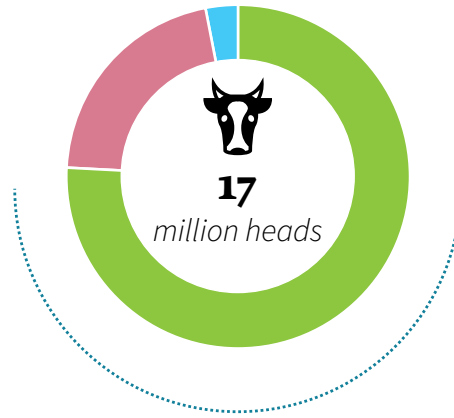
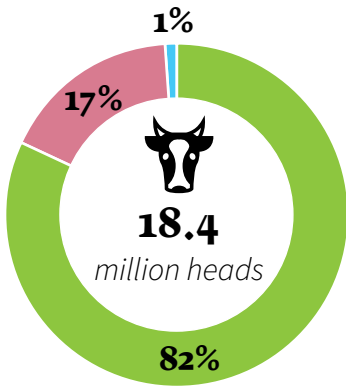
Environment



The decrease in cattle population **reduces the pressure on environmental resources.** However, the increase in imports adds on to **global environmental pressure** through the production of the **imported milk** and transport related emissions.

2015

2050
Predatory Eagle



76%



Pastoral

21%



Agro-pastoral

3%



Commercial

Milk production

(1 000 tonnes)

260



210



594



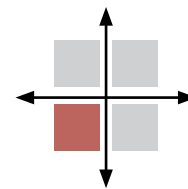
Challenges

The major risks in the Predatory Eagle scenario come from the poor conditions of the pastoral cattle keepers, the rising informal sector and the environmental pressure due to increase in imports. Additionally, the slight expansion of commercial systems increase the vicinity of the ever-growing population and animals, resulting in higher risk of outbreaks

and spread of 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 Nigeria

Jaga Jaga



CONSUMPTION

The population is significantly worse off compared to 2016 due to bad governance and a struggling economy. Per capita consumption of milk is very low, about 2-3 litres per person per year on average. In addition, only a small share of households can afford to consume livestock products regularly, much less than the 64 percent in 2016. In Jaga Jaga the about 400 million people of Nigeria consume in aggregate about one million tonnes of milk per year.



PRODUCTION

Trade balance ↘

Milk production is estimated to be about 200 thousand tonnes, which covers only 20 percent of the national demand. There are limited imports, because of both the sluggish economy and the poor governance. Most milk and dairy products – such as sour-milk, yoghurt, local butter (manshanu) and cheese (chukwi and wara) – are traded informally.

CATTLE POPULATION AND PRODUCTION SYSTEMS

The total cattle herd has declined to 11.7 million heads, of which the majority (85 percent) is kept in the pastoral production system. The agro-pastoral and commercial production systems account for 13 and 2 percent of the cattle population, respectively.

PRODUCTIVITY

Due to lack of investments and policy support, there are no significant improvements in cattle productivity. In pastoral production systems productivity is low, in many cases lower than today, and there are only marginal improvements in milk yields in commercial systems. Commercial farms typically have access to capital, inputs and services, which are unavailable for the wider community of livestock keepers.

Livelihoods



Cattle production is largely subsistence-oriented and 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. **Per capita of milk consumption is 2-3 litres per person per year**, and there are high levels of food insecurity and undernourishment.

Public health



Though there is a significant decrease in the cattle population, the human-cattle interaction is still high due to human population increase, and difficult to manage as there is a lack of information on farm location and production practices. The **rise of the informal sector** enhances the **risk of spread of zoonoses** through uncontrolled food safety practices and **improper use of antimicrobials**.

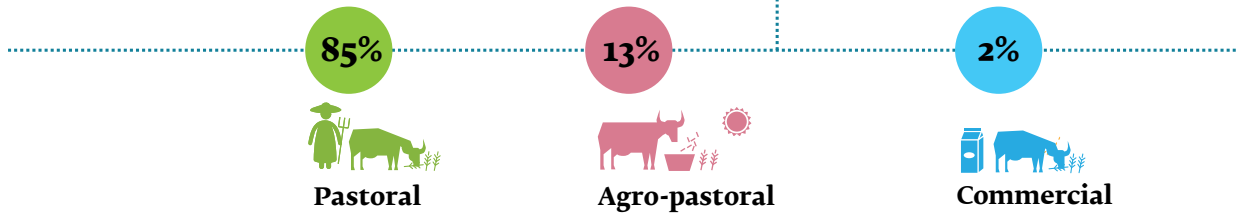
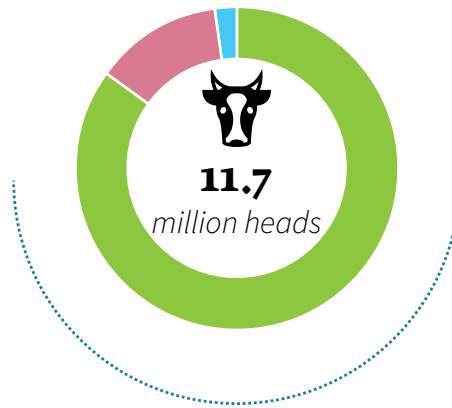
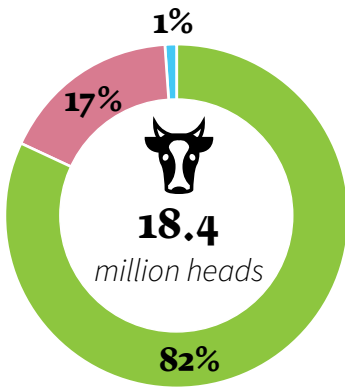
Environment



