

Tanzania livestock master plan



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Tanzania livestock master plan

Developed by the Tanzania Ministry of Livestock and Fisheries (MLF) and the International Livestock Research Institute (ILRI) livestock master plan team

January 2018

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Acronyms

ALive	African Partnership for Livestock Development
AI	Artificial insemination
AnGR	Animal genetic resources
ASF	African swine fever
ASDP	Agricultural Sector Development Program
ATA	Agricultural Transformation Agency
AU-IBAR	African Union–Interafrican Bureau for Animal Resources
BAU	Business as usual
BMGF	Bill & Melinda Gates Foundation
CBPP	Contagious bovine pleuropneumonia
CCPP	Contagious caprine pleuropneumonia
CIRAD	French Agricultural Reserach Centre for International Development
CSO	Civil society organization
DOC	Day-old chick
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot-and-mouth disease
GDP	Gross domestic product
HACCP	Hazard analysis and critical control points
IFD	Improved family dairy
IFP	Improved family poultry
ILRI	International Livestock Research Institute
IRR	Internal rate of return

IFPS	Improved family pig system
ITFC	Improved traditional family chicken
LGA	Local government authority
LMP	Livestock master plan
LMU	Livestock multiplication units
LSA	Livestock sector analysis
LSIPT	Livestock sector investment and policy toolkit
MLF	Ministry of Livestock and Fisheries
NAFORMA	Tanzania Forest Service Agency
NARCO	National Ranching Company
PPE	Personal protective equipment
PPP	Public-private partnership
PPR	Peste des petits ruminants (goat plague)
RVF	Rift Valley fever
SCC	Specialized commercial chicken
SUA	Sokoine University of Agriculture
SPA	Swine producers' association
TAC	Technical advisory committee
TALIRI	Tanzania Livestock Research Institute
TB	Tuberculosis
TDV	Tanzania Development Vision
TFPS	Traditional family pig system
TIC	Traditional improved chicken
TLMI	Tanzania Livestock Modernization Initiative
TVLA	Tanzania Veterinary Laboratory Agency
TZS	Tanzania shilling
YASM	Young and adult stock mortality

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Luhaga Joelson Mpina
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Executive summary

In recent years, the government of Tanzania has prioritized the transformation of the agricultural sector. This approach has been adopted in the 2007 Agricultural Sector Development Program (ASDP) and its successor, the 2016 ASDP II. The country's agriculture development plan is designed to help meet the objectives set out in a number of existing strategies and policies in the country. Despite accounting for 11% of the African cattle population, livestock-related activities contribute only 7.4% to Tanzania's GDP and growth of the livestock sector at 2.6% is low. This growth largely reflects increases in livestock numbers, rather than productivity gains. The absence of a roadmap to develop the livestock sector has persistently hindered successful implementation of previous investment plans for the sector. Though severely constrained by low livestock reproductive rates, high mortality and high disease prevalence, detailed interdisciplinary by the International Livestock Research Institute (ILRI) and the Ministry of Livestock and Fisheries (MLF) revealed the potential benefits of a comprehensive livestock master plan (LMP) for Tanzania.

The LMP sets out livestock-sector investment interventions—better genetics, feed and health services, and complementary policy support—which could help meet the ASDP II targets by improving productivity and total production in the key livestock value chains of poultry, pork, red meat and milk, and dairy. If the proposed investments of USD 621 million—36% and 64% from the public and private sectors, respectively—were successfully implemented, the anticipated transformation of the sector has the potential to impact positively on rural livestock keepers in increasing their incomes and on urban consumers through lower animal product prices. The success of the LMP is also critical to the achievement of food and nutrition security at household and national levels.

Development of the livestock master plan

Using the most recently available data, from 2013 to 2015, the MLF supported by ILRI and by the Bill & Melinda Gates Foundation (BMGF), employed the livestock sector investment and policy toolkit (LSIPT) to develop herd and sector models and a baseline assessment of the current state of livestock development in Tanzania. This assessment was used to assess the potential long-term, 15–20 years, impact of proposed combined technology and policy interventions, referred to as the livestock sector analysis (LSA), whose results formed the basis for the development of the LMP for 2017–2022. The LMP is a series of five-year development implementation plans or 'roadmaps', to be used to implement the ASDP II.

