Food and Agriculture Organization of the United Nations

AFRICA SUSTAINABLE LIVESTOCK 2050

Tranforming livestock sector

UGANDA

What do long-term projections say?

The Republic of Uganda

USAID FROM THE AMERICAN PEOPLE

Financial support provided by the United States Agency for International Development (USAID)

ASL 2050

1. Introduction

Africa is in the midst of simultaneously unfolding and substantial, unprecedented, urban, socio-economic, policy and technological transitions. The UN predicts that, in 2050, the African population will reach 2.5 billion, from 1.2 billion today, and that 56 percent of the population will live in urban areas, vis-à-vis 40 percent today (UN, 2017 and 2018). Gross domestic product, currently at USD 4,7 trillion, is estimated to almost triple by 2050 (FAO, 2018), resulting in increased purchasing power for African consumers. An emerging middle class will support the democratization of the continent, further reinforcing economic growth and development (AfDB, 2011). Basic infrastructure, such power supplies and communications, will be increasingly available, allowing Africa to benefit from technology development and, in the best case, to use technology to leapfrog over some of its current and emerging challenges (Swarth, 2011).

These rapid transitions will have major implications for African agriculture, which will be challenged to supply affordably-priced, nutritious and safe food to an increasingly affluent and urbanized population. Evidence from other regions suggests the sector will undergo two major structural transformations in the coming decades. The first is that, while the quantity and value of agriculture production will increase, the contribution of the sector to GDP and employment will reduce. Currently, agriculture accounts for 17.5 and 11.7 percent of GDP and contributes 57 and 22.3 percent to total employment in sub-Saharan Africa and North Africa, respectively. In high income countries, these shares are less than 2 and about 3 percent, respectively (WDI, 2018). The second transformation is that livestock will become one of the most important sectors of agriculture in value terms. Today, it accounts for 25 percent of agricultural value added in Africa, and to 55 percent and 67 percent in North America and Western Europe, respectively (FAOSTAT, 2018). The reason is that, as economic development progresses, increasingly well-off consumers will move away from a predominantly cereal-based diet and start purchasing the high-value proteins that meat, milk and other livestock products offer, as well as fruits and vegetables. This trend in animal source food consumption pattern, often referred to as Livestock Revolution (Delgado *et al.*, 1999), will profoundly affect the development of African livestock in the coming decades.

This note presents long-term projections, for the period 2012-2050, of key socio-economic and livestock-related variables for Uganda, as estimated by the FAO Global Perspective Studies Team for a reference projection[1] (Box 1). Projections base year is taken from FAOSTAT (Box 2). Projections for a sustainable and an unequal development trajectory, which are not presented here, are slightly different but the overall trends stay the same.

Long-term projections do not reflect the current policy thrust, as they capture the fundamental forces underpinning society's growth and transformation. However, by identifying the opportunities and challenges associated with long-term livestock trends, they provide an essential piece of information to decision makers when designing country policies and strategies. For example, evidence of a growing demand for animal source foods points to an opportunity for inclusive agricultural development, e.g. through the creation of jobs along the livestock value chain. On the other hand, evidence of increased livestock production should draw attention to potential environmental and public health threats, e.g. because of manure and wastewater mismanagement, the emergence of zoonotic diseases with pandemic potential, and the proliferation of antimicrobial resistant pathogens.

[1] The FAO's Global Perspective Studies Team has developed a recursive dynamic multi regional multi commodity partial equilibrium model – the Global Agriculture Perspectives System (GAPS) – which simulates the evolution of national and international agro-food markets and solves for supply, demand and prices that equilibrate markets by equating world supply and demand. This brief presents GAPS draft livestock-related projections for Uganda, for discussion and validation with national stakeholders.

The next section presents 2012-2050 trends in the drivers of livestock sector transformation in Uganda, including population growth, urbanization and GDP per capita. Section three and four explore trends in the demand and supply of major livestock products, as well as of the animal population over the period 2012-2050. Section five summarizes the main evidence and suggests decision-makers should build on long-term projections to explore how a transformed livestock sector will affect people's livelihoods, the environment and public health in the decades ahead. This allows anticipating coming opportunities and emerging challenges, and taking decisions now for the livestock sector to develop sustainably in the long term.

