



Food and Agriculture  
Organization of the  
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AFRICA  
SUSTAINABLE  
LIVESTOCK  
2050



*The long-term future of  
livestock and fishery in*

**EGYPT**

Production targets in  
the face of uncertainty



**USAID**  
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AFRICA  
SUSTAINABLE  
LIVESTOCK  
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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 Egypt society, in ways that are often unpredictable. The livestock and fishery sectors, whose developments are fundamental to support the transformation of the country in a sustainable way from a socially, environmentally and from a public health perspective, are anticipated to go through major transformations in the coming decades. Under these circumstances, a robust analysis of the livestock and fishery production systems, an understanding of the dietary requirements of the population, 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 and fishery productivity? How will the feed-food competition unfold? How will the livestock and fishery value chains affect the environment and public health? We must admit that we neither we can accurately forecast nor we can precisely plan the long-term future of livestock and fishery by merely relying on predictive analytics. However, by exploring how the many unknowns might unfold to result in different futures for the livestock and fishery sectors, we can generate credible production targets for the future while, at the same time, identifying challenges to address to support their sustainable transformation.

The Government of Egypt, with support from FAO and USAID, engaged a multitude of stakeholders in a conversation around the knowns and unknowns of the future of the livestock and fishery sectors in the country, such as animal protein requirements, current policy priorities, technology uptake and institutional changes. Stakeholders did not predict

or forecast the future of the livestock and fishery sectors with accuracy, but they first generated evidence on alternative, yet all plausible futures, and then identify production targets for 2050 that, if achieved, will allow the projected population of 150 million in 2050 to have access to a sufficient amount of animal protein for a healthy diet. Stakeholders also call for the adoption of a One Health approach to design and implement livestock and fishery policies and investments, particularly to effectively deal with emerging and re-emerging animal diseases that, if uncontrolled, can jeopardize the development trajectory of the whole livestock and fishery sectors and, in the worst case scenario, of the entire Egypt.

The report “The long-term future of livestock and fishery in Egypt-Production targets in the face of uncertainty” looks out to 2050 and presents alternative scenarios, or plausible portrays, of the future of the livestock and fishery sectors in the country. It provides invaluable insights to decision-makers on production targets to achieve in 2050, including the underlying livestock and fishery production systems, and actions to take to make the Egypt livestock and fishery sectors 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 Egypt. We are grateful to stakeholders from across Egypt, and to FAO and USAID in particular, who provided the invaluable expertise and knowledge that underpin this report.



**NASREDIN HAG ELAMIN**  
FAO Representative in Egypt

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# Executive summary

The Egyptian population will grow from about 100 to almost 150 million in the next three decades, and in 2050 about 85 million people will live in cities and towns vis-à-vis 40 million today; per capita income, currently at about USD 12 000 per year, will also significantly increase. Consequently, the demand for food, goods and services will shoot up, resulting in a major transformation of the economy.

With regard to livestock and fishery, the challenge for the Egyptian government is to put in place policies and investments so that, by 2050, not only all citizens have access to affordably priced, safe and healthy animal protein, but also that the livestock and fishery sectors develop sustainably, provide new jobs for the growing population, and are competitive in the global market place. In order to inform long-term planning, the government of Egypt and the Food and Agriculture Organization of the United Nations (FAO) have engaged stakeholders to articulate livestock and fishery scenarios for 2050 and identify the necessary transformations for ensuring that there will be sufficient availability of meat, milk and eggs for a healthy diet of a 150 million population in 2050.

Scenarios present plausible snapshots of the livestock and fishery sectors in 2050, including opportunities and challenges for their sustainable transformation and, as such, provide strategic inputs into policy design and implementation. The scenario formulation exercise was implemented in consultation with all relevant stakeholders, from the public and private sectors. It has determined four plausible scenarios for the future of livestock and fishery in Egypt, which result from the possible combinations of alternative investment and policy environments. The most preferable scenario is the one with an enabling policy and investment framework, which would ensure both a sustainable development trajectories of the two sectors, from an environmental and public health perspective; food security for the population; and self-sufficiency in animal protein. The other scenarios warn that, in case little attention is devoted to the livestock and fishery sectors, the entire development trajectory of Egypt could be jeopardized, because of the negative societal effects of less-than-efficient

growth and transformation of the two sectors, such as environmental degradation and outbreaks of zoonotic diseases that jump from animals to humans.

In order to make the most preferable scenario relevant for decision-makers, the report also estimates the amount of animal protein Egypt should produce by 2050 to ensure food security and self-sufficiency: national meat (beef, poultry and fish), milk and egg production should increase, respectively, by about 109, 290 and 162 percent with respect to today. To this end, policies should support a process of sustainable intensification, characterized by a transition from extensive to semi-intensive and intensive production systems more than by increased productivity within the various production systems. Policies should be complementary and in line with the National Sustainable Development Strategy “Egypt 2030” and adopt on a One Health approach to manage the multitude of environmental and public health challenges the proposed transformative process will bring about, which is a precondition to ensure the livestock and fishery sectors provide sustainable benefits to the Egyptian society in the coming decades.

Policies should adopt a One Health approach to effectively deal with the anticipated public health challenges the coming transformation of the livestock and fishery sector will bring about





# Introduction

The Egyptian society and economy will grow fast and transform extensively in the next three decades: the country's population is projected to reach 150 million in 2050, vis-à-vis 100 million today, and it will be increasingly urbanized; the economy will expand, and consumer purchasing power will substantially increase by 2050.

Along this transformative process, the demand for animal source foods, including livestock and fishery products, will exponentially increase. As a response, the livestock and fishery sectors will grow and transform, not only providing opportunities for employment generation and rural industrialization but also posing environmental and public health challenges.

## What actions should Egypt take to ensure a sustainable transformation of the livestock and fishery sectors in the coming decades?

This is the question at the basis of this report. In the last two years, the Ministry of Agriculture and Land Reclamation, the Ministry of Health and the 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 Egypt and of its livestock and fishery sectors. The consensus stakeholders reached is presented here.

This report portrays four alternative scenarios for the future livestock and fishery sectors and identifies transformations of the two sectors that ensure a sufficient availability of animal protein for a healthy diet of the population in 2050. It also calls for the adoption of a One Health approach to deal with those systemic risks that might not only jeopardize the future development of the livestock and fishery sectors but also of the entire Egypt.

## 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 for the livestock and fishery sectors.

Scenarios build on the premise that the future is still on 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.

## Data sources

Data and statistics in this report originate from a multitude of sources, including the Central Agency for Public Mobilization and Statistics; the Ministry of Agriculture and Land Reclamation, the Ministry of Environment; the Ministry of Health; and the Arab Center for Nutrition. 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.

Given multiple sources of data, some readers may find differences between the presented statistics and their own data. However, this should not be considered as a major issue. On the one hand, the process of scenario formulation started in 2018, when some of the most recent country data were not yet available and, on the other hand, the focus of the report is about the long-term future of the livestock and fishery sector in Egypt.

The FAO's Global Perspective Studies and the United Nations Population Divisions provided long-term projections for social, economic and livestock-related variables. When data portraying the current situation of the country and its livestock and fishery 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 longterm, alternative development pathways, around which they reached broad consensus.

# Egypt and its livestock and fishery sectors

With a population of 100 million people and a GDP per capita of about USD 12 000 per year, Egypt is a lower middle income where about 43 percent of the population dwells in urban areas. The livestock and fishery sectors constitute 37.5 percent and 11 percent the value of agricultural production, respectively, providing essential protein and micronutrient for food security and nutrition.

# Egypt today

Egypt is a lower middle-income country with a population of 100 million people and a GDP per capita of about USD 11 700 per year at purchasing power parity (PPP). About 43 percent of the population lives in urban areas.

Life expectancy is 72 years and major causes of death are ischemic heart diseases, strokes and diarrheal diseases, usually symptoms of an infection of the intestine, diabetes and cirrhosis. On average, the government spends USD 130 per person per year or 4.6 percent of GDP on public health (WB, 2019 and IHME, 2019).

Undernourishment affects 4.8 percent of the population, while school enrollment for primary and secondary education is close to 100 percent.



Agriculture, forestry and fishery contribute about 9 percent to GDP and 25 percent to employment. Industry and services contribute around 33 and 53 percent to GDP, respectively, and employ around 26 and 48 percent of the Egyptian labour force (WB, 2018).

The country's agricultural sector is heterogeneous, comprising small through medium to large farmers and farms with different levels of efficiency. Livestock is an integral part of agriculture, accounting for about 37.5 percent to the total value of agricultural production and supporting the livelihoods of a large share of the population. The national herd comprises 5.1 million cattle and buffaloes, 5.4 million sheep, 4 million goats, 46 million layers and 1.4 billion broilers, as well as asses, equines and camels. Statistics on the animal population, however, vary significantly depending on the source. The fishery sector accounts for about 11 percent of agricultural production value and is a source of livelihoods for about 800 000 people, including 150 000 working in aquaculture and 650 000 in capture fishery.

Both the livestock and the fishery sector are a major supplier of protein and micronutrient for the population. However, their future contribution to food security and nutrition is challenged by increased anthropic pressure on natural resource use and by climate change, which are both making it increasingly difficult to produce sustainability.

## Livelihoods



**32.5%**  
of the population lives below the poverty line  
Most of the **poor** are in rural areas



Undernourishment affects about  
**5%** of the population

## Public health



Life expectancy is  
**73** (male) and **76** (female) years



Major causes of death are ischemic heart diseases, strokes, diarrheal diseases, diabetes and cirrhosis

## Environment



Terrestrial and marine protected areas constitute **14%** of total territorial area

The arid desert covers **92%** of the country's surface area. Only **8% of the country area is arable**: the Nile Valley, the Nile Delta and a few oases in the Western Desert



The **6%** of energy consumed comes from renewable sources



### URBANIZATION

Roughly, **43%** of the population dwells in urban areas

### GDP

USD **251** billion and about USD PPP **11 700** per capita per year

### POPULATION

**100** million

### FISHERY

The country's fishery sector accounts for about

**11%** to the value of agricultural production

### LIVESTOCK

Cattle, buffaloes, small ruminants, equine and camels contribute about

**37.5%** to the value of agricultural production

### AGRICULTURE

Contributes about **11%** to GDP and **25%** to employment



### Fishing vessels

Motorized



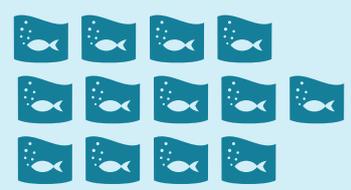
**5** thousand

Non-motorized



**26** thousand

### Aquaculture ponds



**130** thousand hectares

### Livestock population



**Broilers**  
**1.4** billion



**Layers**  
**46.6** million



**Sheep**  
**5.4** million



**Cattle/buffaloes**  
**5.1** million



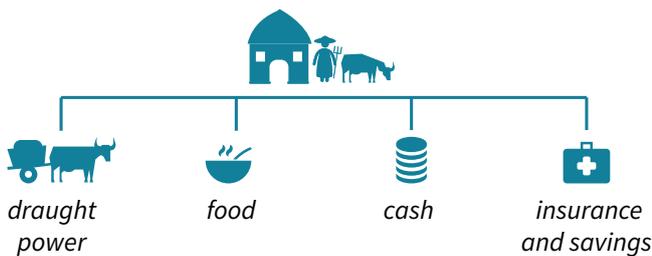
**Goats**  
**4** million

# Cattle and buffaloes today

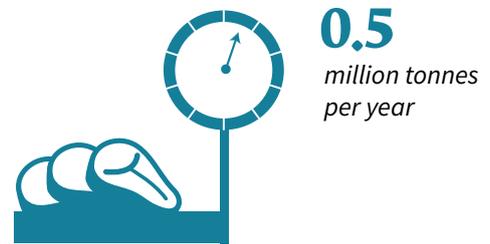
Over 5.1 million cattle and buffaloes generate about 6 million tonnes of milk and 0.5 million tonnes of meat per year. About 53 percent of all milk and 86 of meat come from cattle, with the remainder coming from buffaloes. The total output from cattle and buffaloes is valued USD 8 billion per year. Egypt is a net importer of both beef and milk.