The LSA and LMP interventions, based on investment scenarios related to productivity-enhancing technologies and improved policies developed by the MLF, were tested in accordance national development objectives based on the following criteria:

- reducing poverty,
- achieving food security,
- contributing to economic growth,
- contributing to exports, and
- contributing to industrialization.

Using measurable economic or environmental indicators for these objectives, four key livestock value chains—live animals and red meat and milk (from cattle, sheep, and goats), dairy with crossbred cows, poultry, pigs, and dairy—were identified in the LSA as producing the greatest productivity increases contributing to national economic development objectives and the long-term development of the sector.

The LMP comprises two sub-value chains for each value chain: smallholder family and commercial specialized production systems. These sub-value chains are found in one or more of the three major production typology zones of Tanzania: central; coastal and lake; and highlands, plus commercial specialized systems found throughout the country. The rigorous ex-ante technical and financial review of alternative intervention options (investment scenarios) carried out by the MLF is thus a guide to the choice and prioritization of public and private investments that have the highest payoffs for livestock sector transformation.

Livestock master plan commodity value chains

Based on results of the LSA analysis, to reach the objectives and goals of the government, the key value chains targeted in the livestock master plan roadmaps are:

1. Red meat (and milk) from cattle, sheep, and goats
 - Improved traditional red meat and milk
 - Ranches
 - Specialized feedlots
2. Poultry
 - Improved family chicken
 - Commercial specialized chicken (layers and broilers)
3. Pigs/pork
 - Traditional system (scavenging and semi-scavenging system)
 - Commercial specialized pig production systems
4. Cow dairy
 - Improved family dairy
 - Commercial specialized dairy

Key results

Red meat value chain development

The proposed combined interventions for red meat production on traditional family farms and commercial ranches, as well as feedlot development, would result in a 52% increase in total red meat production. Production would grow to 742,524 tonnes between 2017 and 2022. This would, however, not meet expected consumption growth of 71% by 2022 (to 867,302 tonnes), leaving a 17% deficit (124,778 tonnes) in the 2017–2022 red meat production and consumption balance. Given the rapidly growing population, and increasing incomes and demand for animal-source foods in Tanzania, such projected deficits would put upward pressure on red meat prices.

The extremely restricted access to land for grazing and feed production and limited ability to enhance the genetic potential of local ruminant breeds in the medium-term means it is unlikely that the red meat production gap can be closed in the next five years. Even a substantial increase in the supply of red meat from small ruminants—with goat meat and mutton currently accounting for 14% and 4%, respectively—is unlikely to significantly help close the projected meat consumption/demand gap because beef accounts for 82% of red meat production in Tanzania.

Poultry value chain development

Successful interventions would allow the poultry subsector to move to improved family poultry with semi-scavenging crossbreds and enable substantial increases in the scale of specialized layer and broiler operations. Such a transformation—depending on successful interventions in breed selection, health services (particularly in treating Newcastle disease), feed, extension, private investment and trade policies—would contribute considerably to improving household food and nutrition security and increase the subsector’s contribution to GDP by 182% from TZS 256 billion to TZS 723 billion; thereby contributing significantly to closing the production-consumption gap for meat.

Projected annual chicken meat and egg production in Tanzania would rise to 465,600 tonnes and 4.2 billion eggs. This would bring the production-consumption deficit for chicken meat from 130,000 to a surplus of 258,000 tonnes between 2017 and 2022. The combined interventions would result in increases of 666% and 40% respectively in chicken meat and egg production by 2022. Such accomplishments would enable Tanzania to meet the chicken meat and egg demand for its growing population, and produce a very significant surplus for domestic industrial use or for export. With the assistance of policies encouraging investment in processing plants, the surplus eggs could be processed into egg powder and used domestically for new or additional industrial uses (e.g. in the baking industry), or exported to generate foreign exchange earnings.