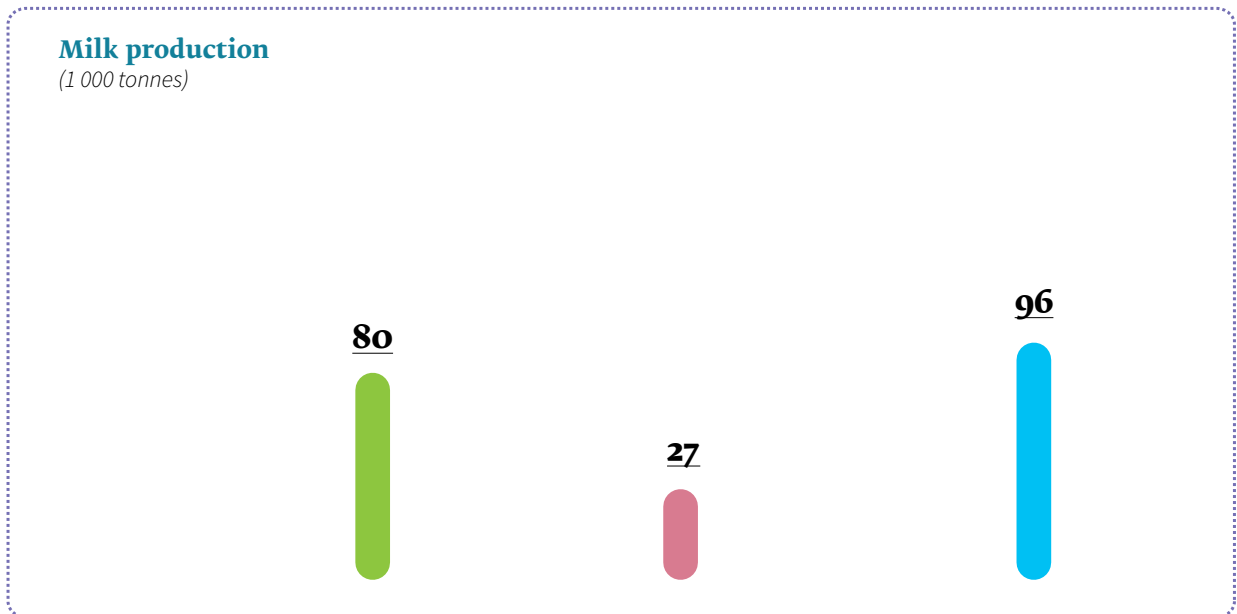
The overall impact of the cattle sector on the environment is much higher than in the past due to the lack of good rules and regulations and limited farmers' investments. In particular, **pasture lands are over-grazed** and there is high biodiversity loss. As animals are largely raised in pastoral production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

2015

2050
Jaga Jaga



Milk production
(1 000 tonnes)



Challenges

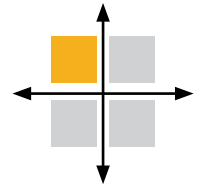
The Nigeria Jaga Jaga poses several risks with disastrous potential outcomes even though the cattle population is smaller than today. Major challenges, related to the massive increase in human population and the lack of any finance and governance system, include increased risks of (re)-emerging zoonotic diseases in the face of extremely weak public animal

health services; and degradation of natural resources. The low consumption of animal source foods increases food insecurity and widespread malnutrition reduces the capacity of the population to deal with shocks.

Nigeria in 2050: poultry scenarios



The alternative futures of Nigeria 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 Nigeria Arise



CONSUMPTION

In Nigeria Arise consumption of poultry products has substantially increased with respect to today due to population growth and decreasing inequalities. Per capita annual consumption has doubled to 3.6 kg for poultry meat, and egg consumption has increased by almost three times to 10 kg per person per year. The national demand is of around 1.5 million tonnes of poultry meat and 4 million tonnes of eggs per year.

Per capita milk consumption <i>per year</i>		Today	2050	
	Poultry meat (kg)	1.8	3.6	↑
	eggs (kg)	3.5	10	↑

PRODUCTION

Trade balance 

Poultry meat production has reached 2.3 million tonnes per year and egg production 4.4 million tonnes, both exceeding the demand of the population. Nigeria is thus a net exporter of poultry meat and eggs in the region.

POULTRY POPULATION AND PRODUCTION SYSTEMS

There has been a significant increase in the poultry population from 180 million birds in 2016 to 900 million birds in 2050. All the extensive, semi-intensive and intensive production systems have expanded, though with a shift towards intensive and semi-intensive holdings: many medium -scale poultry farmers have emerged in the rapidly expanding urban and peri-urban areas to satisfy the local demand.

PRODUCTIVITY

There are no significant productivity changes with respect to today in the different production systems. However, the national average productivity is higher due to the increase in the share of semi-intensive and intensive poultry holdings. These holdings are typically small- and middle-scale, as large-scale operations remain few due to lack of readily available finance.

Livelihoods



A small share of the population own poultry. Many farmers have exited agricultural self-employment to **well-paid salary** jobs in semi-intensive and intensive poultry farms as well as along the value chain. Some, however, have been unable to find alternative employment opportunities and struggle survive.

