

African Livestock Futures

Realizing the potential of livestock for food security,
poverty reduction and the environment in Sub-Saharan Africa



Executive Summary



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Foreword

If people can access milk, eggs, meat and other livestock products, they are likely to be able to enjoy food security and to be well-nourished. As people's disposable incomes increase, their demand for (and access to) livestock products tends to increase as well.

The degree to which people have predictable access to safe livestock products depends on the extent to which local markets respond to increasing demand and to which gaps in production can be met through imports from elsewhere. A growing market for livestock products, and the increasing production of livestock products, can be an important contributor to the resilience and productivity of rural people's livelihoods and food security. The potential for farmers and food producers to respond to increasing demand with greater production is important in determining the prosperity of rural communities in many developing countries.

Demand for livestock products in sub-Saharan Africa is increasing rapidly. The trend of increasing demand is currently not being matched by similar growth in local production. Several African governments, as well as regional organizations, are now working out how they can best ensure that their farmers can contribute to the better availability of high-quality livestock products, thus reducing the need for dependence on increased imports. At the same time, governments are increasingly aware that if increases in the production of livestock products are not carefully managed, there will be adverse consequences, including greatly increased pressures on natural resources (particularly water and land), greenhouse gas emissions, and threats of zoonotic diseases.

The risks associated with unmanaged increases in livestock production prompt national decision-makers to ask a number of questions. What kind of livestock policies will contribute to the expansion of livestock production in Africa in ways that bring equitable benefits to societies? What is the best way to ensure that they also contribute to people enjoying good health? What are the options for ensuring that livestock production practices are sustainable from social, environmental, economic and climatic perspectives?

Such questions prompted an investigation of plausible trajectories for African livestock up to 2050: the results are presented in this 2014 report on African livestock futures. The researchers build on their analytical work and offer a series of recommendations as to how farmers, societies, businesses and governments can realize the potential

of livestock as an engine of economic growth, food security and environmental well-being. The researchers conclude that a strong and predictable African response to increasing demand will need to include long-term investment in sustainable intensification of African livestock systems. This will need to include year-round access to high-quality animal feeds, careful land-use planning and increased support for applied research into means for ensuring good animal health in livestock production systems.

The researchers also conclude that governments play a vital role in setting and executing policies for livestock development. It is in the interests of all involved in the expansion of livestock production that governments be in a position to enforce regulations and so limit the externalities associated with intensified production. This includes governments being enabled to combine the enforcement of regulations with the application of incentives in ways that take account of income inequalities, and being guided by applied research in areas where animals and humans intersect within different ecosystems.

The researchers also recommend ways in which the expansion of livestock production can improve the livelihoods of smallholder producers and pastoralists in ways that encourage resilience, avoid costs to the environment and limit adverse health impacts. The recommendations include the preservation of land rights, protecting the interests of women, managing water and land use, creating decent employment and paying for environmental services.

The researchers suggest ways in which intensified production can best contribute to animal health, e.g. through the creation of buffer zones in densely settled areas where there is intensive livestock production.

The results of this research set the scene for more intensive work on options for expanding livestock production in Africa. Follow-up work will explore how the dynamics of livestock markets will evolve in Africa and how changes in habitats will impact on the likelihood that new diseases will emerge and threaten the health of both animal and, if they are transmissible, human populations.

We look forward to receiving your reactions to this work.

David Nabarro

Special Representative of the UN Secretary General for Food Security and Nutrition

This African Livestock Futures study was conceived early in 2013. It was initiated during the same year and completed in mid-April 2014.



Acknowledgments

The core research team undertaking the study included [Mario Herrero](#) from the Commonwealth Scientific and Industrial Research Organisation, St Lucia, Australia; [Petr Havlík](#), [Amanda Palazzo](#) and [Hugo Valin](#) from the International Institute for Applied Systems Analysis, Laxenburg, Austria; and [John Murray McIntire](#) from the International Livestock Research Institute, Nairobi, Kenya.

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While the study was implemented under my overall stewardship, I was supported by [Chadia Wannous](#) of the UN System Influenza Coordination Team (UNSICT). I would like to thank the researchers, fellow members of the advisory group, the experts, colleagues at USAID and many others who assisted with the work for their contributions to an extraordinary team effort.

David Nabarro
Special Representative of the UN Secretary General for Food Security and Nutrition

Executive summary

This study investigates plausible trajectories for African livestock to 2050.