Over 1.8 million households keep bovine animals, largely for commercial purpose. Bovines are a valuable asset, representing a regular source of cash through the sale of milk and providing inputs for increasing crop productivity in mixed crop-livestock systems.

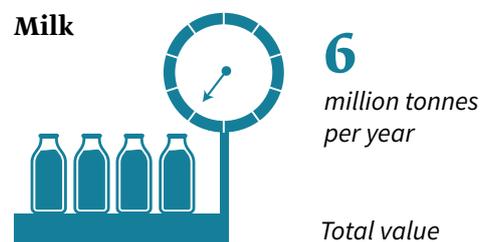
More than **1.8 million households** keep **cattle and buffaloes**



## Bovine meat



## Milk



Total value  
 **USD 8 billion**

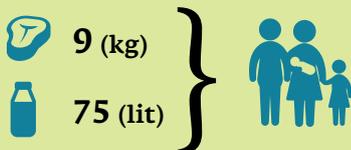
## Livelihoods



About **1.8 million households** keep **cattle or buffaloes**.

Bovine animals contribute to **household income, food security** and **nutrition**, and provide meat and milk to the broader Egyptian population

**Per capita consumption** of beef and cow milk is **9 kg** and **75 litres** per year, respectively



## Public health



While meat and milk from cattle contribute to food security, **zoonotic diseases**, which jump from animals to humans, might **negatively affect public health**



**Inappropriate use of antibiotics** in cattle and buffalo farms might contribute to **antimicrobial resistance in humans**



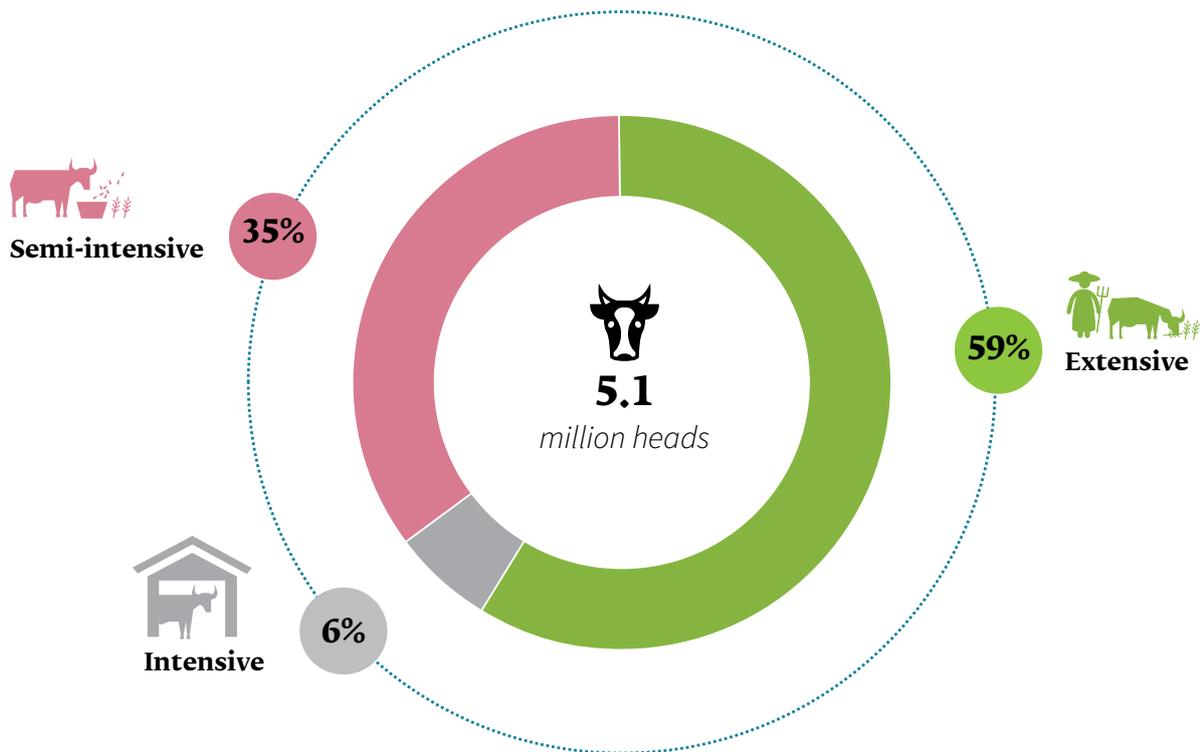
## Environment



As bovine animals are major users of land water, **ineffective production practices** contribute to **soil and water pollution**

Large ruminants are a major emitter of **Greenhouse Gas Emissions**, such as through feed production, cattle methane emission and transport. These vary by production system, and are the lowest in intensive system and the higher in intensive ones.

- Intensive = **1 298**
  - Semi-Intensive = **12 359**
  - Extensive = **10 397**
- (CO<sub>2</sub>e) per year, thousand tonnes



There is heterogeneity among the households / farms that raise cattle and buffaloes, but three main production systems dominate:

● **Intensive system**

It is a high-input high-output production system that includes dairy, beef and buffalo farms. There are about 14 000 registered intensive cattle and buffalo farms in Egypt, with herd size that varies from 10 to over 1 000 heads. In total, about 6 percent of all bovines in the country are kept in intensive farms. Dairy farms mainly keep exotic animals, while both exotic and crossbred animals are used for meat production. Productivity is high as farmers have sufficient finance to purchase good quality feed and to access veterinary services, though animals are also vaccinated through large government vaccination campaigns.

● **Semi-intensive system**

It is a production system that, while using modern production and husbandry practices, presents mixed levels of efficiency. The herd size ranges from 10 to more than 50 heads of cattle and buffaloes,

and often varies by season. About 35 percent of all bovines in the country are kept in this system. Semi-intensive livestock farmers keep mainly local breeds and produce both milk and meat for the market. They have access, though not necessarily on a regular basis, to both private and public veterinary services but also vaccinate their animals during the government vaccination campaigns.

● **Extensive system**

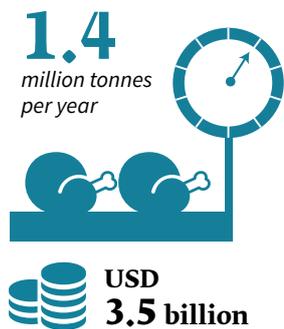
It is a low input-low output system. Farmers keep herds of between 1 to 10 indigenous cattle and buffaloes, often in conjunction with some cropland. Production inputs, including veterinary services, are limited. About 59 percent of all cattle and buffaloes are kept in this system though, as farms are often unregistered, accurate statistics are not available. Milk is the main product: it is self-consumed, used to feed calves as well as sold for cash either locally, e.g. to neighbours, or to milk collectors. Only a small share of the milk produced is processed to make cheese and ghee.

# Poultry today

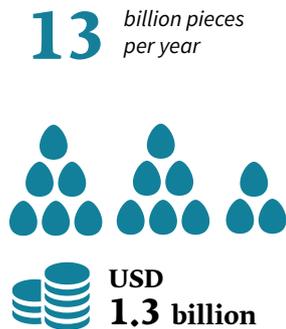
**E**gypt's poultry population comprises about 1.5 billion birds that produce over 13 billion eggs and 1.4 billion tonnes of poultry meat per year, valued USD 1.3 billion and USD 3.5 billion respectively. The country is largely self-sufficient in both poultry meat and eggs.

The poultry sector comprises a number of large companies raising grand parent stocks and that provide chicks for both commercial layer and broiler farms. At the same time, about 7.5 million households partly or fully depend on poultry for their livelihoods, both in urban and rural areas. For many, poultry keeping facilitates regular access to nutrient animal protein.

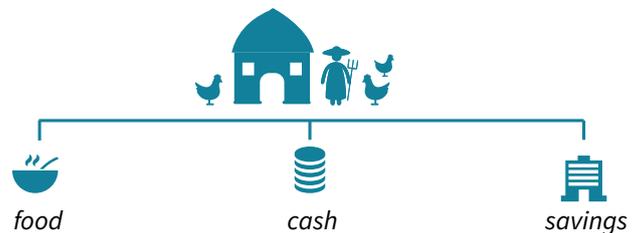
## Poultry meat



## Egg production



## 7.5 million households keep chicken



## Livelihoods



About **7.5 million households** keep poultry

Poultry contribute to **household income, food security and nutrition** through the regular provision of meat and eggs

About **2.5 million people** are directly and indirectly employed in the **commercial poultry sector**

**Per capita supply of chicken meat and eggs** is about **15 kg** and **140 eggs** per year, respectively



## Public health



**Zoonotic diseases**, and in particular avian influenza that jump from animals to humans, might **negatively affect public health**



**Inappropriate use of antibiotics** in poultry farms might contribute to **antimicrobial resistance in humans**



## Environment



Mismanagement of poultry litter result in **point source pollution of soil and water**

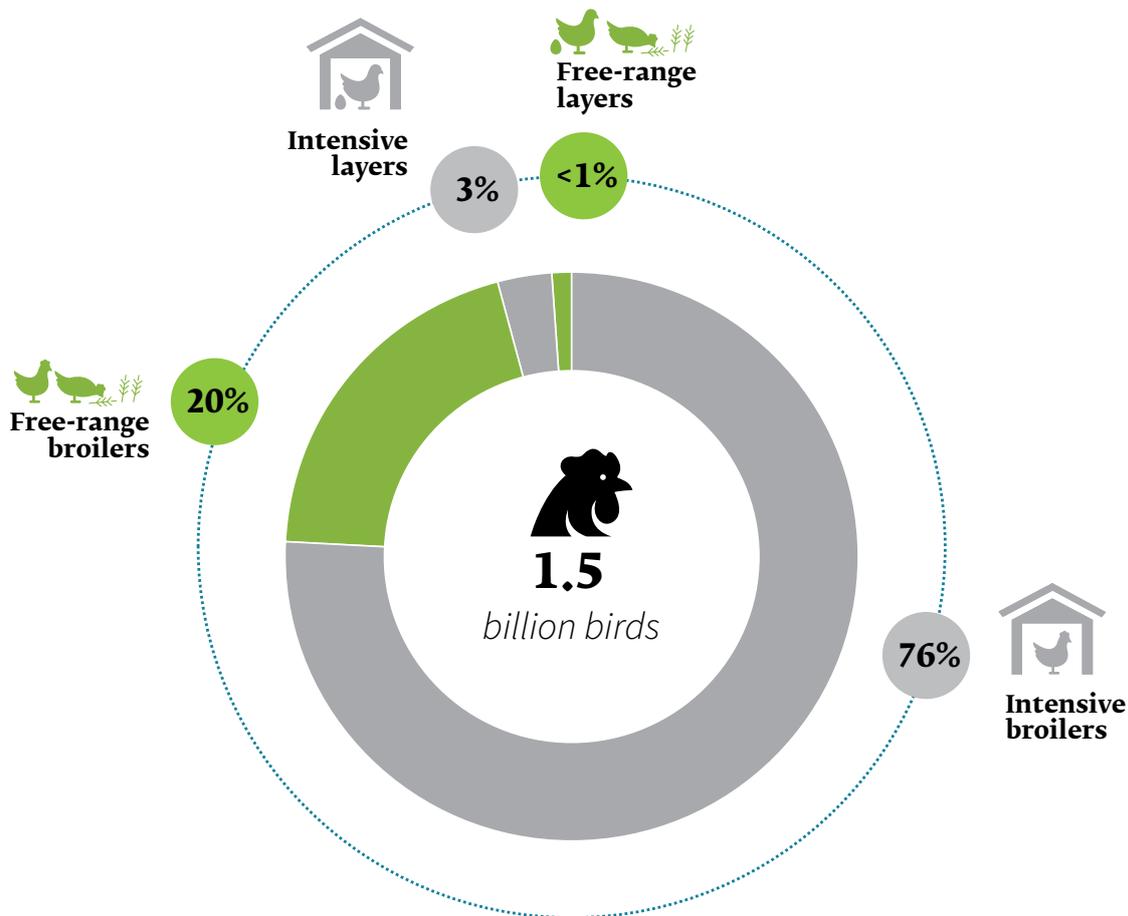
**Greenhouse Gas Emissions** from poultry is higher in intensive than extensive systems, but poultry production has, in general, a **low emission intensity per kilo of product**

Systems:

● Intensive systems = **20 066**

● Free-range systems = **683**

(CO<sub>2</sub>e) per year, thousand tonnes



There are two major poultry production systems in Egypt, the free-range or extensive system and the intensive system.