Box 1. The reference projection

In the reference projection, the future develops according to socio-economic, technological and environmental global trends similar to those that have been observed historically. Population growth is high in sub-Saharan Africa with moderate increases in per capita income. Persistent inequalities jeopardize social cohesion, with medium to high unemployment rate. Local conflicts persist amidst broader international instability. Developing countries find it often difficult to provide quality education to the population, and access to health-care services remains a challenge. Current trends of moderate reduction in extreme poverty are maintained, with modest improvement in food security. In terms of diets, there is a marginal shift towards the consumption of more nutritious and processed food, with consumers exhibiting limited willingness to pay for environmental services. Food waste and losses continue at current levels. Agricultural land expands and there are modest gains in agricultural productivity. Innovation is largely generated by the private sector, with limited benefits for smallholders, and yields are variably affected by climate change. Deforestation continues at its current rate, land degradation is only partially addressed and, while water efficiency improves, the lack of major changes in technology leads to the emergence of more water-stressed countries. GHG sequestration is limited, and GHG emissions from agriculture contribute to the world's average temperature increasing by 0.8-1.8 °C by 2050 relative to the period 1986–2005. In this future, both challenges for access and utilization, as well as for sustainable food stability and availability range from a medium to a high level.

Box 2. Base year data

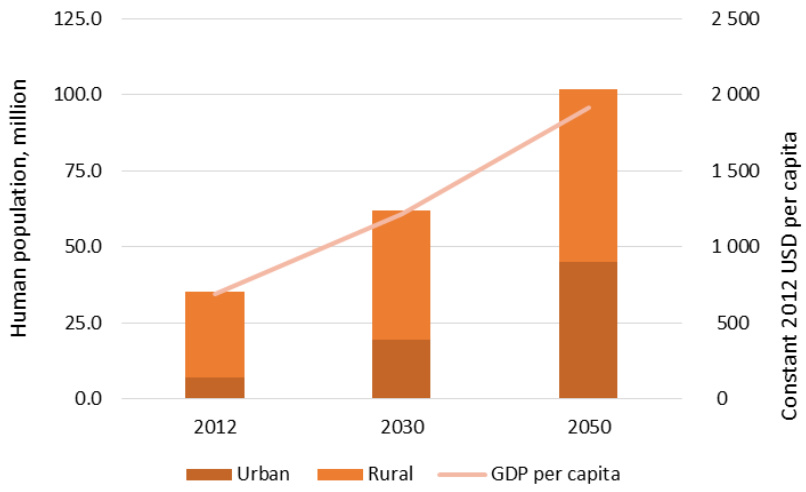
The FAO reference projection, as generated by the Global Perspective Studies Team, builds upon base year data for agricultural-related variables as in FAOSTAT, including data on livestock population and on production and on supply of animal source foods for human consumption FAOSTAT assembles data from FAO member countries either through annual production questionnaires distributed to countries, from national publications (e.g. Statistical Yearbooks) or from official country websites. The sourced data originate from surveys, administrative records or estimates based on expert observations. FAOSTAT records data as countries report them, with validation focusing on transmission errors, outliers' detection and data consistency. For example, the current value of a variable should be consistent with its past values and with the value of associated variables (e.g. milk production level should be consistent with the number of animals producing milk). When no official data is available, because for example countries do not report to FAO or do not collect data on certain items, FAOSTAT either relies on data from non-official sources or estimate them, though the accuracy of the imputation is uncertain because of the many underlying assumptions. In this latter case, FAOSTAT data are not necessarily aligned with country level statistics, with the differences explained by the ultimate source of the data and the imputation method used. Any difference between the base year data presented here and available country statistics is not an issue for the purpose of this note, whose aim is to appreciate long-term dynamics and relative changes in livestock-related variables. The base year in

FAO GAPS is created by averaging FAOSTAT data for the years 2011, 2012, and 2013 and is referred to as "2012".