Public health



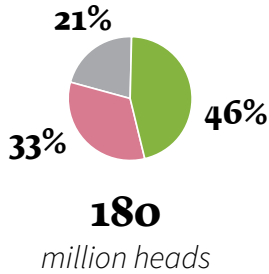
The expanded commercial poultry sector employs many workers on the farm, in processing plants and in associated industries. The **number of people interacting with poultry is thus significant**, with serious risks of outbreaks of **zoonotic diseases and inappropriate use of antimicrobials**. As the population is much better off than today, a large share of the population people consume chicken meat and eggs and wide risks of **food borne diseases**.

Environment

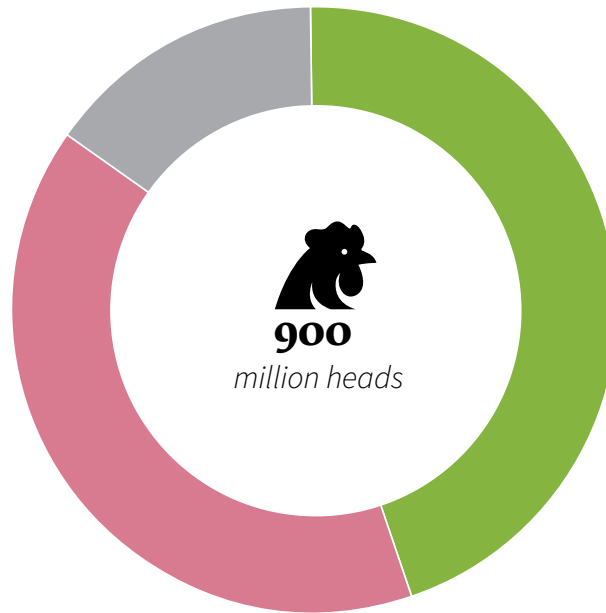


The tremendous increase in poultry production and the fact that most chicken are raised in intensive systems result in a **large pressure** on the environment. On the one hand, concentration of birds in a limited area have negative impacts **on soil and water** quality; on the other hand, the increased demand for poultry feed contribute to **increased greenhouse gas emissions** from the sector.

2015



2050
Nigeria Arise



45%



Intensive

40%



Semi-intensive

15%



Extensive

Poultry meat production

(1 000 tonnes)

2 087



178



30



Eggs production

(1 000 tonnes)

2 784



1 440



135

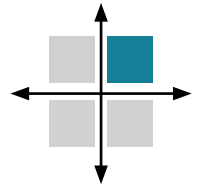


Challenges

The main challenge of this scenario comes from the five-fold increase in the poultry population and the expansion of intensive and semi-intensive systems with lack of private and public finance available for its effective management. These changes result in increased and more concentrated human-poultry interactions, particularly in urban and peri-urban areas, that elevate the risk outbreak and spread of



zoonotic diseases, particularly emerging infectious diseases. Due to declining income inequalities, a larger share of the population consumes poultry products, which on the one hand improves food security but, on the other, increases the risk of food-borne diseases. The shift in production systems results in higher and more risk for the environment, largely associated to poor waste management.

Poultry in Gliding Eagle



CONSUMPTION

Each segment of the population benefits from the economic boom thanks to the inclusive and efficient governance system. Consequently, per capita consumption of poultry meat and eggs has increased to 7 kg and 10 kg per year, respectively. This results in an aggregate demand of 2.8 million tonnes of meat and 4 million tonnes of eggs per year.

Per capita milk consumption <i>per year</i>		Today	2050	
	Poultry meat (kg)	1.8	7	↑
	eggs (kg)	3.5	10	↑

POULTRY POPULATION AND PRODUCTION SYSTEMS

The large increase in poultry production is mostly due to the tremendous expansion of the intensive production system that manages about 540 out of the 900 million birds in the country. Extensive and semi-intensive farmers keep 10 and 30 percent of the total population of birds, respectively.

PRODUCTIVITY

All the production systems are highly productive because of large investments in the poultry sector, – especially in breeding, biosecurity, feeding, as well as animal welfare – and effective rules and regulations to support functional value chains. An effective marketing system also ensures high returns on investment for farmers and other actors along the value chain.

PRODUCTION

Trade balance 

The demand growth is met by a large increase in total production that reaches 3.1 million tonnes of poultry meat and 4.9 million tonnes of eggs in Gliding Eagle. Nigeria is a net exporter of poultry products.

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



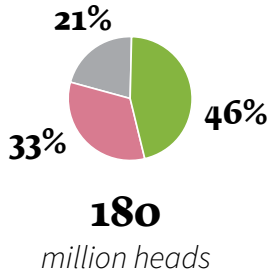
The animal-human interface changes greatly due to the large expansion of the national flock and particularly the intensive sector. Animal-human contact happens in more concentrated areas, typically closer to **densely populate urban areas**. The resilience of the population to diseases has improved due to **better nutrition** and better education.