● **Free-range (extensive)**

It is a heterogeneous production system, comprising about 21 percent of all birds raised in the country. It includes households / farms keeping from few birds up to 1 000 birds in all rural, peri-urban and urban areas both for meat and egg production. The business is family-run, with usually no any hired labour and only basic investments in infrastructure; production practices are rudimentary, with limited biosecurity. Regular vaccination – such as against Avian Influenza, Infectious Bronchitis and Newcastle Disease – is only practiced by those with large flock and who are commercially oriented.

● **Intensive**

It is a high-output high-input production system, comprising about 76s of all poultry raised in the country. It comprises about 27 000 registered farms (in 2016) as well as a number of unregistered farms. Chicken meat and eggs are produced for the market. The business model is an “all-in all-out” system, with batches of baladi improved or exotic cockerels and chickens entering and exiting the farm in unison on a cycle basis. For broiler production, small to mid-size commercial farms have 4-5 cycles a year, while large integrated farms have 7-8 cycles per year. Biosecurity is high, though with different degrees. About 2.5 million people are estimated to be employed along the commercial poultry value chain.

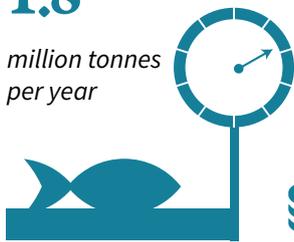
# Fishery today

**F**ish is an important source of nourishment for the Egyptian population as it accounts for 25 percent of the total household's protein intake. Production reaches about 1.8 million tonnes, with aquaculture contributing about three quarter of the total country's fish production. The sector contributes about 10 percent to the total value of agricultural production. Egypt is a net importer of fish products.

## Fish production

**1.8**

million tonnes  
per year

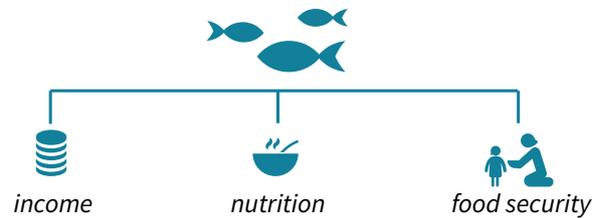


Value

USD  
**2.8**  
billion



About **815 000**  
depend on **fishery**



The fishery sector provides livelihoods to about 815 000 persons (665 000 employed in capture fishery and 150 000 in aquaculture), contributing to income, nutrition and food security. Egypt is a net importer of fish.

## Livelihoods



About **815 000 households** depend on fishery for their livelihoods

Fishery contributes to food security and nutrition through the provision of animal protein to the population

**Per capita supply of fish product** is about **21.5 kg** per year



**21.5 (kg)**



Fishery products contribute **25 percent to the protein intake** of the Egyptian population

## Public health



A number of **food borne diseases** result from improper fish management practices, associated for instance to **inappropriate cooling facilities, excessive use of chemicals** in ponds and, more in general, **poor biosecurity practices**

**Locations of ponds close to latrines, livestock and poultry farms** might lead to contaminated fish meat

The **improper use of antibiotics in aquaculture** might contribute to antimicrobial resistance in humans

## Environment



In the medium- to long-term, **overfishing** not only reduces the total fish available for human consumption but also contributes to loss of biodiversity at the species and low genetic diversity leading to ecosystem degradation in the Mediterranean and the Red Sea

**High density of fish**, which produces waste, result-with other factors- in **eutrophication**, i.e. excess of nitrogen and phosphorous in the ecosystem of which one of the effects is the **algal blooms** toxic to humans and animals

**Improper waste management** from aquaculture, including solid and dissolved waste, might result in environmental pollution

Aquaculture and capture fishery contribute 80 and 20 percent to the total Egypt fish production, respectively.



### Aquaculture - Semi-intensive ponds

Semi-intensive pond aquaculture is the dominant aquaculture system in the country. The majority of the ponds are between 2 and 8 hectares, and located in the northern and eastern parts of the Nile Delta where they utilize both brackish and freshwater. Intensity of production and efficiency levels vary greatly across farms, with annual production levels ranging from 2.8 to 8 tonnes per hectare. About 125,000 hectares are used for semi-intensive aquaculture production, including government and private farms.



### Aquaculture - Intensive ponds

Intensive aquaculture is based on well-designed and constructed earthen ponds (sometimes lined with polyethylene sheets). Ponds are small, averaging between 0.4 and 0.6 hectares, deep between 1.5 and 1.75 meters, and aerated with electrical paddle wheels to allow continuous water renewal. The main species grown are tilapia, mullets and catfish.



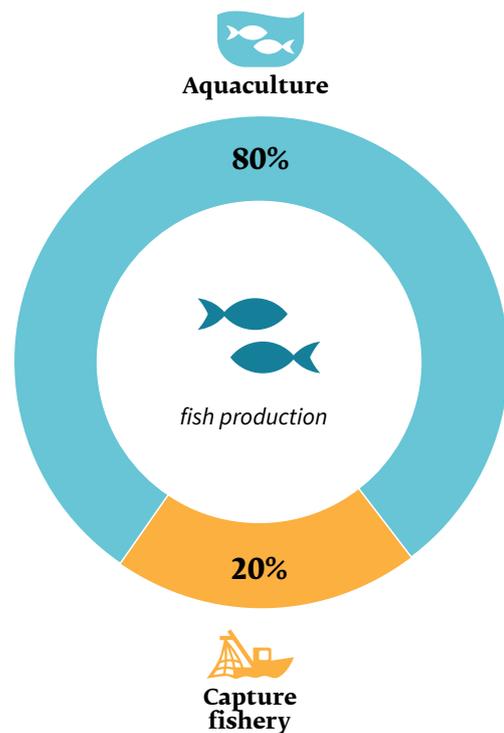
### Aquaculture – cage production

It involves growing fishes enclosed in a net in natural water resources. Cage production is common in most northern part of the Nile delta. Over 110 million cubic meters of cages are currently in operation.



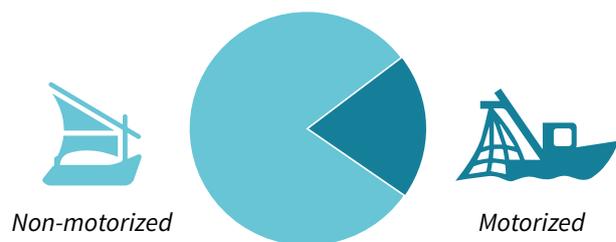
### Aquaculture - Poly-culture in rice paddy fields

Poly-culture in rice paddy fields has been practiced in Egypt since the mid 1980s: it involves growing rice along with fish that is harvested at the end of the rice-growing season. The quantity of fish production varies depending on the acreage dedicated to rice production, which in turn depends on water availability.



### Capture fisheries

Capture fisheries is practiced in both marine water (Red Sea and Mediterranean Sea) and fresh water (Nile River and lakes), with the latter contributing almost 70 percent of production.



Statistics indicate there are about 31 000 fishing vessels in Egypt, of which about 20 percent are motorized. There is variation in catch across the years, with a general declining trend.



# Livestock and fishery in 2050: four scenarios

The Egypt population will grow by about 50 percent in the next 30 years. Will the livestock and fishery sectors be able to provide a sufficient amount of animal protein to 150 million Egyptians in 2050? Which policies should the government pursue?

# Knowns

## Long-term policies and strategies

Two major strategies guide the long-term development of Egypt, and of its livestock and fishery sectors. The **Sustainable Development Strategy: Egypt Vision 2030** “represents a foothold on the way towards inclusive development. It has followed the sustainable development principle as a general framework for improving the quality of lives and welfare, taking into consideration the rights of new generations of a prosperous life; thus, dealing with three main dimensions; economic, social, and environmental dimensions.”

The **Sustainable Agricultural Development Strategy 2030** (SADS 2030) aims at “modernizing Egyptian agriculture based on achieving food security and improving the livelihood of the rural inhabitants, through the efficient use of development resources, the utilization of the geopolitical and environmental advantages, and the comparative advantages of the different agro-ecological regions.”

**SADS 2030** notes that “Increasing per capita animal protein consumption is one of the main objectives of developing animal, poultry and fisheries production, and reconstituting the animal food basket from the different sources in favour of the least-costly local resources”. It highlights that “protecting livestock, poultry and fisheries against veterinary endemic and trans-boundary diseases” and “protecting consumers against common diseases transmitted from animals to humans” are pre-conditions to sustainably increased animal protein consumption.

## Megatrends, 2015-2050

### POPULATION

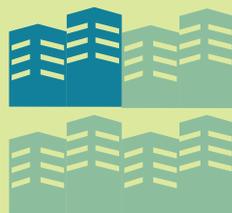
**+50%**  
from **100** to **150** million



In the next decades, the supply of livestock and fishery products should increase to satisfy the animal protein requirements of the growing population

### URBANIZATION

**+115%**  
from **40** to **85** million



### CLIMATE CHANGE

Temperatures will be much warmer



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

### TECHNOLOGY

Automation technologies and big data will improve productivity in all sectors



Production practices, and value chains will be markedly different than today both for livestock and fishery products.

Estimated **increases in animal food production** necessary to satisfy the dietary requirements and reduce import dependence **by 2050**



**Beef, poultry and fish supply = +109%**

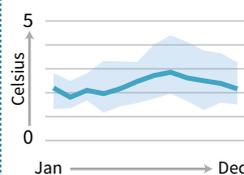


**milk +290%**

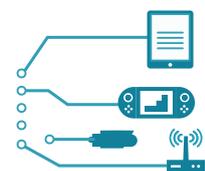


**eggs +162%**

Projected **increase in monthly temperature** with respect to today: **2040 -2059**



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



# Unknowns

Peace and stability, market integration between Northern Africa and Europe, the use of drones for the provision of livestock services and improvements in feed efficiency in aquaculture are examples of unpredictable factors that will influence the future of the livestock and fishery sectors.

However, there are two bottom line uncertainties that will largely shape how the Egyptian livestock and fishery sectors will be in 2050: the future policy framework and the future investment framework.



## POLICY FRAMEWORK

The policy framework includes laws, rules and procedures that provide (dis)incentives for actors along the livestock and fishery value chains to comply with good practices, which support sustainable production in the long-term. At the extremes, the policy framework could be either enabling or wicked.

### Enabling policy framework

full compliance with good practices

### Wicked policy framework

poor compliance with good practices



## INVESTMENT FRAMEWORK

The investment framework includes government actions that provide (dis)incentives for actors along the livestock and fishery value chains to make short, medium and long-term investments for the development of the livestock and fishery sectors. At the extremes, the investment framework could be either enabling or wicked.