2. Changing drivers in the demand for animal source foods

The demand for animal source foods in a country is influenced by three major factors. The first is the human population: the larger the population, the larger the demand for livestock products, and of any other food and non-food products and services for that matter. The second is income per-capita, as consumers' purchasing power is positively associated with consumption of animal source foods. Once nutritional requirements are met, however, further increases in disposable income do not translate into increased intake of calories, proteins and other nutrients. The third factor is urbanization. Urban dwellers are typically better-off than rural households and can allocate a larger share of their food budget to purchase "luxury" food items as the availability of infrastructure, such as cold chains (electric power), allows trading and storing perishable products, including milk and meat (Satterthwaite *et al.*, 2010).

Fig 1. Uganda: Current and projected population and GDP per capita, 2012-2030-2050



Source: UN 2017, 2018; SSP, 2016

The drivers of the demand for animal source foods are anticipated to dramatically change in the coming decades in Uganda. From 1980 to 2012, the Ugandan population grew by 22.5 million from 12.5 to 35 million people. In the next 38 years, it is projected to increase by 67 million and reach 102 million people by 2050 (UN, 2017). About 7.5 and 20.4 percent of the Ugandan population lived in urban areas in 1980 and 2012, respectively. Projections indicate that, by 2050, 44.1 percent of the population will live in urban areas, or about 45 million people vis-a-vis 7.2 million in 2012 (UN, 2018). Kampala, the largest city in the country and with a population of 1.5 million people in 2015, is anticipated to host about 9.4 million people in 2050 (Hoornweg and Pope, 2014). GDP per capita, a proxy of consumer purchasing power, is estimated to increase from near USD 700 per capita per year to over USD 1 900, more than double increase, between 2012 and 2050 (SSP, 2016).

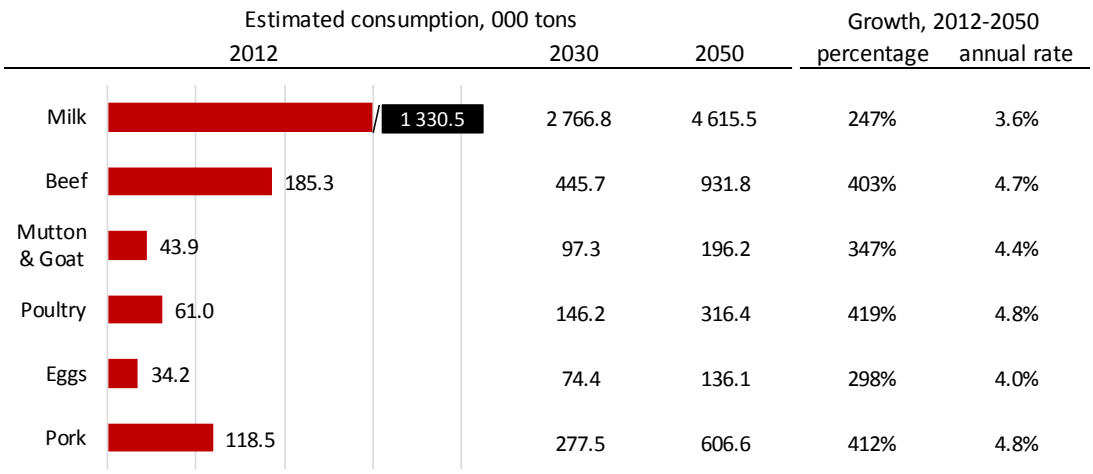
3. Projected increases in the demand for animal source foods

Population growth, urbanization and gains in real per capita income will result in an increased demand for livestock products. Fig 2 presents data on projected trends in consumption of major livestock products, including:

- Aggregate consumption, as measured by the volume of current (2012) and projected consumption level of livestock products in 2030 and 2050.
- Consumption growth, as measured by relative change and annual growth rate in consumption of livestock products between 2012 and 2050.