Environment

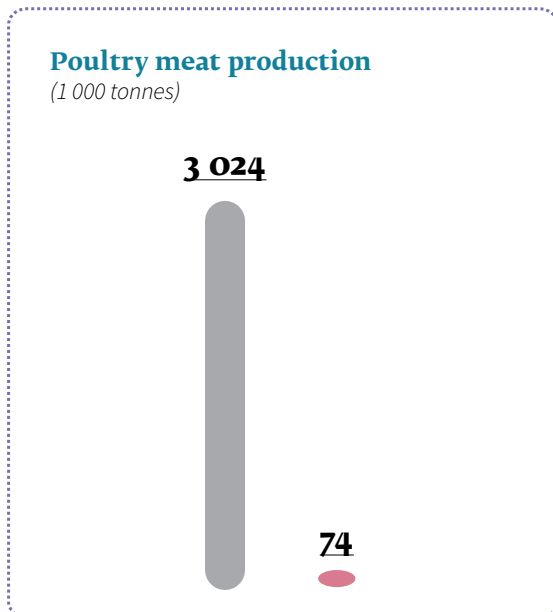
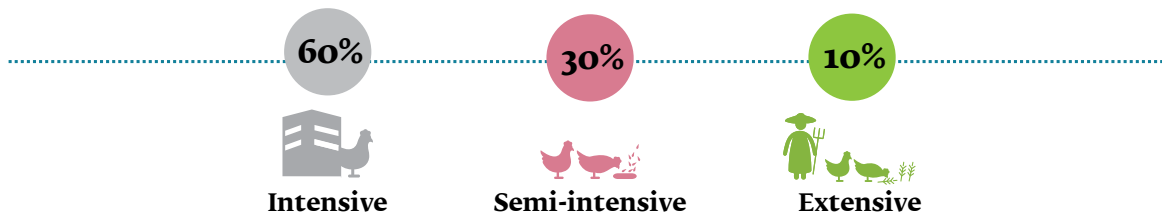
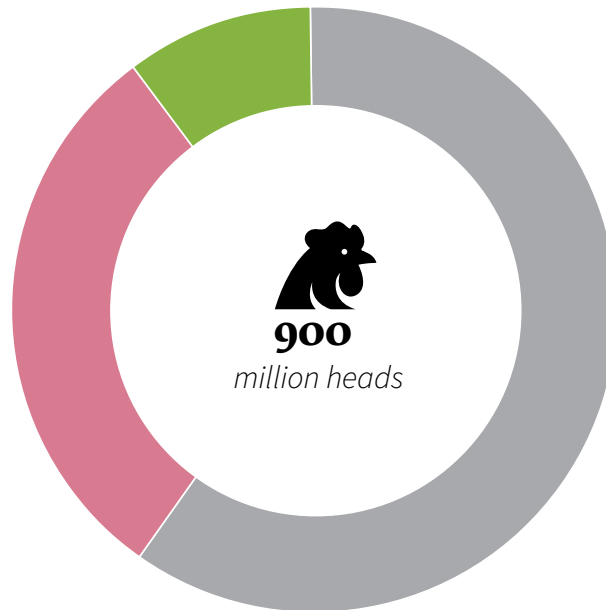


Effective rules and regulations ensure poultry production systems have a limited negative impact on the environment. However, the tremendous increase in the chicken population in **intensive systems** poses environmental risks. On the one hand **inappropriate waste management** might result in **soil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

2015



2050
Gliding Eagle

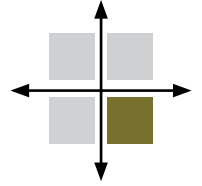


Challenges

The large increase in the poultry population and the shift towards intensive production systems generates a series of challenges for society. First, a number of small scale poultry producers are 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. The risk of spread of food-borne diseases through consumption of poultry products is also high since almost the entire population consumes poultry products on a regular basis.

Poultry in Predatory Eagle



CONSUMPTION

Per capita consumption of poultry meat has decreased to 1.5 kg per person per year, and egg consumption to 3 kg per person per year. In fact, only a small elite enjoy the benefits of a thriving economy. The aggregate demand is of 600 thousand tonnes of poultry meat and 1.2 million tonnes of eggs per year.

Per capita milk consumption <i>per year</i>		Today	2050	
	Poultry meat (kg)	1.8	1.5	↓
	eggs (kg)	3.5	3	↓

PRODUCTION

Trade balance ↘

Total production is estimated at about 350 thousand tonnes of poultry meat and around 700 thousand tonnes of eggs, which is slightly higher than in 2016. However, national production is not able to meet the demand. Due to an import ban, which is in place in Predatory Eagle, many purchase poultry products through informal channels.

POULTRY POPULATION AND PRODUCTION SYSTEMS

In this scenario, there has been a slight increase (17 percent) of the poultry population that is now estimated at around 211 million birds. There hasn't been any significant change in the distribution of birds across production systems: the extensive, semi-intensive and intensive systems have a share of 45, 33 and 22 percent of the national flock, respectively.

PRODUCTIVITY

Average productivity is low due to little investment and, therefore, minimal improvement in housing, feeding and animal health. Intensive and semi-intensive systems, however, are slightly more productive than today. The extensive systems is highly unproductive, with an inefficient Government unable to provide even basic services to producers and other value chains actors.

Livelihoods



There is an **increase in the number of households keeping poultry**, largely in extensive production systems. However, the inability of the Government to provide services to them results in **reduced livelihoods**. Some additional **jobs** are created **along the value chains** – to the increased size of the intensive and semi-intensive production systems – but **wages are low** and working conditions are poor. **Few households consume poultry meat** on a regular basis.

Public health



The risk of spread of disease is high due to the **rise of the informal sector**, the low resilience of the **malnourished population**, the large increase in human population and lack of investments in animal health. This provides incentives to farmers to make **ample use of antibiotics**, contributing to AMR in humans. The extensive sector remains the largest sector, most people are in direct contact with the birds through these free-range systems.