### Enabling investment framework

incentives for major investments

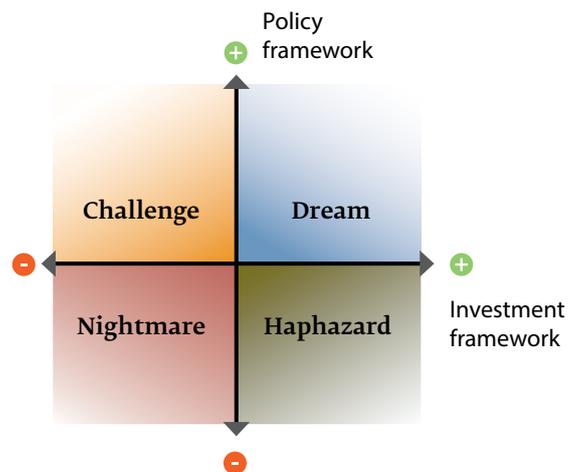
### Wicked investment framework

little incentives for any investment

Pairing the governance and the economic uncertainties allows constructing four possible scenarios for Egypt in 2050.

## SCENARIO NAMES

The four scenarios – named the **DREAM** الحلم, the **HAPHAZARD** العشوائية, the **CHALLENGE** التحدي and the **NIGHTMARE** الكابوس – shed light on how the known and unknown factors of the future might differently interact to result in alternative, yet all plausible futures for Egypt and its livestock and fishery sectors.



The four scenario provide insights to decision makers on priority areas for policies and investments that, while avoiding that Egypt ends up in the Challenge, the Nightmare or the Haphazard scenarios, build the foundations for achieving the Dream Scenario.

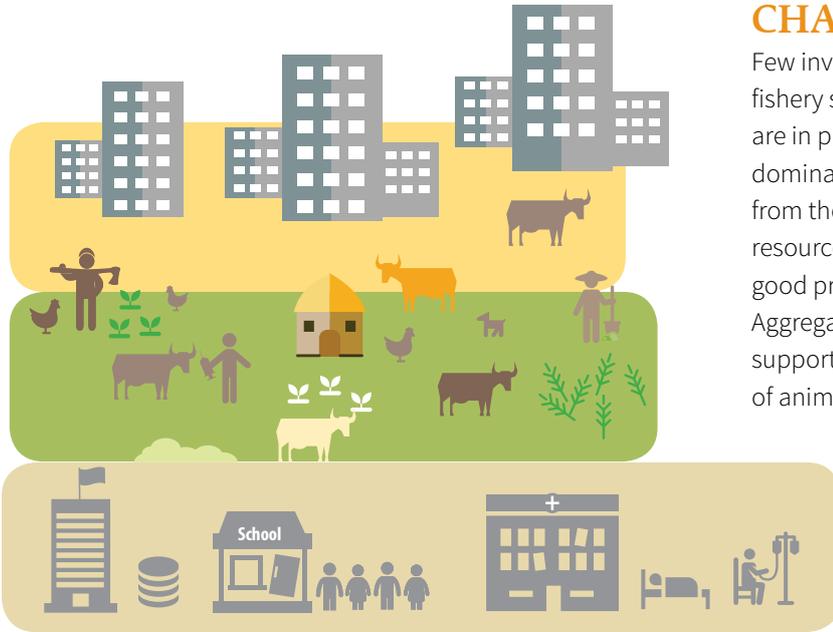
# Egypt 2050 scenarios

POLICY framework  

## التحدى

### CHALLENGE

Few investments are made in the livestock and fishery sectors, but effective laws and regulations are in place. Semi-intensive production systems dominate. Producers derive a decent livelihood from their business but, because of limited resources, not always are in a position to adopt good production and husbandry practices. Aggregate protein production is insufficient to support a healthy diet, and Egypt is a net importer of animal products.



 INVESTMENT framework 



## الكابوس

### NIGHTMARE

Given poor policy and investment frameworks, the livestock and fishery sectors are largely dominated by small, inefficient and disorganized producers. Productivity is low, animal diseases widespread, with zoonoses and food-borne diseases affecting humans, and the livestock and fishery sectors significantly contributing to environmental pollution and degradation. Egypt faces serious challenges in ensuring its citizens have access to a sufficient amount of animal protein and the country is a net importer of meat, milk and fish products.

POLICY framework  



## POLICY framework



### الحلم

#### DREAM

Enabling policy and investment frameworks result in semi-intensive and intensive livestock and fishery production systems that are environmentally sustainable and effectively manage diseases and public health threats. Sustainable mega-farms operate in the country, which adopt cutting-edge production technologies and practices. The aggregated production of animal protein is sufficient to support a healthy diet and Egypt is a net exporter of animal products.



## INVESTMENT framework



### العشوائية

#### HAPHAZARD

There are few large producers and value chain actors that dominate the livestock and fishery sectors and several smallholders that rely upon few domesticated animals / marginal fishing activities for their livelihoods. There is overexploitation of natural resources, environmental degradation and animal diseases, often resulting in public health threats, are widespread. Egypt is unable to produce a sufficient amount of animal protein to support a healthy diet and is a net importer of animal products.



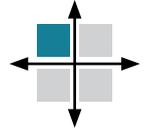
## POLICY framework





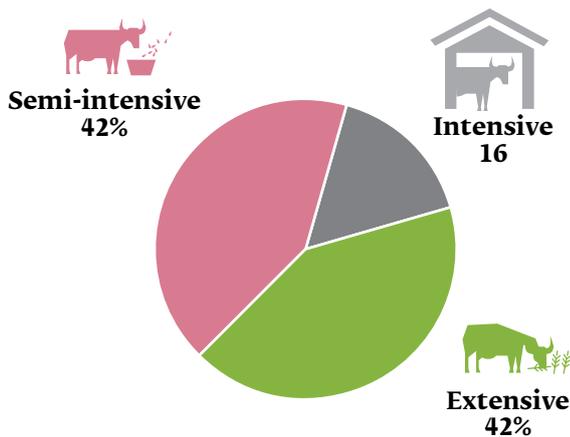
# The Challenge

## التحدى



### PRODUCTION SYSTEMS

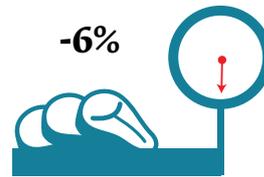
The bovine population has increased by about 0.5 million heads with respect to today. Semi-intensive and extensive production systems account both for 42 percent of all bovine animals, with the intensive system playing a marginal role (16 percent).



### PRODUCTION LEVEL

Beef production has somewhat decreased with respect to today, while milk production has reached almost 10 million tonnes per year.

#### Beef production



#### Milk production



### PER CAPITA SUPPLY

Per capita domestic supply of beef has gone down by about 4 kilos per year, assuming imports stay constant. Per capita milk supply has increased by almost two kilos, reaching about 76 kilos per person per year.

#### Per capita supply per year

	Today	2050
Beef (kg)	9	↓
Milk (kg)	75	↑

### Livelihoods



There are no major changes with respect to today, neither in terms of number of cattle/buffalo keepers nor in terms of the benefits they derive from keeping bovine animals.

### Public health



While good policies are in place, there are limited resources available for their implementation. As a result, there is increased risk of zoonotic diseases and inappropriate use of antibiotics in livestock farms.

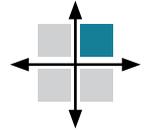
### Environment



The good policy framework ensures effective laws and regulations are in place, though lack of resources limit the government's capacity to monitor their implementation, with increased risks of bovine-related environmental pollution and degradation.

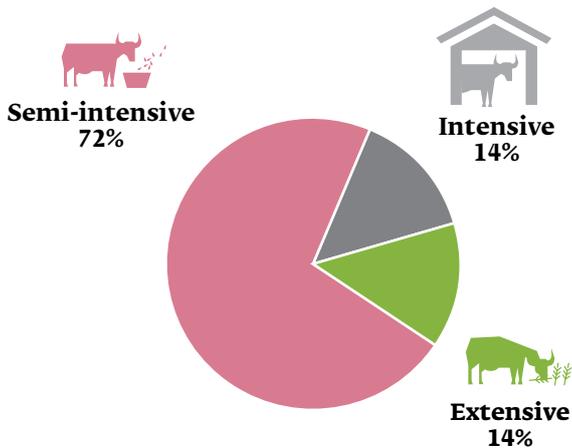
# The Dream

## الحلم



### PRODUCTION SYSTEMS

The total bovine population has increased by about 1.9 million heads with respect to today, comprising about 7 million animals in 2050. Semi-intensive production systems dominate, accounting for about 71 percent of the total number of bovine animals. Intensive and semi-intensive production systems contribute 14 percent each to the total bovine population.

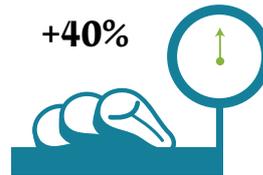


### PRODUCTION LEVEL

Beef production has increased to reach 800 000 tonnes per year, that is by about 40 percent with respect to today. Milk production has gone up by almost 300 percent.

#### Beef production

+40%



#### Milk production

+300%



### PER CAPITA SUPPLY

Per capita domestic supply of beef has gone down with respect to today. Conversely, per capita milk consumption has increased and is about 158 kilos per person per year.

#### Per capita supply per year

	Today	2050
Beef (kg)	9	↓
Milk (kg)	75	↑

### Livelihoods



Bovine production systems increasingly contribute to the livelihoods of farmers in all production systems. Well-paid jobs are generated in semi-intensive and intensive production systems and the associated value chains.

### Public health



High biosecurity at farm level and product traceability result in a marginal if any negative impact of bovine systems on public health. Outbreaks of zoonotic diseases are rare and effectively controlled, while farmers make limited and always appropriate use of antibiotics.

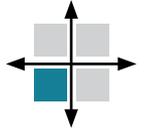
### Environment



There is an increase in GHG emissions from bovines kept in semi-intensive and intensive production systems, though good practices are in place for manure management. Water consumption per unit of product decreases, but total water use from the sector goes up. Local breeds are protected.

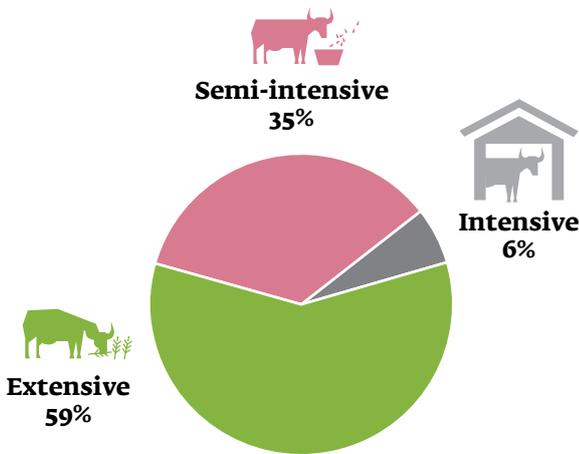
# The Nightmare

## الكابوس



### PRODUCTION SYSTEMS

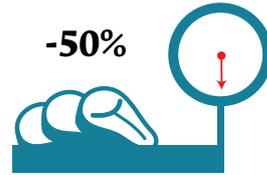
The total bovine population has gone down by almost two million heads with respect to today. The extensive production system dominates, accounting for 59 percent of all bovine animals. The semi-intensive production systems (35 percent) and the intensive production systems (6 percent) follow.



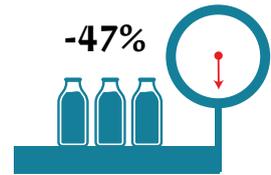
### PRODUCTION LEVEL

Beef production is less than half with respect to today, while milk production levels have not changed much (around 9 million tonnes per year).

#### Beef production



#### Milk production



### PER CAPITA SUPPLY

Per capita domestic supply of both beef and milk has gone down dramatically with respect to today, being about 3.5 and 30 kilos per person per year, respectively.

#### Per capita supply

per year

	Today	2050
Beef (kg)	9	↓
Milk (kg)	75	↓

### Livelihoods



There is a major decline in the number of households keeping bovines, who derive limited benefits from their animals. Low productivity also results in limited availability of beef and milk for the population.