Pig/pork value chain development

The proposed combined interventions for improved family and expanded commercial pig production systems would result in a 69% increase in pork production. Production would grow from 22,025 to 37,191 tonnes between 2017 and 2022. The development of a competently market-oriented farming, processing and a dynamic pig/pork marketing sector, operating in more sustainable and climate-smart ways, supplying consumers with high-quality and safe pork would significantly contribute to increased household income, food and nutrition security, poverty alleviation and would increase sector’s contribution to GDP by 83%, from TZS 44 billion to 80 billion between 2017 and 2022. This would bring the production-consumption deficit for pork from 8,000 tonnes to a 1,350-tonne surplus between 2017 and 2022.

Improving pig production requires a focus on controlling African swine fever in pigs. In the ‘without additional investment’ scenario, by year 2032, a deficit of 16,000 tonnes of pig meat is estimated, thus resulting in a total ‘all meat’ deficit of 2.0 million tonnes. However, industrializing pork production (in large commercial-scale operations and processing for product transformation) will lower domestic meat prices, and lead to an increase in pig/pork exports and foreign exchange earnings.

Cow dairy

The projected increase in national cow milk production as a result of the proposed interventions—including artificial insemination and hormone synchronization, combined with improved feed and health interventions, value addition and complementary policy changes—during the ASDP II period (2017–2022) is 77%. This represents a surplus of 1,002 million litres over projected domestic consumption requirements. This production increase would make it possible to meet the milk production targets in the ASDP II and exceed the growing domestic demand for milk by 35%. This surplus of milk could then be substituted for imported milk products and used domestically for new or additional industrial uses (e.g. in the baking industry), or exported as milk powder or ultra-heat treated (UHT) milk to raise foreign exchange earnings. Due to increases in the number of crossbred dairy cows by 281% and milk production per cow by 26-42%, the contribution of the dairy sector to GDP is expected to rise by 75%.

Meat production-consumption balance

Perhaps most importantly, the growth of the poultry and pig subsectors would enable Tanzania to close the projected total national meat production-consumption gap. This growth would also make it possible to increase the share of white meat in the total meat consumed from the current 9% to 41% by 2032, but only if chicken is substituted for

red meat. Taking advantage of the benefits of the potential poultry revolution will require substantial investments in promotional activities to change tastes and preferences from beef, as well as from local to exotic chicken meat and eggs. The substitution of the surplus chicken meat for domestic red meat consumption would also lower pressure on domestic meat prices and enable an increase in the export of live animals (cattle, sheep, and goats), potentially raising foreign exchange earnings.

The huge deficit in projected demand (without investments) for red meat is being driven by an increasing human population and income growth. Limited access to land for improving feed production, including grazing lands, and the low genetic potential of local cattle and small ruminant breeds are the main constraints to increased red meat production. Nevertheless, red meat from small ruminants will be of little help in closing the meat gap due to their low numbers, limited feed resources and low genetic potential of indigenous breeds, nor will pork help because of outbreaks of African swine fever and a lack of demand in the country.

Conclusions

Key messages

- Investment in poultry has the most potential to close the projected meat consumption gap and could enable export of ruminant animals and red meat. However, domestic consumer preferences for white meat and particularly chicken meat would need significant investment and effort in changing consumer preferences for red meat, especially beef and goat meat.
- The projected gap in milk demanded could be closed and a surplus produced through artificial insemination and hormone synchronization for breed improvement, combined with feed and health interventions addressing young and adult stock mortality (YASM).
- Feed is the biggest constraint to animal productivity improvement. Access to land appropriate for grazing, and land for feed production needs to be addressed to overcome the serious existing feed deficit.
- Red meat production is not expected to increase much over time and help significantly to close the projected all-meat production-consumption gap due to the present limited access to land for feed production and grazing, the need to expand animal health services, and the low genetic potential of local cattle breeds and small ruminants.
- Small ruminants are also not expected to contribute much in closing the meat gap due to their low numbers, inadequate feed resources and low genetic potential of indigenous breeds.
- Pork has potential to help close the projected all-meat production-consumption gap but it is prone to African swine fever requiring improved prevention and control, and its demand is limited; hence it cannot be a priority solution for closing the meat gap.