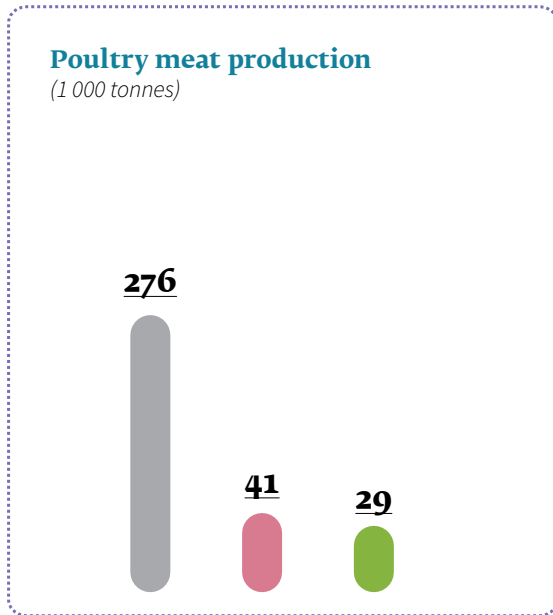
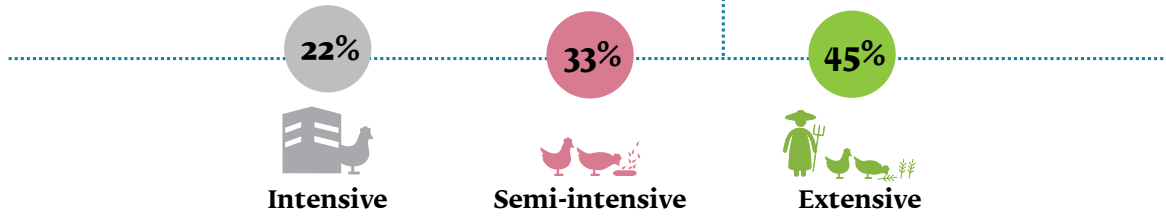
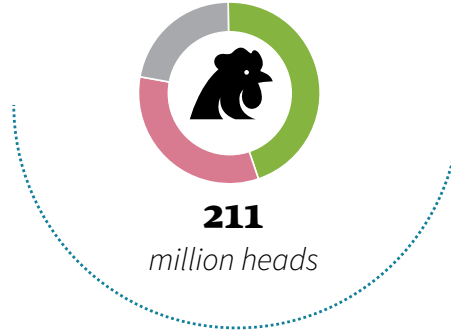
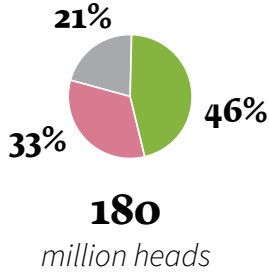
Environment



The overall **direct impact on environment is higher** than today as there is a slight expansion of the sector. The low production levels and the import ban result in smuggling of poultry products from outside the country that also contributes to environmental pollution.

2015

2050
Predatory Eagle



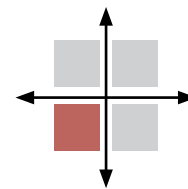
Challenges

The main challenge in Predatory Eagle lies in the inability of the poultry sector to satisfy the national demand, and the rise of the informal sector. The inefficient Government is not only unable to provide services to smallholders but also to ensure that semi-intensive and intensive producers comply with existing rules and regulations. This results in high risk of

zoonotic disease outbreaks and spread and improper use of antibiotics. The weak enforcement of rules and regulations results in high negative environmental impact.




Poultry in Nigeria

Jaga Jaga



CONSUMPTION

Due to the low purchasing power of the population and to an inefficient Government unable to implement any type of social protection programmes, per capita consumption of poultry meat and eggs has declined to 1.2 kg and 2 kg per year, respectively. As the human population has reached 400 million people, aggregate demand has increased to 467 thousand tonnes of poultry meat and 800 thousand tonnes of eggs per year.

Per capita milk consumption		Today	2050	
	per year			
	Poultry meat (kg)	1.8	1.2	↓
	eggs (kg)	3.5	2	↓

POULTRY POPULATION AND PRODUCTION SYSTEMS

The poultry population has increased from 180 million birds today to about 192 million birds. The extensive poultry production system remains the largest subsector representing about 46 percent of the total poultry population. The semi-intensive and intensive systems comprise 33 percent and 21 percent of the national flock, respectively.

PRODUCTIVITY

Productivity is low. There are little incentives for producers in all production systems to invest in productivity-enhancing technologies, including in animal health, breeding, feeding and housing and, in any case, the market for services and inputs functions badly. The average carcass weight has decreased to 0.9-1.2 kg per bird.

PRODUCTION

Trade balance ↓

Poultry meat and egg production, which are estimated at 250 and 640 thousand tonnes respectively, are unable to satisfy national demand. These gaps are to some extent filled with the rise of the informal sector, since there is an import ban in place.

Livelihoods



Because of the inefficient nature of the poultry sector in this scenario, farmers derive **little benefits from poultry farming**. The decrease in productivity affects both income levels and consumption. There are **limited employment opportunities along the poultry 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**, which are often of poor quality or counterfeited. There is **little food safety**.