### Public health



Incidence and prevalence of zoonoses is high, both among the bovine population and among humans. Inappropriate use of antibiotics in animal farming contributes to severe antimicrobial resistance in humans.

### Environment



While the decline of the bovine population with respect to today results in reduced pressure on the environment, rudimentary production and husbandry practices, associated with inappropriate manure and waste management, lead to major environmental damage.

### Findings



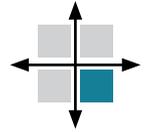
In the Dream اللحم scenario bovine production systems are sustainable; semi-intensive production systems dominate and farmers adopt sustainable production and husbandry practices,

though there is the risk that high density of bovine animals in circumscribed location pollutes the environment.

In all other scenarios, production systems are unsustainable, with public health threats due to outbreaks of zoonotic diseases and inappropriate use

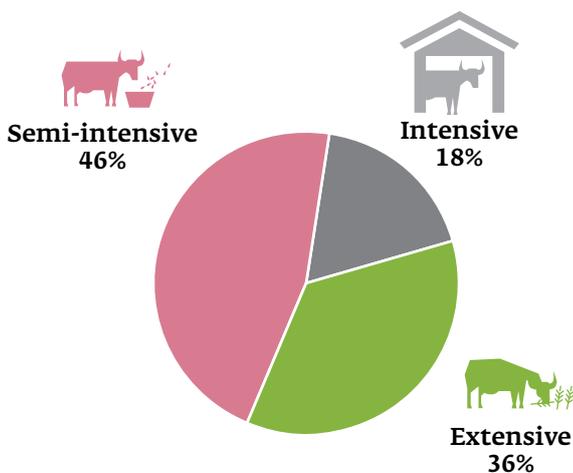
# The Haphazard

## العشوائية



### PRODUCTION SYSTEMS

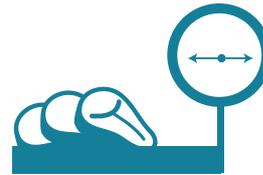
The total number of bovine animals has increased by **over 4 million heads** with respect to today. Semi intensive production systems dominate, accounting for about 46 percent of all bovine animals, followed by the extensive (36 percent) and the intensive systems (18 percent).



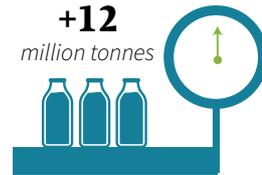
### PRODUCTION LEVEL

Beef production has not shown any significant increase with respect to today. Milk production has increased to reach over 12 million tonnes.

#### Beef production



#### Milk production



### PER CAPITA SUPPLY

Per capita domestic supply of beef has gone down by over 1 kilo per year, assuming imports stay constant. Per capita milk supply has increased to reach 82.5 kilos per person per year in 2050.

#### Per capita supply

per year

	Today	2050
Beef (kg)	9	↓
Milk (kg)	75	↑

### Livelihoods



The total number of households keeping bovines has increased with respect to today. As many of them are semi-intensive and intensive farmers, they also derive fair benefits from their animals.

### Public health



Because of ineffective policies, cattle production systems end up generating a number of public health threats, both through outbreaks of zoonotic diseases and inappropriate use of antibiotics.

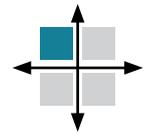
### Environment



The increased number of large ruminants exercises tremendous pressure on soil and water. There is high risk of environmental pollution and degradation due to the ineffective legal and regulatory framework.

of antibiotics, and increased environmental degradation due to poor manure and waste management. In all scenarios, per capita beef consumption has reduced with respect to today, highlighting the challenges to sustainably produce beef in the country. Only in the Dream اللحم

scenario availability of milk is sufficient to ensure food security and a healthy diet for the entire population.

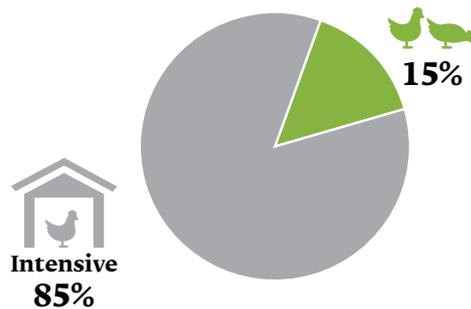


# The Challenge

## التحدى

### PRODUCTION SYSTEMS

The poultry population has increased by about 1.5 billion birds with respect to today. Intensive production systems dominate, accounting for about 80 to 90 percent of all the poultry population in the country.

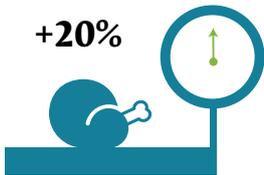


### PRODUCTION LEVEL

With respect to today, poultry meat production has gone up by about 20 percent and egg production by almost 200 percent. This difference in growth rate is due to the fact that eggs are more affordable for consumers than poultry meat.

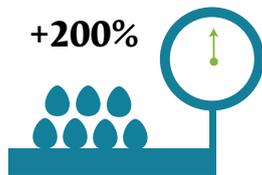
#### Poultry meat

+20%



#### Egg production

+200%



### PER CAPITA SUPPLY

Per capita domestic supply of poultry meat has gone down by about 3.5 kilos with respect to today, while per capita egg supply has doubled from 7 to 14 kilos per year.

#### Per capita supply per year

	Today	2050
Poultry meat (kg)	15	↓
Egg (kg)	7	↑

### Livelihoods



With respect to today, there is a slight increase in the number of people employed in the poultry sector. However, the economy is weak and households and farmers derive little benefits from their birds.

### Public health



While good policies are in place, little resources are available for their full implementation. As a consequence, there is significant risk of zoonotic disease outbreaks and inappropriate use of antibiotics in poultry production.

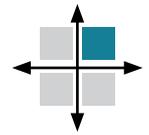
### Environment



Even though the legal and regulatory frameworks are appropriate, lack of resources induce farmers to adopt inappropriate waste management practices, resulting in soil, water and air pollution in intensive production systems.

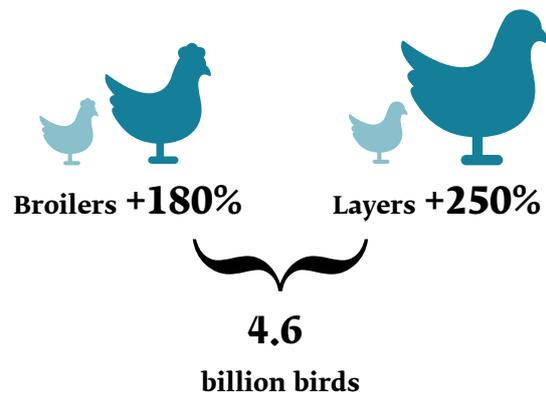
# The Dream

## الحلم



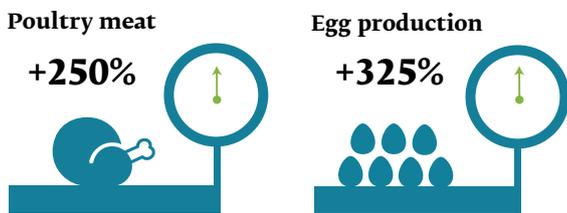
### PRODUCTION SYSTEMS

The number of layers has increased by about 250 percent in comparison with today and that of broilers by about 180 percent. The standing poultry population has reached about 4.6 billion birds.



### PRODUCTION LEVEL

Poultry meat production has increased by around 250 percent with respect to today, reaching over 5 000 000 tonnes, while egg production by about 325 percent, from 700 000 to 3 000 000 tonnes per year.



### PER CAPITA SUPPLY

Per capita domestic supply of both poultry meat and egg has increased - by about 185 and 130 percent respectively. Over 34 and 20 kilos of poultry meat and eggs are available per year on a per capita basis.

Per capita supply per year		
	Today	2050
(kg)	15	↑
(kg)	7	↑

### Livelihoods



There have been major transformations of the poultry sectors with respect to today, with the almost disappearance of the free-range production system. Most benefits for society comes from the wide availability of cheap and safe poultry products for the population.

### Public health



Strict biosecurity practices are adopted in all production systems, which reduces to a minimum the risk of outbreak and spread of zoonotic diseases. The use of antibiotics in poultry farms is well regulated and monitored by the government.

### Environment



Good waste management practices are in place and the negative impact of poultry production systems on the environment is negligible. Local poultry breeds, however, have almost vanished.

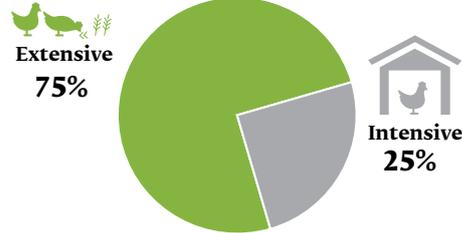
# The Nightmare



## الكابوس

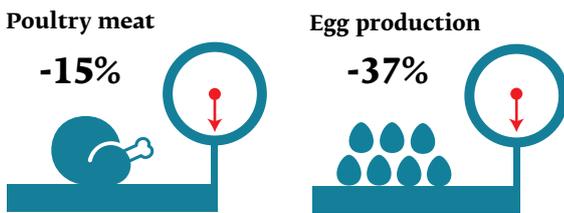
### PRODUCTION SYSTEMS

The poultry population has not increased much with respect to today. The free-range / extensive production system is in this scenario the dominant one, accounting for about 75 percent of all the poultry population.



### PRODUCTION LEVEL

Poultry meat production has reduced by about 15 percent with respect to today, while egg production by about half. Productivity has gone down, by 15 and 37 percent for poultry meat and eggs, respectively.



### PER CAPITA SUPPLY

Per capita domestic supply of both poultry meat and eggs has gone down dramatically with respect to today, by about 44 and 65 percent, respectively

Per capita supply per year		
	Today	2050
Poultry meat (kg)	15	↓
Eggs (kg)	7	↓

### Livelihoods



A large number of households keep birds in free-range production systems. However, as productivity is low, poultry contribute little to their livelihoods, and few if any jobs are generated along the poultry value chain.

### Public health



Poultry creates major public health threats, largely because of regular outbreaks of zoonotic diseases in free-range systems. Inappropriate use of antibiotics in intensive system might also contribute to AMR in humans, though the market for poultry products is limited.

### Environment



There are no major negative impacts of the poultry sector on the environment, largely because the largest share of birds is kept in free-range systems. Improper waste management practices in intensive and semi-intensive production systems contribute to pollution of soil and water in circumscribed areas.

### Findings

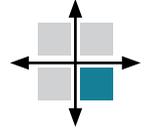


In the Dream **الحلم** scenario poultry production systems significantly contribute to ensure a healthy diet for the population, as the per capita

supply of poultry meat and eggs suffices to satisfy the dietary requirements indicated by the Arab Centre of Nutrition. In all other scenarios, the availability of poultry meat reduces while that of eggs is insufficient to support food security. Poultry generates serious

# The Haphazard

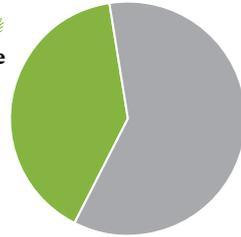
## العشوائية



### PRODUCTION SYSTEMS

With respect to today, the poultry population has increased by about 600 million birds. About 40 percent of all poultry are raised in extensive production systems, which dominate the production landscape

  
Extensive  
40%



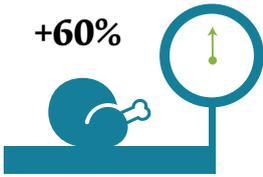
  
Intensive  
60%

### PRODUCTION LEVEL

Poultry meat and egg production have increased by about 60 and 88 percent, respectively. Most of the increased production is explained by the larger bird population, as productivity has marginally changed with respect to today.