Priority investment interventions

Various combinations of the three standard types of livestock technology interventions— improved genetics, health and feed—are needed to generate higher incomes and animal productivity, and contribute to achievement of national development objectives. The appropriate combinations, depending upon the biophysical, agro-ecological and market conditions facing livestock in the four production zones in Tanzania, include:

- Ensuring artificial insemination and hormone synchronization, and improving feed and health interventions addressing YASM to help facilitate a surplus in milk production.
- Targeting animal health interventions to address young and adult stock mortality (vaccinations, parasite control), and ensuring improved productivity, thereby increasing animal and product off-take for meat and dairy products.
- Prioritizing beef production from on-farm fattening and commercial feedlots as a way of reducing the red meat deficit.
- Improving access to land appropriate for grazing, and land for feed production to overcome the existing feed deficit, which is the biggest constraint to animal productivity improvement.

-
- Improving the quality and quantity of livestock feed resources by introducing improved forage crops and better animal feed management practices, feed production on irrigated land

Complementary policy interventions

- Appropriate policies will be needed to support livestock sector development efforts including in the following areas:
- Expanding animal health services provision especially in remote areas where pastoralists predominate. Public-private partnerships could be explored for offering these services where private investments are risky, and returns are low.
- Undertaking investments in promotional activities to change tastes and preferences from beef to white meat, especially chicken.
- Prioritizing poultry investments in genetic improvement by focusing on crossbred and fully exotic chicken, and pure breeds for both family and commercial enterprises.
- Prioritizing policies creating a conducive environment for investment in commercial meat and milk production and processing.
- Promoting land allocation and ownership policies which facilitate the investments required to increase feed availability for meat and milk production.
- Promoting land leasing, including land under irrigation, for animal and feed production and providing tax incentives and subsidized leasing rates to entrepreneurs.
- Promoting exports to more remunerative markets in the region through the introduction of a practical and affordable system of animal identification and traceability, as well as food safety and animal health programs that include disease surveillance and monitoring animal slaughter processes.
- Promoting substantial private investment in livestock product transformation through high value-added processing.
- Improving the enabling environment for agribusiness investment by streamlining regulations and procedures to attract and maintain private investment.

Introduction

Tanzania livestock master plan and livestock sector analysis

The Tanzania livestock master plan (LMP) was co-developed by the MLF and ILRI. Its development was overseen by a high-level technical advisory committee (TAC) convened under the auspices of the MLF livestock permanent secretary, Maria Mashingo, and chaired by Catherine Dangat, the director for policy and planning at the ministry. The TAC was comprised of the directors of key MLF livestock-related departments and other government agencies, and representatives from the private sector, civil society organizations and development agencies.

Data collection and quantitative diagnostics was supported by the continual involvement of key national livestock experts and consultation with a wide range of key stakeholders. The quantitative sector analysis was undertaken using the livestock sector investment and policy toolkit (LSIPT) developed by the World Bank, the French Agricultural Research Centre for International Development (CIRAD) and the Food and Agriculture Organization of the United Nations working under the auspices of ALive at the African Union Inter-African Bureau for Animal Resources (AU-IBAR).

The LMP is a series of five-year development plans or roadmaps for the key livestock value chains and production systems within each value, chosen based on the priority development objectives of the Tanzania government. Each roadmap includes specific visions and targets, challenges and strategies, and combined investments in technology and policy interventions, with expected outputs, outcomes and impacts. The roadmaps are also fully budgeted, and include timed and sequenced activity plans (see Gantt charts).