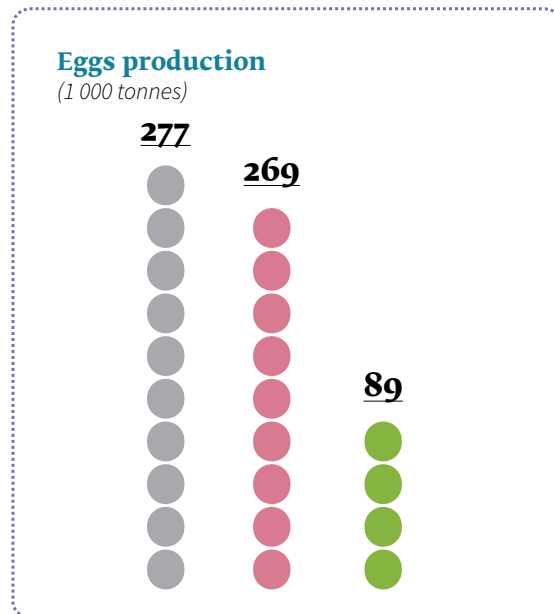
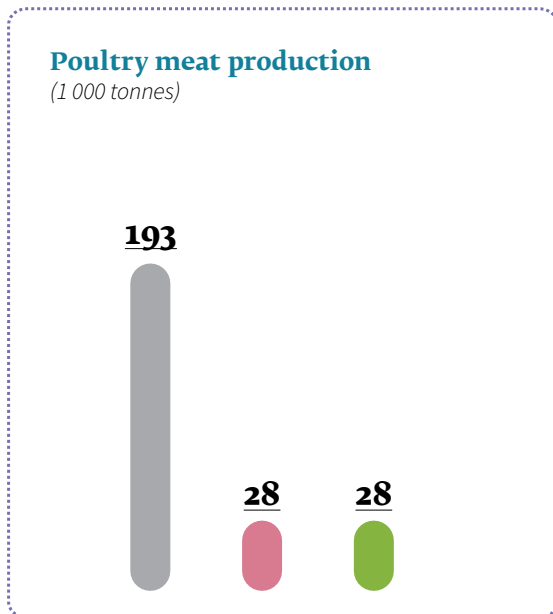
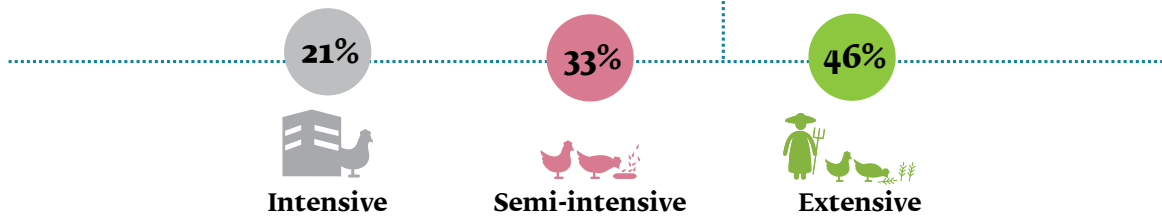
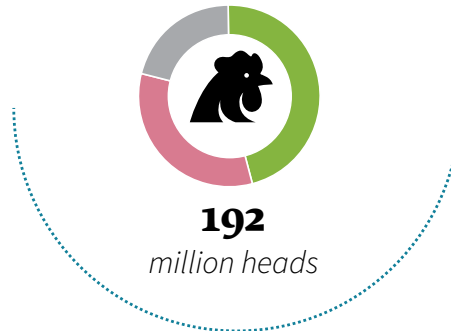
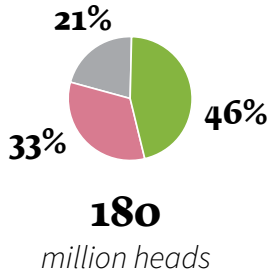
Environment



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**. The low production levels and the import ban result in smuggling of poultry products from outside the country that contribute greatly to environmental pollution.

2015

2050
Nigeria Jaga Jaga



Challenges

The major challenges in Nigeria Jaga Jaga stem from low productivity levels, lack of health services, the large informal sector and widespread undernourishment. All these factors increase risk of outbreak and spread of zoonotic diseases and result in environmental degradation and pollution. There are limited employment opportunities for the ever growing

population. The challenges emerging are similar to those of the poultry sector in Predatory Eagle, but to a larger extent as the general economic situation is worse.

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 Nigeria's society in the next decades. As part of the future remains unpredictable, however, 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 Nigeria and its livestock sector sheds light on the multitude of future opportunities, challenges and threats. It 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 requirements 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 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 ever-growing animal and human populations will compete for 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.