In the next 38 years, the aggregate consumption of all livestock products will more than triple, and about quadruple for beef, poultry and pork. On an annual basis, demand will grow between 3.6 percent for milk to 4.8 percent for poultry and pork, which translate in major increases in volume terms. For example, the volume of milk and beef consumed will increase by near 3 300 and 750 thousand tons in the next 38 years, respectively, with aggregate consumption estimated at over 4 600 thousand tons for milk and 930 thousand tons for beef in 2050. These increases in demand of livestock products represent a major opportunity for livestock producers to expand their business. At broader societal level, they are an opportunity for a growth of agriculture that supports inclusive and sustainable development.

Fig 2. Uganda: Current and projected consumption of livestock products, 2012 – 2030 - 2050



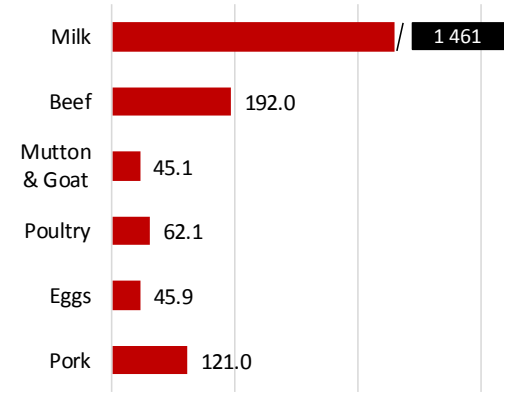
4. Projected increases in the supply for animal source foods

As a response to the growing demand for animal source foods, Ugandan livestock producers are anticipated to make investments that increase production and productivity. In the reference projection, it is estimated that, between 2012 and 2050, production of all types of meat and that of milk will increase by 164 and 41 percent, respectively. Production will increase from a minimum of 17 percent for beef to 490 percent for poultry meat, with annual growth rates ranging from 0.5 to 5.2 percent. Eventually, demand will increase more than production, worsening both the Ugandan meat and milk trade balance.

Increases in livestock production are the result of improved productivity in cattle, and both a larger animal population and improved productivity in the rest of animal products. Fig 4 suggests that, in the reference scenario, beef and milk production will improve yields, growing thanks to increased productivity counteracting a slight drop in the cattle herd size. Fig. 4 also suggest that the estimated increases in production for the rest of animal products will be mainly due to a larger animal population, more than to increases in productivity, though the latter become more and more relevant as one moves towards the future. Between 2012 and 2050, improved productivity will contribute to the whole increases in beef and milk production, and about to 16.6 percent for poultry meat. These estimates are consistent with past livestock development trajectories. In a variety of countries and regions, cattle herd size reduced. Botswana reduced its cattle stock a 67% in the 35 years from 1980 to 2015. In Western Europe, cattle herd size reduced from 142.6 million heads to 39 million in the same 35 years