The LMP is based on a 15-year (2016/7–2031/32) livestock sector analysis (LSA). The LSA entailed creating a livestock sector model and then carrying out a quantitative analysis of the present technical performance of the sector and the economic contribution of potential interventions to households, value chains, the livestock subsector, the agricultural sector, and the national economy. A set of quantitative tools from the LSIPT were used to carry out the sector analysis. The LSA and LMP are based on available data from field surveys and published literature, as well as expert opinions, validated through consistency tests. The development of the LMP entailed regular and open consultations with relevant technical experts, partners and other stakeholders to help ensure ownership by all relevant livestock sector stakeholders.

The LMP is meant to help realize the various existing national development strategies and policies namely the Tanzania Development Vision 2025, the Five-year Development Plan (2016/2017 -2021/2022), the National Strategy for Growth and Poverty Reduction (MKUKUTA II), the National Livestock Policy 2006, the Agricultural Sector Development Strategy II (ASDS II) and the Livestock Sector Development Strategy (2010).

With technical support from international and local research organizations, these roadmaps are meant to be implemented by the MLF, other government ministries and agencies, at both national and regional levels, as well as by development partners (donors, development banks, international and local non-governmental organizations (NGOs), civil society organizations (CSOs) etc. and private sector actors.

Main results and conclusions of the livestock sector analysis

Introduction

According to the livestock sector analysis (LSA), Tanzania accounts for about 1.4% of the global cattle population and 11% of African cattle population (FAO 2014). The main livestock types are cattle, goats, sheep, pigs, chickens, and donkeys. Based on the 2016/17 LSA baseline Tanzania has about 28.8 million cattle, 16.7 million goats and 5 million sheep. Other livestock include 2 million pigs, 33.3 million local chicken and 15.6 million improved chicken (as also reported in the MLF budget speech, 2016/17). Goat meat and mutton currently account for 14% and 4% of all red meat respectively—thus, their improved productivity is unlikely to significantly close the projected meat consumption/ demand gap as beef accounts for 82% of the red meat production in Tanzania. Thus, the development focus has to include cattle.

The national herd is dominated by indigenous cattle which are currently displaying low productivity, but they have much potential if feed, health and breed improvements can be made. The main breeds of beef cattle in the country include: Tanzania Shorthorn Zebu (TSHZ) characterized by small size mature body weight (200–350 kg); Longhorn Cattle (LHC) such as the Ankole which is characterized by large matured body weight (500–730 kg); and the Boran which has a large body weight (500–800 kg).

The country has many other outstanding natural resources to support livestock development including extensive rangelands; diverse natural vegetation and its diversely resilient low production livestock breeds. Despite these resources, the livestock sector is performing below its potential.

The LSA baseline analysis showed that only with additional investments in technological change and changes in policy can the productivity and production potential of these animal resource be sufficiently improved to provide sufficient animal-source foods (ASFs) to feed a rapidly growing population, with its rapidly increasing income and demand for ASFs. Presently, livestock activities contribute only 7.4% to the country's GDP and the annual growth rate of the sector is low at 2.6%. This growth for the large part reflects an increase in livestock numbers rather than productivity gains. The sector is severely constrained by low livestock reproductive rates, high mortality and high disease prevalence, and lack of feed (TLMI 2015).

The widely accepted baseline results for the sector, and the LSA investment scenario results shared below point to high returns on investment in livestock. They also show there is a need to strategically increase investments in livestock production systems and value chains in order to improve productivity and incomes, thus enhancing the sector's economic contributions at all levels, and to the development objectives mentioned above.

In the investment scenarios carried out by MLF under the LSA on productivity enhancing technology interventions, combined with better policies, the following current national development objectives of Tanzania were used as decision criteria for comparing the alternative investment interventions (combined technology and policy):

- reducing poverty
- achieving food security
- contributing to economic growth
- contributing to exports
- contributing to industrialization

Using measurable economic indicators for the above objectives, four key livestock value chains—live animals and red meat and milk (from cattle, sheep, and goats), dairy with crossbred cows, and poultry and pigs (both white meat)—were identified in the LSA as having the most potential for productivity increase with new investments to achieve these national economic development objectives and contribute most to the long-run development of the sector. The rigorous ex-ante technical and financial analysis of alternative intervention options (investment scenarios) carried out by MLF is thus a guide to the choice and prioritization of public and private investments with the highest payoffs for livestock sector transformation.