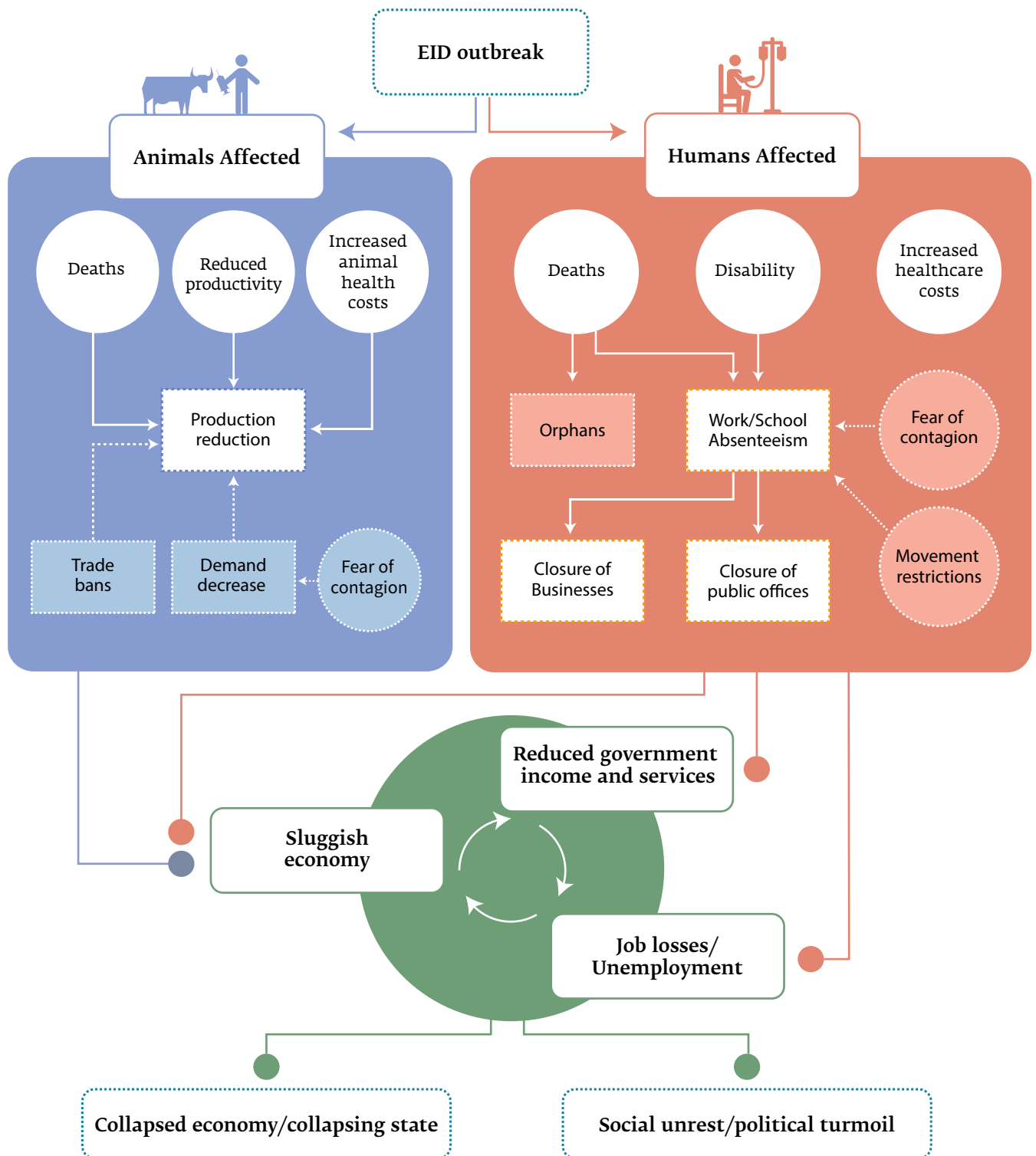
The magnitude of the future livestock-related livelihoods, environment and public health challenges will vary in the different 2050 scenarios. However, two elements deserve closer scrutiny,

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 domesticated 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.