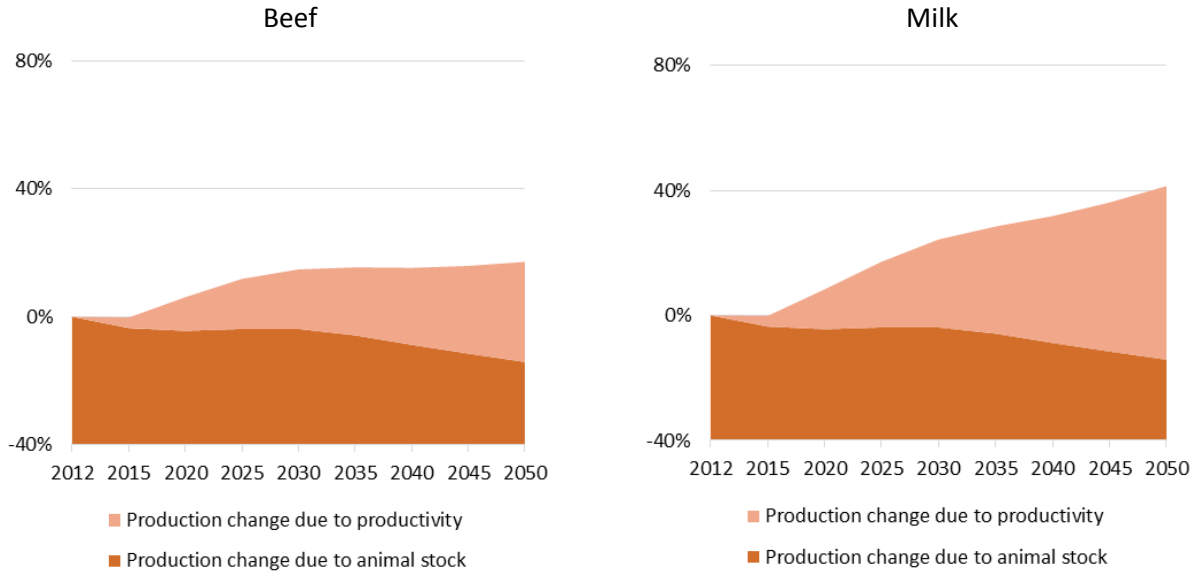
period. Brazil, with almost 228 million cattle, is currently a leading player in the beef world market exporting about 1.4 million tons of beef in 2016 valued at over US$ 5.5 billion (FAOSTAT, 2018; ABIEC, 2017). Between 1980 and 2015, increased productivity explained about 38 percent of all increases in Brazilian beef production, which currently stands at over 9 million tons. The poultry sector in China has experienced robust growth over the past three decades, supported by growing intensification and concentration (FAO, 2008). Production levels increased from 1.2 to 12.6 million tonnes between 1980 and 2015, with increased productivity contributed about 25 percent to the total increase in poultry production (FAO, 2018). In 1970 India launched Operation Flood, a national program that for about 20 years supported the creation of a national dairy industry integrating small-scale farmers with cooperatives and commercial processors and distributors, including supporting the adoption of new technologies and practices (Cunningham, 20100). In 2005, 35 years after the launch of Operation Flood – the time span of the projections presented in this note – increased milk productivity explained about 44 percent of the total increase in milk production in India, which is currently the largest producer of milk in the world (FAOSTAT, 2018).

Fig 3. Uganda: Current and projected production of animal source foods, 2012 – 2030 - 2050



	Estimated production, 000 tons 2012	2030	2050	Growth, 2012-2050 percentage	annual rate
Milk	1 461	1 816.1	2 065.8	41%	1.0%
Beef	192.0	220.5	225.0	17%	0.5%
Mutton & Goat	45.1	81.6	123.5	173%	2.9%
Poultry	62.1	202.0	366.5	490%	5.2%
Eggs	45.9	143.9	256.5	459%	5.0%
Pork	121.0	230.0	393.0	225%	3.4%