Priority interventions to modernize the sector

The identified priority technology interventions for modernizing the livestock sector include:

Improving the quality and quantity of livestock feed resources by introducing improved forage crops and improved animal feed management practices, as well as increased access to existing lands appropriate for grazing.

Improving the productivity of indigenous livestock by changing the genetic composition through breed selection by crossbreeding, introducing pure exotic breeds where feasible and through improved animal husbandry interventions;

Increasing the quality and quantity of animal health services and livestock producers' access to these services through private and/or private-public partnerships in order to decrease YASM.

Designing and implementing policies and institutional interventions which enable private and private-public investment interventions in animal feed, genetics, animal feed and animal husbandry.

Key results and conclusions

Profitability, GDP and nutritional impacts

The return on investment (ROI) in the livestock sector is very attractive and has significant impact on household incomes (Table 1) and food and nutrition security, as well as the national economy. For all species and commodity value chains, the internal rate of return (IRR) obtained was greater than 10% (the assumed project financial discount rate), except for the investment in cattle ranches in the coastal and lake zone (IRR = 6.6%). The other IRRs ranging from 15–86% indicate the substantial financial viability of all other investments. The incremental change in GDP in 2031 due to livestock investment interventions as compared to the base year of 2016 was also found to be very large. The incremental change was more than 80% in all cases and the highest incremental change of 4,696% was observed for cattle fattening. In comparison with the 'without additional investment' scenario in 2031, the 'with additional investment' intervention resulted in an increase of GDP which varied from 8% for cattle ranching in central zone to 1,187% for cattle fattening.

Table 1: Profitability, GDP and nutritional impacts of investment in the livestock sector by year 2031

Value chain and production zone	Internal rate of return (IRR)	Increase in GDP contribution from additional investments in livestock by 2031 by production system and zone		% change in nutrition contribution	
		In comparison with the base year 2015/16	In comparison with the without additional investment in 2031	Calories	Protein
Improved traditional cattle small-scale (central)	34%			8	22
Improved traditional cattle medium-to large-scale (central)	18%			10	49
Ranch cattle (central)	39%	87%	8%	NA	NA
Improved traditional cattle—small-scale (coastal and lake)	77%			5	15
Improved traditional cattle medium-to large-scale (coastal and lake)	58%			35	105
Ranch cattle (coastal and lake)	6.6%	131%	57%		
Improved traditional cattle—small-scale (highlands)	18%			2	5
Improved traditional cattle—large-scale (highlands)	15%				25
Ranch cattle (highlands)	73%	196%	48%	NA	NA
Urban and peri-urban dairy cattle small-scale (all zones)	35%			2	42
Urban and peri-urban dairy cattle medium- to large-scale (all zones)	73%	1,748%	958%	14	114
Cattle fattening (all zones)	72%	4,696%	1,187%	NA	NA
Improved traditional pigs small-scale (all zones)	86%			3	1
Improved traditional pigs—medium- to large-scale (all zones)	17%	651%	165%	8	5
Specialized pig operation (all zones)	22%			1	2

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The nutritional impact was also assessed in terms of the percentage change in livestock contribution to calories and protein. The increase in calories varied from only 1% for specialized pig operations to 35% for medium- to large-scale improved traditional cattle. The percentage change in contribution to protein varied from 1% for small-scale improved pigs to 105% for medium- to large-scale improved traditional cattle. It is important to note that the investment in improved traditional pigs is most profitable, but it contributes potentially least to household nutrition while the investment in medium- to large-scale cattle (coastal and lake zone) is modest in return on investment, but it also has the highest potential nutritional impact of the meat operations (assuming the meat is consumed in the household and not sold). Meanwhile, urban and peri-urban dairy cattle, medium- to large-scale (in all zones) also has significant potential to contribute to household nutritional security (again assuming the meat is consumed in the household and not sold).