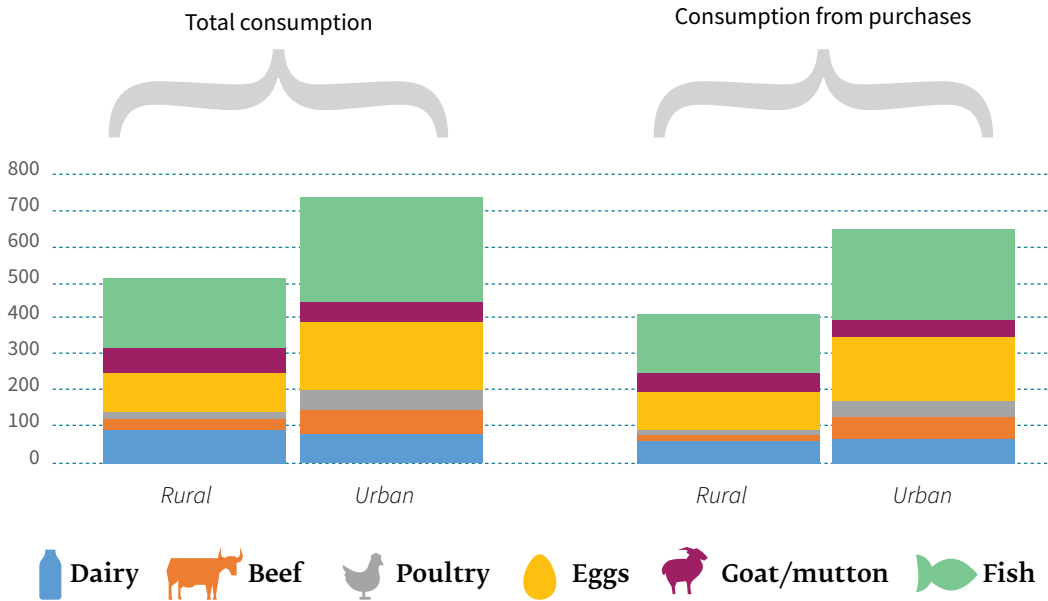
URBANIZATION

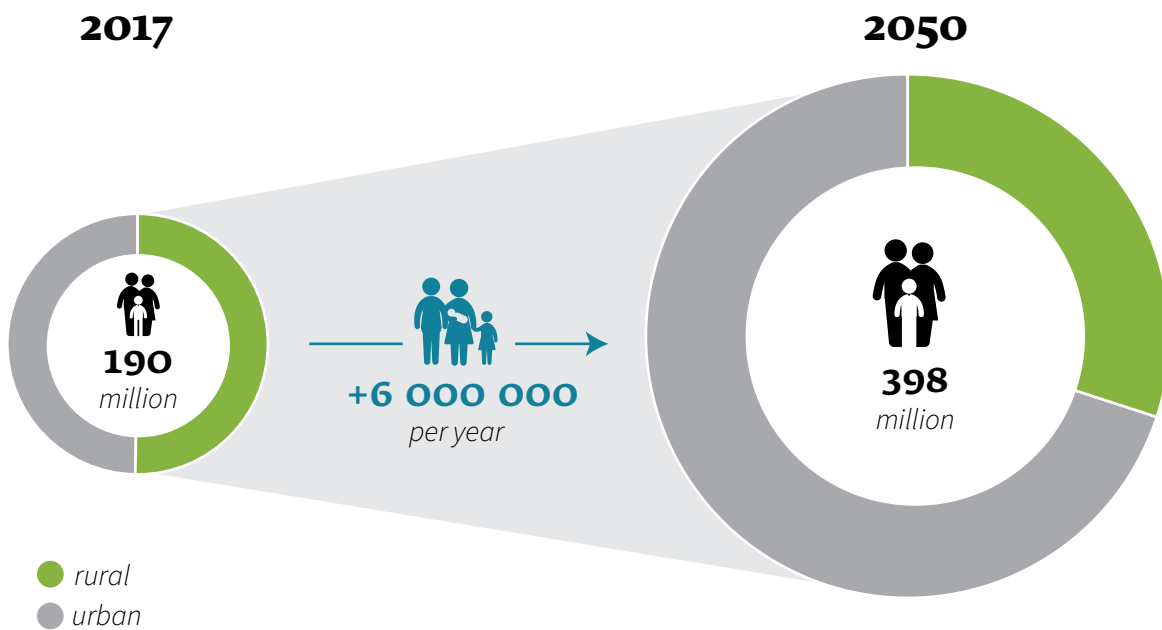
The coming transformation of livestock will largely aim at satisfying the demand for animal source foods of a growing urban population.

Between 2017 and 2050, 89 percent of the anticipated increase in population will occur in urban areas vis-à-vis 11 percent in rural areas, and the average per capita consumption of animal source foods is

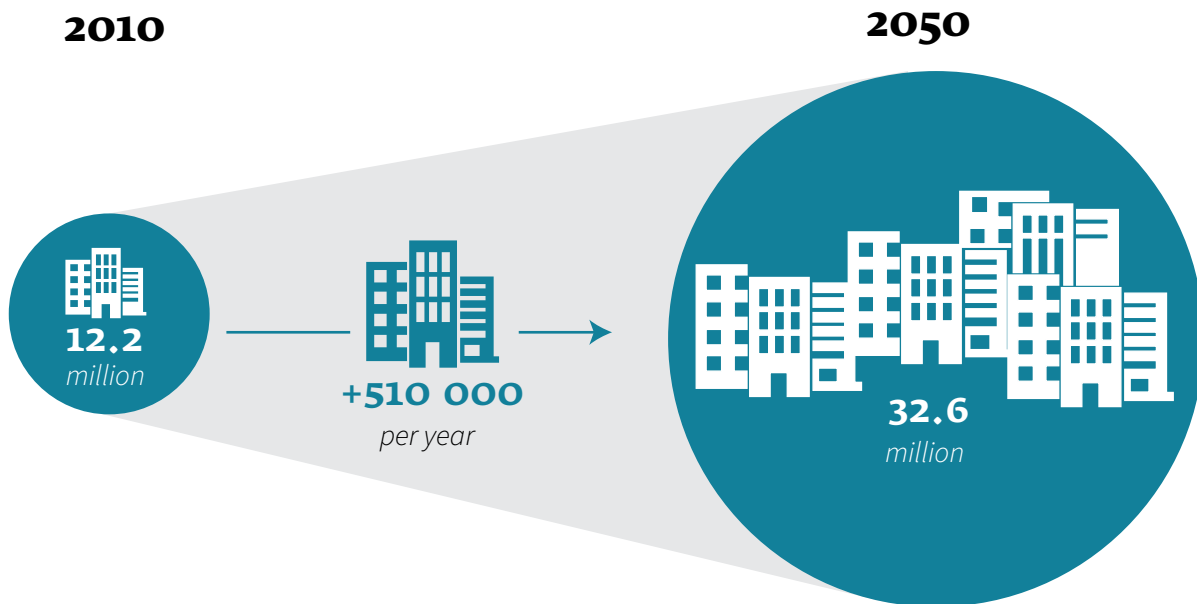
higher in urban than rural areas. Livestock farms and value chains in peri-urban and urban areas are thus expected to transform more rapidly and hastily than anywhere else in the country, exacerbating exponentially the risk of negative impacts of livestock farming on the environment and public health in densely populated areas.

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





2017–2050 population projections by rural and urban area



Lagos population, 2010–2050

Towards resilient policies

Multiple plausible futures await Nigeria and its livestock sector, 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 Nigeria and its cattle and poultry sectors might turn out to be in 2050. None of the alternative scenarios will likely materialise and the future will comprise elements from all of them. They do, however, point to expanding business opportunities for actors along the value chain as well as to numerous common social, public health and environmental challenges.

The scenarios convincingly show the escalation of many known challenges such as fierce competition for environmental resources, particularly land and water, structural changes in employment opportunities 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 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 and 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, demanding increasingly larger quantities of livestock products. It is critical that these hotspots of human-animal interaction are properly regulated, as any disease outbreak could escalate rapidly in such densely populated areas.

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



Stakeholders should adopt a One Health approach to appreciate the relevance and efficiency of current policies dealing with priority zoonotic diseases, emerging infectious diseases, antimicrobial use and farming systems in urban and peri-urban areas. Making the current policy framework resilient to these anticipated changes is a pre-condition to ensure an expansion of the Nigerian livestock sector that provides affordable and healthy milk and meat to the population 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 National Bureau of Statistics; the Federal Ministry of Agriculture and Rural Development; Federal Ministry of Health and Federal Ministry of Environment. 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.

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