Fig .4. Determinants of relative changes (%) in production level, 2012 - 2050



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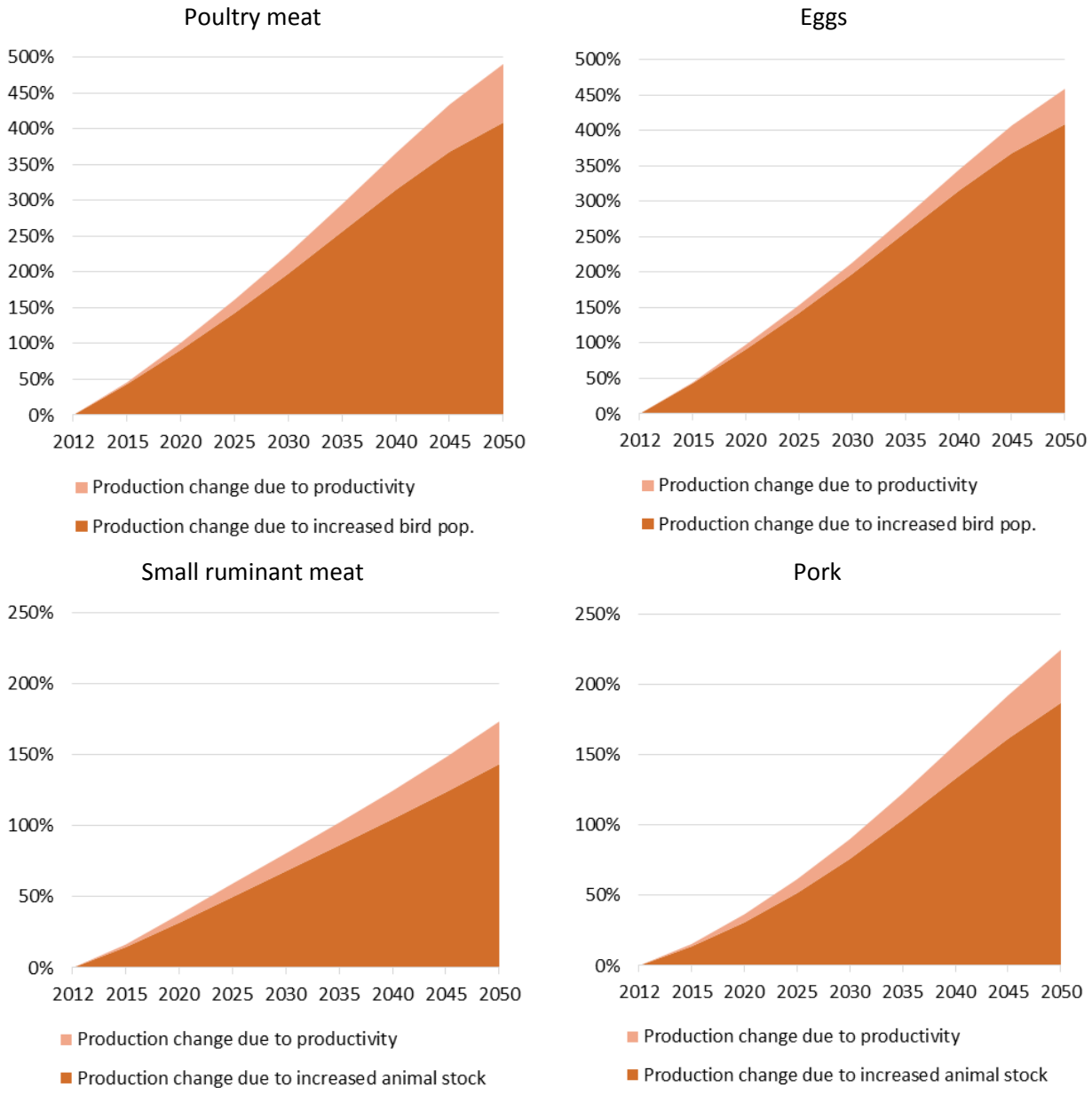
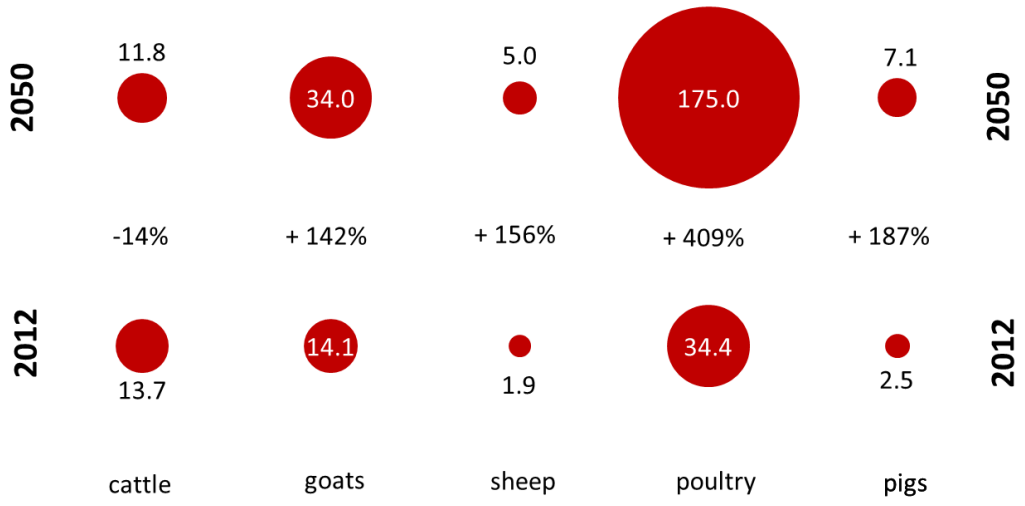