The study builds on the IPCC's Shared Socioeconomic Pathways (SSP) scenarios and examines three variants: a sustainable intensification scenario with high economic growth, high GDP growth, changing diets and a high degree of technological change (SSP1); a continuation of current trends (SSP2); and a degradation scenario with little technological change, poor economic growth and high population growth (SSP3).

Using a global partial equilibrium model (GLOBIOM), we determine consumption, production, prices and trade projections for different animal products (milk from cattle and small ruminants, meat from cattle, small ruminant and monogastrics, and eggs) for each scenario. We estimate the impacts of increasing production on key environmental dimensions (use of nitrogen, land-use change, greenhouse gases (GHG)) and examine the role of different farming systems (pastoralists, smallholder mixed crop-livestock systems and industrial systems) in meeting the demand for livestock products.

We compare Africa against selected regions of the world and also discuss how the results impact different regions in sub-Saharan Africa (East, West, and Southern Africa and the Congo Basin).

We also discuss the implications of our findings for the competitiveness of the sector, for what roles smallholders and pastoralists may play in the future, and discuss the potential disease impacts of meeting livestock product demand.

We conclude with policy recommendations for realizing the potential of livestock as an engine of economic growth, food security and environmental well-being in sub-Saharan Africa.



The key quantitative findings of the study are as follows.

1. Milk consumption is likely to triple under most scenarios in all SSA regions by 2050, with East Africa, traditionally the largest consumer of milk, dominating the growth in consumption.
2. The consumption of meat and eggs from poultry and pork have the highest projected rates of growth across SSA. West Africa is projected to have a six- to sevenfold increase in the consumption of monogastric products (mostly poultry) to 2050, followed by Southern and East Africa (fourfold increases).
3. The conditions for achieving high production growth (rapid technological change potential in livestock and crop yields, lower costs, remunerative product prices, more competition in input and product markets) are highest for milk in East and West Africa, for monogastrics in West Africa and for ruminant meat in East Africa.
4. Only under SSP1 (sustainability scenario), with the highest crop and livestock yield increases, the highest resource-use efficiencies and the lowest production costs, can the low trade-deficit conditions prevailing until 2000 for all animal products (around 10% of national production) be maintained to 2050. This suggests that investing in the sustainable intensification of livestock systems in Africa is an urgent matter.
5. Maintaining business-as-usual trends (SSP2) would lead to a doubling of imports of milk and monogastric products (poultry mostly) relative to production by 2050 and, potentially, to an increase in imports for ruminant meats from about 2 per cent of the share of production in 2000 to about 16 per cent in 2050.
6. Any negative deviation from the current trend (SSP2) in terms of production efficiency, prices and GDP growth, such as the potential impacts of climate change on agricultural productivity, would make the SSA livestock sector largely uncompetitive, with substantially lower resource-use efficiencies and high production costs (SSP3). This would have negative implications for both consumers and producers, and it would be likely to affect the continent's food security.
7. Smallholder mixed crop-livestock systems are, and will remain, the main producers of ruminant products to 2050, under all scenarios. However, under SSP1 and SSP2, pastoral systems in all regions and the mixed smallholder systems in more humid areas are likely to increase the production of meat and milk four-to eightfold relative to 2000 production.
8. Given the right socioeconomic conditions and technology to reduce costs and increase productivity, with modest expansion to guarantee feed sources, pastoral systems in arid regions could triple the production of cow's milk and increase small ruminant milk and meat production by a factor of five or six relative to the production levels of 2000.
9. Sustainable intensification of livestock production alone (SSP1) is not enough to meet the increasing demand for livestock products. Cropland and grassland expansion are needed in all scenarios to increase the production of livestock products to 2050.
10. The most common source of land for increasing cropland production in SSA has been, in order of importance, grasslands in relatively high-rainfall areas, followed by wooded savannahs and primary forests. This pattern is likely to continue to 2050 with continuous land conversion in grasslands and natural land, and a stabilization of the rate of reduction of primary forests across all scenarios.
11. A combination of demand management, intensification of land-based systems and structural change promoting more industrial monogastric systems could lead to increases in the environmental efficiency of livestock systems (for example, improved GHG emissions intensities) in sub-Saharan Africa without sacrificing pastoral and smallholder production.
12. There could be increasing threats of disease affecting animals and people under all SSPs.