Production-consumption balance

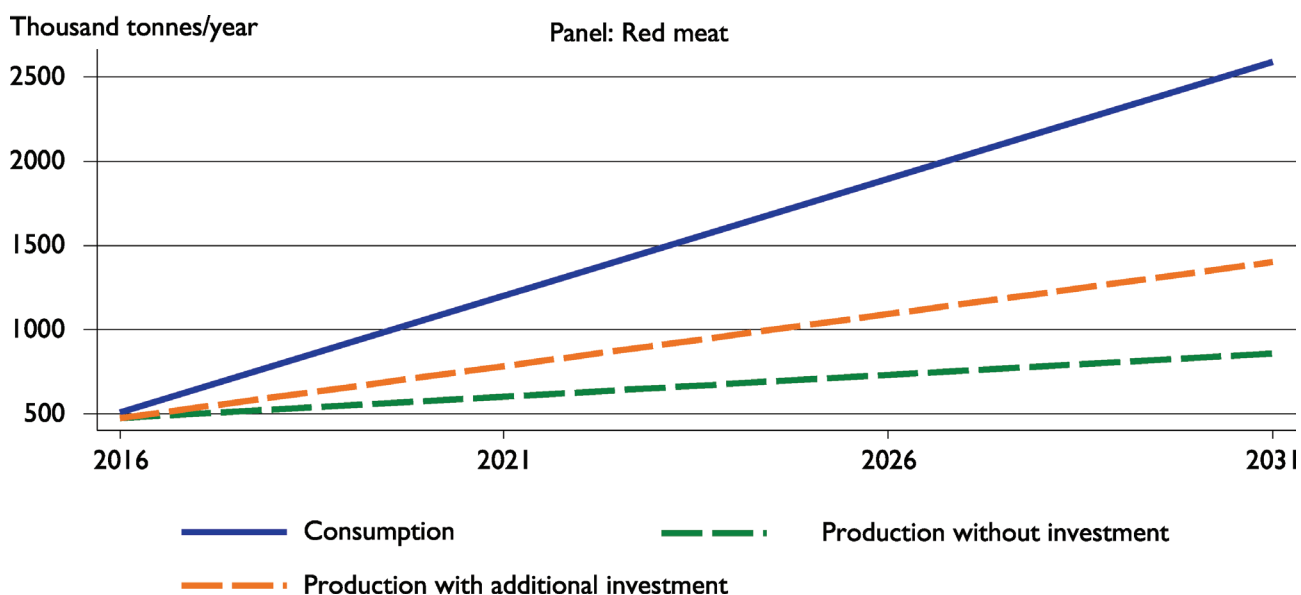
Without additional investments in the sector the projected red meat production-consumption gap in 15 years (by 2031/32) is estimated to be 1.7 million tonnes, driven by existing poor animal genetics, health, and feed constraints. Moreover, the scenario analysis with the current level of dairy investments shows that there will be a production-consumption gap/deficit of 5.8 million litres in 15 years. These projected deficits will also be driven by a high human population, increased incomes, urbanization, and income elasticity of demand, leading to very high projected growth in consumption of animal-source foods.

The key results and conclusions of the ‘with additional investment’ scenario analysis in the LSA for each priority livestock value chain are as follows:

Red meat

The extremely limited access to land for grazing and feed production, and limited ability to raise the genetic potential of local ruminant breeds in the medium- to long-term (15 years) mean that the red meat production shortage is unlikely to be closed in this period (Figure 1). Moreover, additional supply of red meat from ruminants will not contribute much to closing the projected ‘all-meat’ production-consumption gap. Beef is the dominant component of the red meat consumed in Tanzania, along with goat meat and mutton (sheep meat). In the base year of the sector analysis (2016–17), beef accounted for about 82% of the total red meat while goat meat and sheep meat accounted for 14% and 4%, respectively. The projected production-consumption balance indicates that there will be little change in the composition of red meat produced over the coming 15 years, with beef remaining dominant and accounting for 79% of total red meat without additional investment and 82% with additional investment.