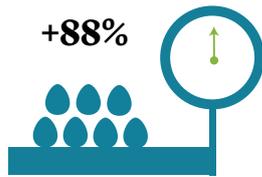
Poultry meat

+60%



Egg production

+88%



### PER CAPITA SUPPLY

In comparison to today, the per capita domestic supply of poultry meat has gone down by about 1 kilo, while egg availability has increased by about 1.5 kilo per year per person.

#### Per capita supply

per year

	Today	2050
 (kg)	15	↓
 (kg)	7	↓

### Livelihoods



There is a dual poultry sector, with a number of backyard farmers deriving little income from their birds, and intensive poultry farms suffering from input and output market volatility.

### Public health



There is high risk of outbreaks of zoonotic diseases because of the ineffective regulatory framework, particularly in free-range systems. Conversely, farmers in intensive systems often make inappropriate use of antibiotics, contributing to AMR in humans.

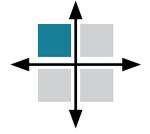
### Environment



There is a negative impact of the poultry sector on the environment, largely because of poor waste management. Biodiversity loss is a concern, because of no any policy in place to protect local breeds.

public health and environmental threats in the Challenge **التحدى**, the Haphazard **العشوائية** and the Nightmare **الكابوس** scenarios. Production systems are largely sustainable in the Dream **الحلم** scenario, though a number of households have left the

poultry sector and this scenario contributes to people's livelihoods more through the provision of affordably-priced and safe animal protein than through farm income and employment generation.



# The Challenge

## التحدى

### PRODUCTION SYSTEMS

Aquaculture continues dominating the production landscape. Within aquaculture, cage production, which is less resource intensive than pond aquaculture, contributes significantly more than today to production.



cage production > pond production

### PRODUCTION LEVEL

There is some increase in capture fishery production. Conversely, total fish production from aquaculture, because of limited investments, has hardly changed in comparison to today.



Aquaculture



Capture fishery

### PER CAPITA SUPPLY

Per capita domestic supply of fish, currently at 21.5 kilos per person per year, has reduced to 13 kilos per capita, assuming no any change in the current trade balance.

#### Per capita supply

per year



### Livelihoods



Fishery contributes less to people's livelihoods than today as, in spite of an effective policy framework, no any major increase in production and productivity is anticipated due to limited investments in the sector.

### Public health



Good policies are in place but, as limited resources are available, there are frequent cases of food poisoning as well as of occupational injuries caused by the utilization of badly maintained equipment.

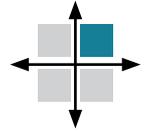
### Environment



Due to inability to enforce laws and regulations, there is increased misuse of natural resources, leading to pollution, continued biodiversity loss and marine ecosystem degradation.

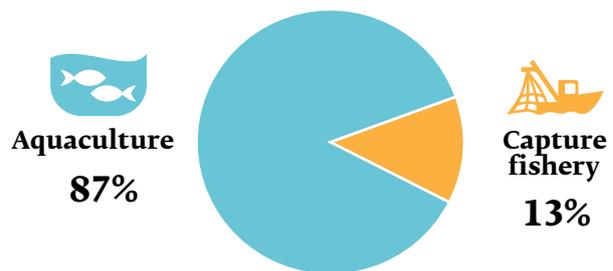
# The Dream

## الحلم



### PRODUCTION SYSTEMS

Aquaculture is by far the most important form of production (87 percent of all production) with capture fishery playing a minor role (around 13 percent).



### PRODUCTION LEVEL

There is a significant increase in fish production, both in aquaculture and capture fishery. In the Dream *الحلم* scenario, production reaches 4.3 million tons, an increase of about 135 percent in comparison to today.



### PER CAPITA SUPPLY

Per capita domestic supply increases to 28 kilos per year, which allows reducing to marginal level any import of fish products.



### Livelihoods



With respect to today, there is a major shift toward capital-intensive aquaculture that results in a reduced number of people employed in the sector, at least in relative terms. There are affordably-priced fish products for consumers.

### Public health



There are effective laws and control mechanisms in place from pond to fork – such as to ensure a sustainable use of hormones – that reduce to the minimum any negative impact of fishery on public health.

### Environment



Production practices are highly sustainable, which assists in reducing the negative impact of fishery on the environment. However, there are risks of marine ecosystem stress if species and location of marine cages are not appropriately selected and controlled.

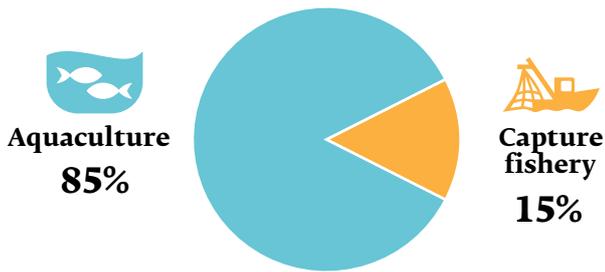
# The Nightmare



## الكابوس

### PRODUCTION SYSTEMS

Aquaculture continues dominating the production landscape (85 percent of all production) with capture fishery contributing the remainder (about 15 percent).



### PRODUCTION LEVEL

There is a significant reduction in total fish production (-25 percent) with respect to today, largely accounted by a dramatic reduction in aquaculture productivity.



### PER CAPITA SUPPLY

Per capita supply of fish products has reduced by more than half, reaching about 9 kilos per person per year vis-à-vis about 21.5 kilos today .



### Livelihoods



The number of people employed in the fishery sector has gone down with respect to today. At the same time, there is a reduction in the benefits households derive from both capture fishery and aquaculture.

### Public health



While the regression of aquaculture might reduce the negative impact of the fishery sector on human health, inappropriate production practices result in frequent food-borne diseases and occupational injuries.

### Environment



Low levels of production result in reduced but negative pressure on natural resources. Production practices are not environmentally sustainable, resulting in pollution from aquaculture and overfishing in circumscribed zones.

### Findings

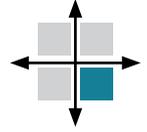


In the Challenge *التحدى*, the Haphazard Future العشوائية and the Nightmare *الكابوس* scenarios

there is a reduction in per capita fish availability, which results in food insecurity and malnutrition. In other words, neither good policies nor significant investments on their own suffice to support a sustainable transformation of the

# The Haphazard

## العشوائية



### PRODUCTION SYSTEMS

Capture fishery becomes increasingly marginal, while the contribution of aquaculture to total fish production goes up by about 10 percent. Semi-intensive ponds and cage production dominate.



### PRODUCTION LEVEL

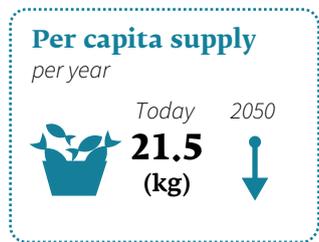
There is a slight increase in total fish production with respect to today, largely due to investments in semi-intensive aquaculture production systems.



Aquaculture semi-intensive production systems

### PER CAPITA SUPPLY

With respect to today, per capita domestic supply of fish products has gone down by about over 6 kilos per year, and is about 15 kilos on a per capita basis.



### Livelihoods



An increased number of people are employed in the fishery sector with respect to today. However, most of them derive little benefits from both capture fishery and aquaculture as ineffective policies prevent good returns on investments.

### Public health



There is high risk that fishery production generates negative impact on human health, such as through the inappropriate use of pharmaceuticals and hormones in aquaculture production systems.

### Environment



Poor waste management in aquaculture and overfishing in capture fishery, such as through destructive fishing techniques, lead to environmental pollution and stressed ecosystems.

fishery sector, which also negatively affects public health and the environment. In the Dream اللحم scenario, characterized by a process of sustainable intensification through growing investments in aquaculture, the fishery sector

sustainably provides a sufficient amount of animal protein to the population, thereby contributing to food and nutrition security and to a healthy diet.



# Towards sustainable livestock and fishery sectors in 2050

A One Health approach supporting production intensification is essential to ensure that, by 2050, Egypt will sustainably produce 8 million tonnes of meat (beef, poultry and fish), 23.4 million tonnes of milk and 1.8 million tonnes of eggs per year, which is the amount of animal protein necessary to satisfy the dietary requirements of about 150 million Egyptians.

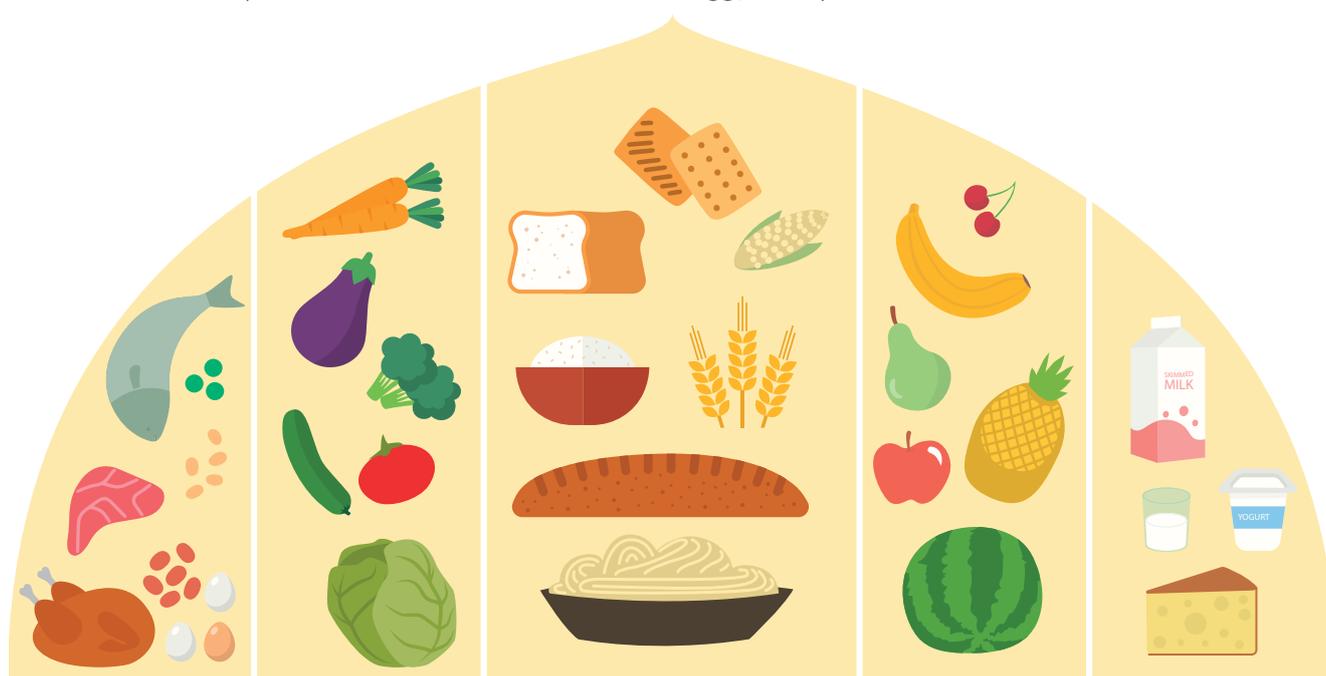
# Livestock and fishery policy targets for 2050

The Challenge التحدى, the Nightmare الكابوس, the Haphazard Future العشوائية and the Dream الحلم scenarios convincingly indicate that both an enabling policy framework and an enabling investment framework are necessary for Egypt to sustainably increase the supply of animal protein and ensure a healthy diet in 2050 for its growing human population. Indeed, it is only in the Dream الحلم scenario that the aggregate supply of animal protein more than meets the dietary requirements of the population – Egypt is even a net exporter of animal protein in 2050 in that scenario – while in all other scenarios there is food insecurity and malnutrition due to the limited availability of meat, milk, eggs for the population.