Key policy recommendations

1. Invest in the sustainable intensification of African livestock systems.

As this study demonstrates, Africa is the continent where sustainable intensification of agriculture and livestock systems could yield significant benefits for food security, incomes, trade, smallholder competitiveness and ecosystems services. Such investments include agricultural research and extension, regional and rural roads, energy generation and transmission, and public irrigation.

2. There is a broad scope for increasing productivity at very high resource-use efficiency gains because current yields of milk and meat are low per animal and per unit of land.

Sustainable intensification includes the increased provision of services, inputs, appropriate institutional support and markets, all of which are essential to transform traditional livestock industries into commercial operations.

3. Invest in the year-round provision of high-quality feeds.

Biomass from pastures, crop residues, planted fodders, grains and others are key for expanded livestock production. Policies to ensure that feed production and trade can occur dynamically through the region are an essential part of the sustainable intensification of the sector.

4. Invest in land-use planning and monitoring:

Even under the most optimistic intensification scenarios, the expansion of cropland and rangeland is required to meet the forecast production growth. It is essential that a choice of land that has relatively lower opportunity costs (economic and environmental) be used to expand animal production. This requires land-use planning, robust land-tenure structures, and adequate incentives for the implementation of sustainable land-use change practices (this is particularly important in places with significant land-use trade-offs, such as high-biodiversity areas, strategic watersheds and densely populated areas).

5. The evidence about production costs as functions of scale in monogastrics is clear: large enterprises can produce more cheaply because of economies of scale in housing, veterinary care, finance, feed and marketing, and large enterprises therefore do not need subsidies.

A related policy is to protect the land rights of smallholders – herders, arable farmers and mixed crop-livestock operators – against land diversions from large operators or from subsidized export sectors, such as natural-resource tourism or mining.

6. Governments should regulate the externalities of intensification.

Externalities can occur in food safety, zoonoses, water quality, farm chemicals, managing the use of GMOs throughout food chains and preserving biological reserves against encroachment. Such regulation is most urgently needed in industrial production, as shifts to intensive production, especially in swine and poultry, will accelerate as demand grows because of economies of scale. Concentration has negative effects such as pollution from the excreta of animals confined together (in the absence of adequate biosecurity), the risk of diseases (including those that can be transmitted to humans or other species) and the eventual development of antibiotic resistance in microbes. Policy must therefore focus on developing regulatory and incentive capacity, including the use of benefit-cost tools for regulation economics. Regulating those externalities will require much more government capacity than currently exists.

Major policies are to:

- (a) make large livestock enterprises pay the full environmental costs of their activities; and
- (b) enforce animal and human health rules against urban and peri-urban livestock enterprises to reduce the risks of zoonoses and the rapid spread of diseases among confined livestock.

7. Invest in basic agriculture and livestock research.

Africa has underinvested in agricultural research and technology. As a result, its rates of productivity growth are lower and its capacity to use external innovations is weaker compared to other regions. Increasing the scale of agricultural research in Africa will require: (a) spending more for agricultural research on regional problems – tropical livestock diseases, animal productivity constraints caused by heat, crop adaptation to heat and moisture stress are a few examples – and for development of African scientific capacities; (b) spending more on basic research in African conditions especially on plant and animal genetics; (c) new research and technology spending must focus on small farmers and on the cost conditions – transport, communications, energy and water supply – in which they operate; (d) new public investment in agricultural research and technology for large farmers should be minimized except to study environmental costs – solid waste, the water footprint, zoonoses, and drug resistance; and (e) making better use of modern biology, especially in livestock science, where the problems are more complex than in crops and the potential for innovation is correspondingly greater.

8. Invest in animal health research.

As animal production intensifies and becomes more concentrated in places, risks of animal diseases - swine fever, poultry diseases, mastitis, zoonoses such as avian flu - will rise. Animal research must shift work to intensive problems of monogastrics in addition to its traditional focus on ruminants in extensive systems in view of the likely expansion of demand for monogastric production

9. Protect smallholders (and pastoralists).

The policy goal for smallholder agriculture should be to protect its competitiveness and its asset bases. The first thing to do is NOT to subsidize large producers, whether of animals or crops and whether of foreign or domestic origin. Subsidies are economically inefficient in that their cost per job created is high. They also have adverse effects on income distribution among groups of livestock producers, notably by having a bias against pastoralists and small-scale owners/operators.