Fig 5 and 6 explore in detail changes in animal population and yield between 2012 and 2050 in the reference scenario, respectively. These were estimated assuming the same animal population growth rate and productivity trends of the past two decades and with constant base-year pastures and rangelands, provided that the land carrying capacity does not reach its upper limit.

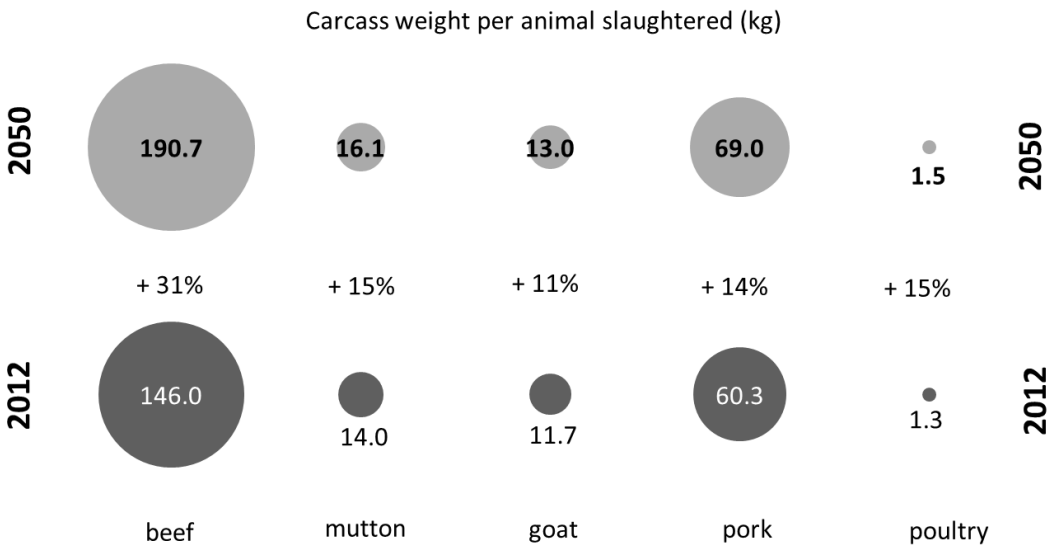
All livestock species except cattle, will double the standing stock more than double in the next 38 years, increasing from a minimum of 142 percent for goats to a maximum of 409 percent for poultry. Cattle stock will reduce by 14 percent. In absolute terms, between 2012 and 2050, the poultry population will increase by 140.6 million, passing from 34.4 to 175 million head. These numbers suggest increased pressure on natural resources, because of the demand for feed and water to raise highly productive animals, and mounting challenges for livestock-environment and the livestock-human health interfaces due to novel interactions between livestock wildlife and natural resources.

Fig. 5. Uganda: Current and projected livestock population by species, 2012-2050



Livestock productivity is also projected to significantly increase over the next 38 years. As carcass weight and milk yield, two key measures of livestock productivity, vary widely by production system, the estimated productivity levels should be considered as the country average and increases in productivity to also reflect shifts across production systems. In Uganda, carcass weight is projected to increase between 11 to 31 percent between 2012 and 2050, with cattle recording the highest productivity increases (+31%) and goat the lowest (+11%). Increasing in milk productivity will be higher, reaching 57 percent for cow milk. These estimates are consistent with past development trajectories such as in Brazil, China and India. In the past 35 years, Brazil cattle productivity increased by 35 percent and Chinese poultry productivity by 26 percent; between 1980 and 2005, as a result of the Operation Flood Program, milk productivity in India increased by 64 percent in aggregate, with higher increases for dairy and buffalo than for small ruminant milk (FAOSTAT, 2018).