To avoid ending up in the Challenge التحدى, the Nightmare الكابوس and the Haphazard العشوائية scenarios, the Egypt government should first of all ensure that, over the next decades, an enabling policy framework is in place, which is a pre-condition for a strong public-private sector partnership resulting in major investments in the livestock and fishery sectors.

The Dream الحلم scenario represents an ideal world epitomized by the maximum levels of sustainable animal protein production the country can achieve.

Achieving the Dream الحلم scenario would thus be a gargantuan task, also considering there are multiple priorities on the policy agenda as highlighted in the Sustainable Development Strategy 2030. These include, for instance, to “ensure that all girls and boys complete free, equitable and quality primary and secondary education”, “achieve universal health coverage” and “ensure universal access to affordable, reliable and modern energy services”. However, underpinning the Dream الحلم scenario there is the policy objective that, by 2050, Egypt should be in a position to produce at national level a sufficient amount of meat – including beef, poultry meat and fish – milk and eggs for a healthy diet of 150 million people. This means, taking in consideration the dietary guidelines developed by the Arab Centre of Nutrition and discussed by Egypt stakeholders, that in 2050 anyone could consume, on a daily basis, 0.16 kg of beef/poultry/fish; 0.5 lit of milk; and one egg, in any form.



A first step towards achieving the Dream **الحلم** scenario is to ensure that in 2050, on the one hand, the supply of animal protein is at least sufficient to ensure a healthy diet for 150 million Egyptians and, on the other, that national production is equal to the national supply, i.e. that Egypt is self-sufficient in animal protein. Taking into account population growth, age composition, food loss along the value chain and the purchasing power of the different population segments, Egypt stakeholders calculated that to meet the dietary guidelines for animal protein of a 150 million population and ensure self-sufficiency, in 2050 the country should produce about 8 million tonnes of beef, poultry and fish combined, 23.4 million tonnes of milk and and 1.85 million tonnes or 32.8 billion eggs per year.

The production targets involve increasing in the next 30 years the aggregate production of meat, milk and eggs by 74, 290 and 162 percent, respectively. These are actionable targets if one considers that, for instance, between 1985 and 2015 national meat, milk and egg production have increased by 250, 290 and 150 percent, respectively. However, increased resource scarcity will possibly make more challenging than in the past supporting such growth rates. It is for this reason that, along the lines of 2050 Sustainable Agricultural Development Strategy, fish and poultry will become the main meats consumed by the Egyptian population, whose intake of beef will conversely reduce. Beef production, in fact, is particularly resource-intensive and, at the same time, beef is the most expensive source of animal protein and often unaffordable for the less well-off contrary, for instance, to poultry meat and fish from aquaculture.

Supply targets provide a first indication for designing policies and investments for the future. The next challenge is to speculate how the systems of production should be in 2050 to supply a sufficient amount of animal protein for the growing population. Starting from the results of the Dream **الحلم** scenario, stakeholders agreed that achieving the production targets requires:

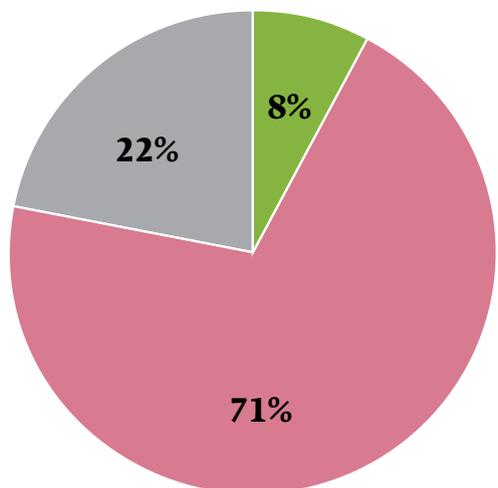
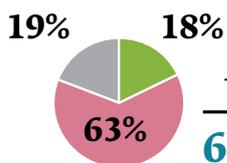
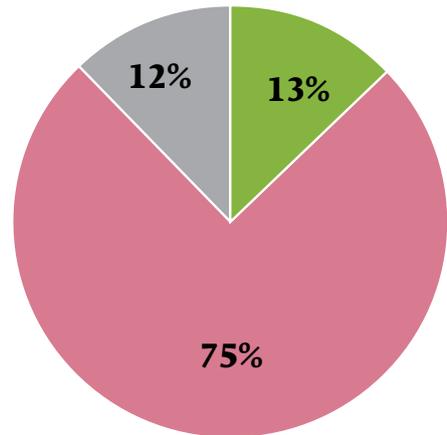
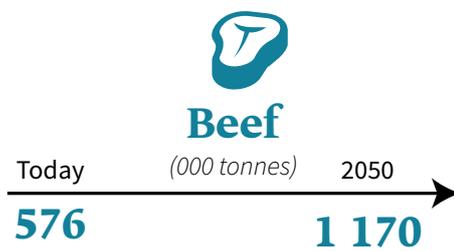
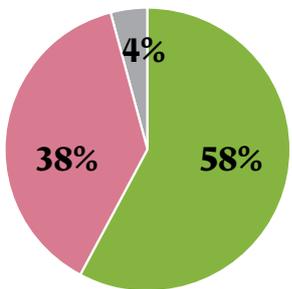
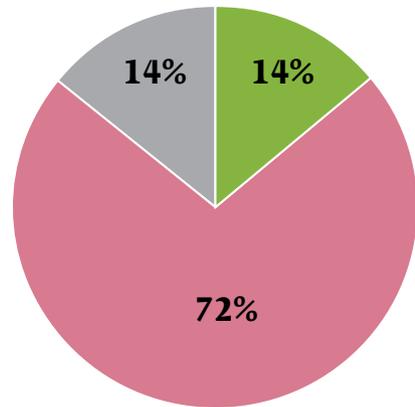
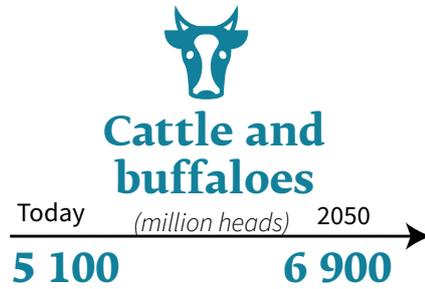
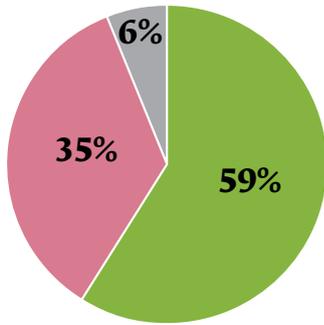
- Increasing the bovine population by about 1.8 million head (+36 percent), to reach over 6.9 million animals in 2050. Most importantly, in 2050 about ¾ of all bovines should be raised in semi-intensive production systems, the most actionable in the Egypt agro-ecological setting. Today, the semi-intensive systems comprise about 35 percent of all bovines.
- Increasing the standing poultry population by about 1 billion bird, from about 1.5 today to over 2.5 billion in 2050. About 99 percent of all birds should be kept in intensive broiler and layer farms in 2050, vis-à-vis 75 percent today.
- Increasing the contribution of aquaculture to about 87 percent of the total fish production vis-à-vis 80 percent today, with a corresponding reduction in the role of capture fishery. In 2050, semi-intensive ponds should be the backbone of the fishery sector, contributing about 60 percent to total fish production.
- While there will be increases in productivity for all commodities in all production systems – for instance the carcass weight should average 320 kilos per bovine and 1.3 kilos per broiler in 2050 vis-à-vis 280 and 1.3 kilos, respectively – it is the major transition from extensive to semi-intensive and intensive production systems that will mainly contribute to achieve the production targets.

	Total production <sup>1</sup> thousand tonnes			Per capita supply kg		
	Today	2050 target	% increase	Today <sup>2</sup>	2050 target	% increase
<b>Meat</b>	3 850	8 060	109	46.3	53.7	16
	1 450	3 200	121	15.5	21.3	38
	576	1 160	101	9.3	7.7	-16
	1 823	3 700	103	21.6	24.7	14
<b>Milk</b> 	6 000	23 400	290	74.8	156.0	109
<b>Eggs</b> 	706	1 850	162	7.1	12.3	75