10. Protect pastoralists.

The first policy to defend pastoralists is one of political and economic entitlement – creating rights to land, water, and grazing corridors. The second is to provide targeted public services for pastoralists where private services are lacking. This should include veterinary, research, financial, transport, infrastructure, education and health services. A third is to facilitate new forms of insurance, such as commercial index-based insurance products and links between those products and participatory disease surveillance and market information.

11. Protecting the interests of women.

Women as livestock owners and managers should be a special policy objective. This is because women stockholders suffer from discrimination in access to services, creating both an efficiency and an equity cost; the goal of policy should be to reverse that discrimination and to avoid making things worse for women operators by subsidizing their larger, usually male, competitors.

12. Address income inequalities.

African states must manage the absolute income gaps that are likely to grow between small and large holders in animal agriculture, as economies of scale and preferential access to finance increase those gaps. Such income inequalities can be partially offset through social safety nets, public service pricing, and tax and trade policies. But governments must strengthen their capacities to create social safety nets and to target tax expenditures to avoid increasing wealth and income inequalities, especially among such groups as pastoralists who are facing the loss of their asset base and of their traditional livelihoods.

13. Manage environmental costs.

The environmental costs of livestock growth are greenhouse gases (GHG), water use, manure disposal, and damage to range productivity from overgrazing. A particular problem of environmental management is the prevalence of small farms whose poverty and market isolation prevent them from self-insuring, either through physical investments or through financial instruments. Appropriate policies include: (a) strengthening governance of regional water bodies, including such issues as water levels, electricity production, irrigation, and biodiversity; (b) holding greater financial reserves, or contracting forward, against costs of food if domestic prices become more variable with higher temperatures and more severe storms; (c) creating public employment for those who have lost income or work, notably in pastoral areas affected by extreme climate events; (d) investing in regional research on plant materials and farming practices that will resist higher temperatures and deeper flooding, which might allow diversification of livelihoods by pastoralists who now specialize in livestock; and (e) promoting payments for environment services.

14. Protect animal health.

One focus in the area of animal health are the traditional major diseases of ruminant livestock, chiefly beef and dairy cattle, in which the public sector provides most services. The policy objectives should be to fund these services adequately for livestock sectors where private vets do not operate (e.g. pastoralism and isolated smallholders). The second path for the development of animal health is intensive ruminant and monogastric production. An intensive commercial livestock sector will create new problems related to breed specialization, feed, confinement, and food safety, all the more so if livestock products are exported. The policy objective is to regulate the providers of these services so that they do not contribute to externalities such as antibiotic resistance.

15. Policy must recognize the potentially conflicting roles of livestock in human health.

Buffer zones should be created in densely settled areas where there is intensive livestock production, especially where human water supply is not well developed; such zones may be even more necessary where high human and animal population densities are near irrigated areas, which can attract migratory birds and insect disease vectors.

The risks associated with unmanaged increases in livestock production prompt national decision-makers to ask a number of questions. What kind of livestock policies will contribute to the expansion of livestock production in Africa in ways that bring equitable benefits to societies? How best to ensure that they also contribute to people enjoying good health? What are the options for ensuring that livestock production practices are sustainable from social, environmental, economic and climatic perspectives?

Such questions prompted an [investigation of plausible trajectories for African livestock up to 2050](#) aiming to provide policy recommendations for realizing the potential of livestock as an engine of economic growth, food security and environmental well-being in sub-Saharan Africa.

The key recommendations of [the African Livestock Futures Study](#) presented in this report are:

- *Policies that encourage healthy food consumption patterns, the sustainable intensification of all livestock production systems and selective promotion of monogastric livestock production, could result in increased environmental efficiency of livestock systems in sub-Saharan Africa. This can be done in ways that protect production in pastoral communities, and by smallholder farmers.*
- *Sustainable intensification of livestock production will yield significant benefits for food security, incomes, trade, smallholder competitiveness and ecosystems services. These benefits need to be widely appreciated: at the present time farmers face major challenges when attempting to increase their investments in livestock production especially when the sector's contribution to sustainable development and economic growth is not appreciated.*
- *The required investments include increased provision of veterinary services, inputs, institutional support, processing and markets. These are all essential if current livestock production systems are to evolve into viable commercial operations.*