Fig.6. Uganda: Current and project livestock productivity by commodity, 2012-2050



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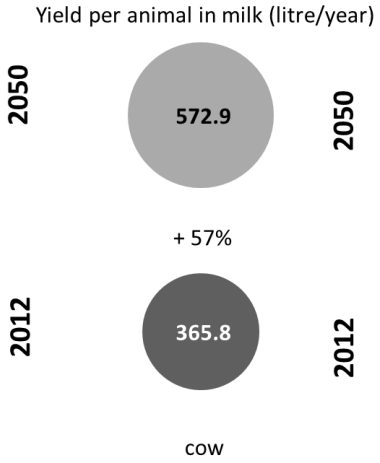

Box 3. Stakeholder comments on the projections

The reference projection discussed above were presented to a group of stakeholders representing the livestock sector during a workshop held in Mbarara, on August 2nd and 3rd, 2018. Stakeholders generally found the projections of herd size and animal productivity plausible. The projections for productivity growth were generally considered to be on the low side; in particular for cattle and goats, stakeholders expect higher gains in meat and milk productivity.

5. Summary and conclusion

A growing, increasingly affluent and urbanized Ugandan population will demand more and more high quality and healthy animal source foods in the coming decades. As a result, the livestock sector will significantly transform. The sheer numbers are impressive: between 2012 and 2050, the Ugandan population will increase from about 35 to more than 100 million and GDP will almost triple. Demand for livestock products will surge, with consumption of all types of meat more than tripling. Producers will respond by increasing yields (investing in productivity-enhancing technologies) and expanding some livestock stocks. It is estimated that, by 2050, milk and beef production will increase by 17 and 41 percent due to productivity gains, respectively, and poultry production will increase by 490 percent. The livestock standing stock will pass from 9.8 to 12.9 million Tropical Livestock Unit[2], with the cattle population decreasing from 13.7 to 11.8 million head and the poultry flock increasing from 34.4 to 175 million birds.

Available projections suggest the Ugandan livestock sector will go through enormous changes in the coming decades. However, they do not provide details on how a transformed livestock sector will enhance the availability of animal source-foods for the food insecure, affect the environment, influence human-animal-ecosystem dynamics, and create new environmental and public health threats. Some, such as emerging zoonotic diseases, may also have pandemic potential and add to existing food safety hazards and proliferation of antimicrobial resistant pathogens. Indeed, a variety of unpredictable factors, such as the future effectiveness of the governance system and the inclusiveness of the economy, will determine if and how the livestock sector will grow along a sustainable trajectory. When uncertainty looms large, long-term projections can be used as an input to articulate alternative long-term livestock scenarios to help guide policy decisions. Scenarios are

[2] Tropical Livestock Units (TLU), equivalent to 250 kg live weight, standardise live animals by species mean live weight. TLU conversion factors are taken from FAO, 2011.

"stories of […] multiple futures, from the expected to the wildcard, in forms that are analytically coherent and imaginatively engaging" (Bishop et al., 2007, p. 5). They are built through multi-stakeholder processes that gather and process "genuine information, knowledge and information about future realities, as opposed to projecting 'old' data, assumptions and 'hindsights' from the past into the future" (UNDP, 2017). By exploring alternative plausible futures of the livestock production systems – such as in terms of number of animals, technology and husbandry practices, environmental and public health dimensions – livestock scenarios assist decision makers to formulate policies that, in all circumstances, support transformational pathways that improve livelihoods, are environmentally sustainable, and safeguard the health of humans and animals.

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CA0887EN/1/10.18