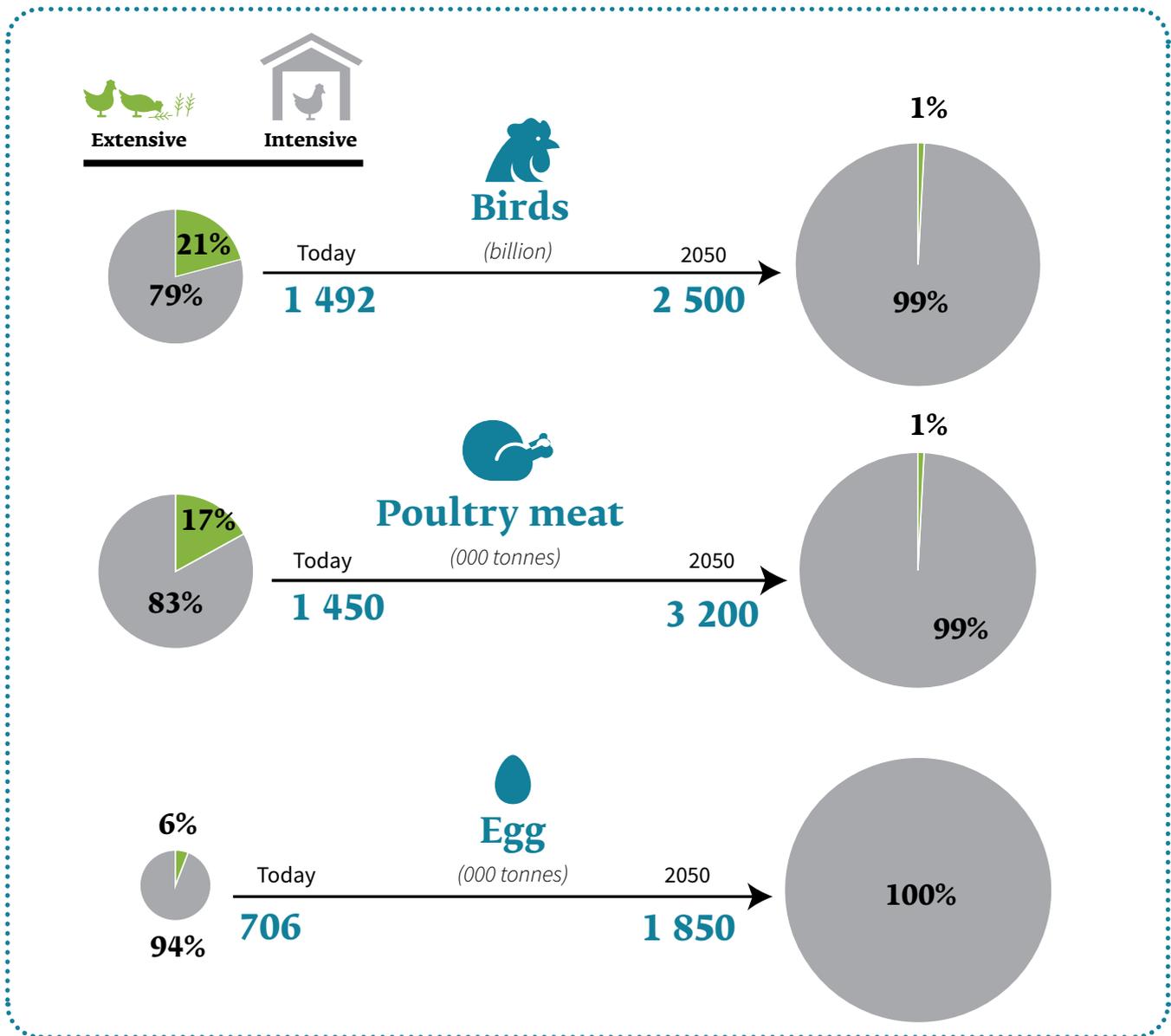
<sup>1</sup>Excluding imports

<sup>2</sup>Including imports

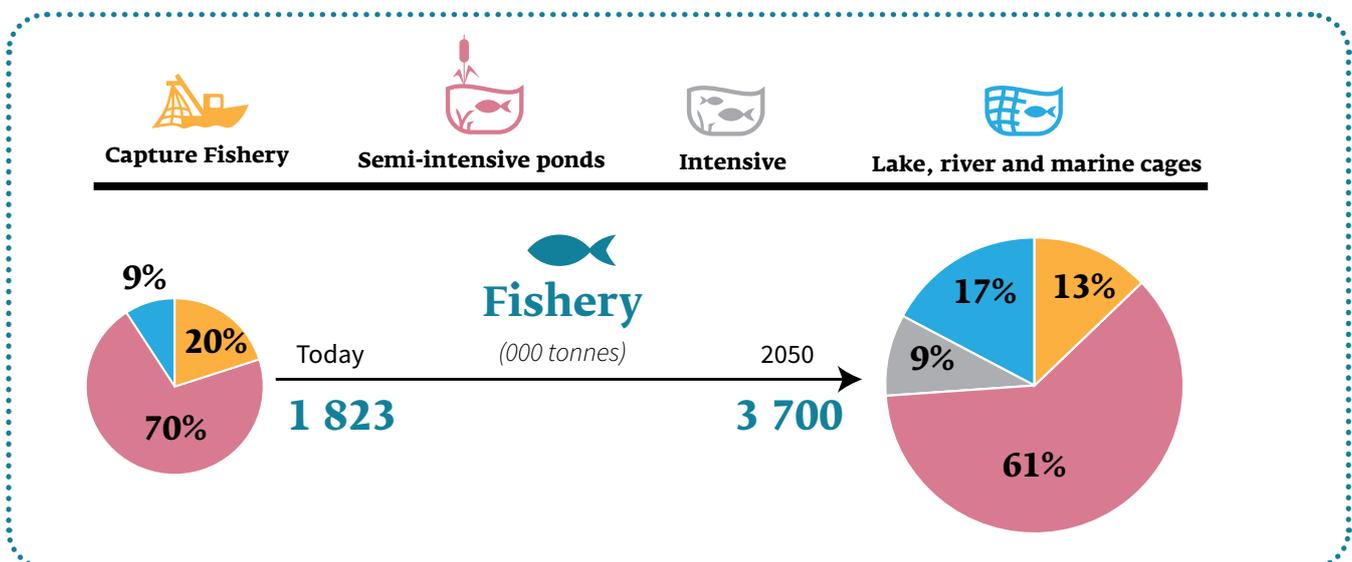
# Cattle, buffaloes, beef and milk targets by production system



## Poultry, poultry meat, egg targets by production system



## Fishery production targets by production system



# Emerging zoonotic diseases: a key challenge

The proposed transformation of the livestock and fishery production systems entails not only technical but also One Health challenges, because of the multiple linkages between the livestock and fishery sectors and food security and nutrition, public health and the environment.

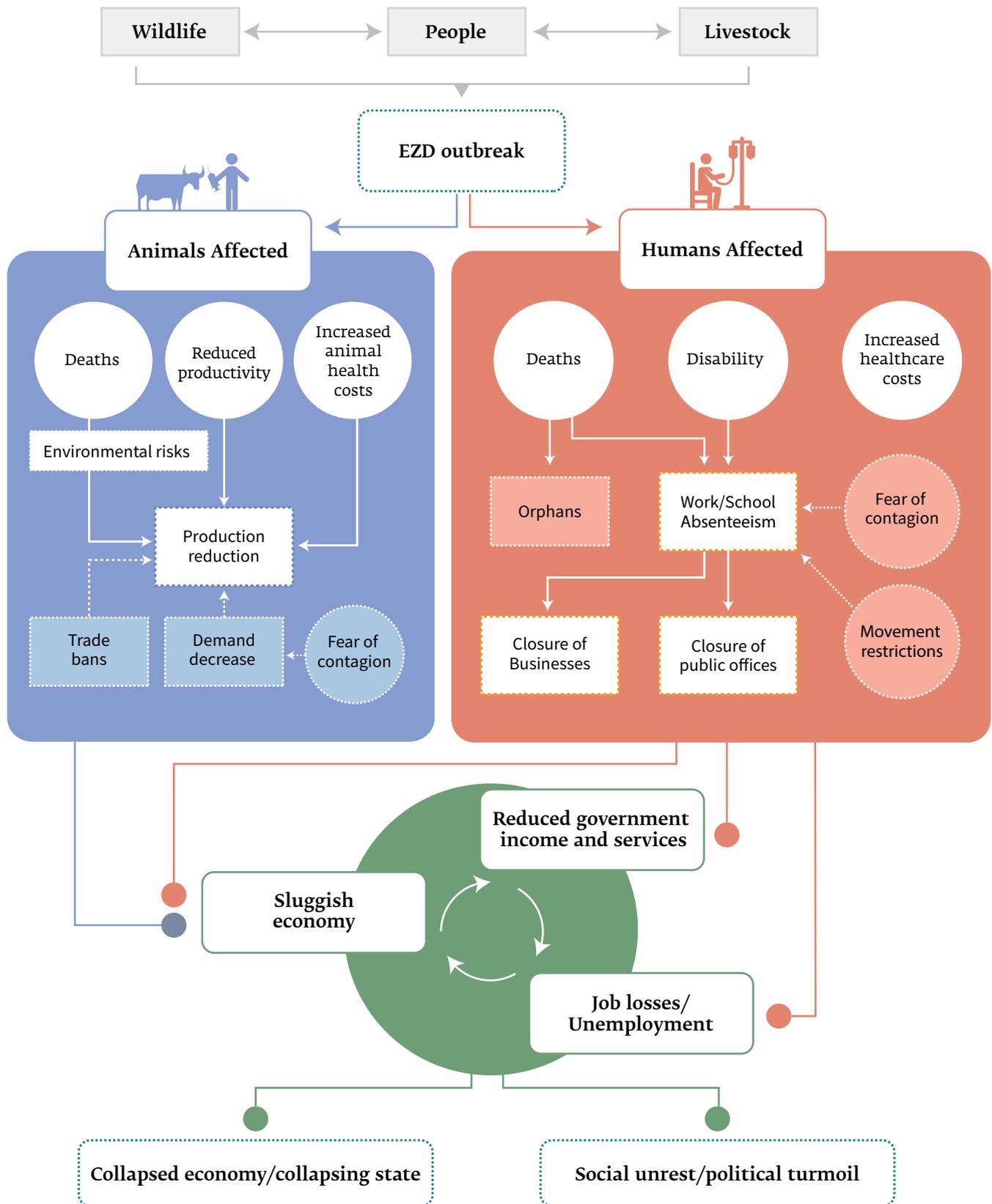
Indeed, the Challenge التحدى, the Nightmare الكابوس, and the Haphazard العشوائية scenarios warn us that inappropriate intensification of production might result in loss of livelihoods and unemployment; pollution of soil, water and air; and public health threats due to outbreaks of zoonotic diseases and inappropriate use of antibiotics in livestock and fishery farms. These risks will escalate and evolve unpredictably along the process of livestock and fishery transformation, because of higher density of animals and humans amidst shifting production systems and novel value chains serving increasingly well-off consumers, particularly urban dwellers.

Most of the One Health related-risks the transformation of livestock and fishery sectors will bring about tend to cumulate over the years, such as the level of livestock-related water pollution and the use of antibiotics in livestock and fish farms. An effective monitoring system should be thus put in place to prevent, detect and control those risks. However, it is all but straightforward to assess and monitor the risk of emergence and spread of zoonotic diseases, as measuring risk levels requires regularly collecting and interpreting data on dozens of variables explaining outbreaks and spread of zoonotic diseases, such as on animal density, climate-vegetation factors, infrastructure availability and stakeholders' behaviour. Yet, an outbreak of a (re-)emerging zoonotic disease (EZD) that jumps to humans – such highly pathogenic avian influenza – might not only negatively affect the livestock 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. (Morse et al., 2012). Eventually, EZDs might trigger social unrest and destabilize governments by eroding public trust and confidence and, when spreading rapidly across countries, regions and continents, they can even turn into worldwide pandemics. For this reason, an effective system to prevent, detect and control EZDs is almost a precondition for ensuring any sustainable transformation of the livestock and fishery sectors, and of Egypt's society as a whole.

To sum up, achieving a sustainable transformation of the livestock and fishery sectors that ensures a healthy diet for a 150 million population in 2050 requires that policies and investments support a transition from extensive to semi-intensive and intensive production systems. This transition, however, will not only improve livelihoods and food security but also bring about a multitude of social, environmental and public health challenges, because of novel and more frequent interactions between humans and livestock in a resource-constrained natural environment. A multidisciplinary and multi-stakeholder One Health approach should be adopted to deal with these challenges. However, while dealing with public health and environmental challenges that manifest themselves through incremental effects on society is relatively straightforward, the real challenge is to manage the risk of outbreaks and spread of emerging and emerging infectious diseases that, if uncontrolled, might jeopardize the entire development trajectory of Egypt in the coming decades.

# Potential impact of an outbreak of an emerging zoonotic disease (EZD)



# Conclusions

**M**ultiple plausible futures await Egypt's livestock and fishery 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 among which governance and the economic system are extremely critical.

This report presented four internally consistent scenarios of what the livestock and fishery sectors might turn out to be in 2050. The four scenarios – named the Dream **لحم**, the Haphazard **العشوائية**, the Challenge **التحدى** and the Nightmare **الكابوس** – indicate that an unfriendly policy and investment framework risks to steer the livestock and fishery sectors along unsustainable development trajectories, with major negative impacts on the environment and public health and limited contribution to food security and nutrition. However, the Dream scenario suggests that Egypt can well support a sustainable development of the livestock and fishery sectors, able to satisfy the animal protein requirements of a growing population and with minimal if any negative impact on both the environment and public health.

An enabling policy and an enabling investment framework necessary for a public-private sector partnership that results in a sustainable transformation of the livestock and fishery sectors in the coming decades. This transformation, characterized by a process of production intensification, will ensure that by 2050 a sufficient amount of meat, milk and eggs will be available for consumers to have a healthy diet. It will also be characterized by the adoption of a One Health approach to effectively manage emerging environmental and public health challenges associated with novel and more frequent interactions between humans, animals and the environment in which they operate.

The government of Egypt is taking bold steps to support a sustainable transformation of the livestock and fishery sectors through the operationalization of its current of policies and

**Policies and investments to prevent, detect and control outbreaks of infectious zoonotic diseases are a precondition for ensuring a sustainable transformation of the livestock and fishery sectors**



programmes. At this stage, it is of paramount importance to prioritize the implementation of all actions necessary to create an enabling policy and investment framework as well as increase the country capacity to prevent, detect and respond to outbreaks of emerging zoonotic diseases (EZDs). The risk of EZDs is going to escalate in the coming decades, particularly in areas with high density of humans and people. An EZD that goes uncontrolled can have devastating impact on the livestock and fishery sectors, on human health and, in the worst scenario, it might even jeopardize the entire development trajectory of the country.

The government of Egypt and the FAO, in the context of the Africa Sustainable Livestock 2050 Programme, will continue advocating for and supporting a One Health multi-disciplinary multi-stakeholder process to operationalize existing policies and strategies, with the specific objectives to (i) create an enabling policy and investment framework for a sustainable development of the livestock and fishery sector and (ii) improve the capacity of stakeholders to detect, prevent and control outbreaks and spread of emerging and re-emerging zoonotic diseases. This is a catalytic and instrumental for the sustainable long-term development of the livestock and fishery sectors, and of Egypt's society as a whole.

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