Figure 1: Production-consumption balance for red meat with and without additional investments for Tanzania, 2016/17–2031/32.

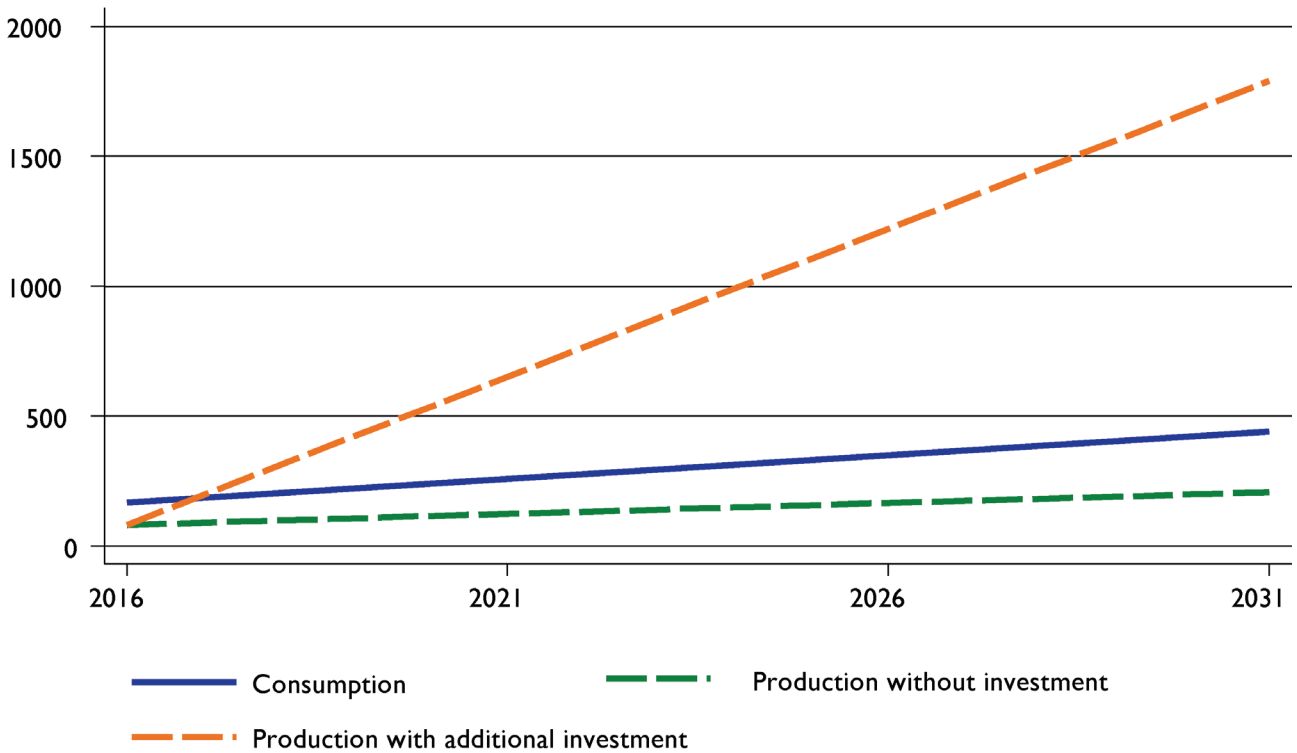


White meat

Improving white meat requires a focus on controlling Newcastle disease and African swine fever (ASF) disease in chicken and pigs, respectively, to increase their productivity and their off-take and meat production. Raising productivity would help close the projected all-meat consumption-production gap projected in 15 years, thus helping to achieve better food security and enable red meat exports. In the ‘without additional investment’ scenario, by year 2031/32, a deficit of about 234,000 tonnes of white meat is projected resulting in a total all meat deficit of 2 million tonnes. Moreover, industrializing white meat (chicken and pork) production in large commercial-scale operations and investing in industrial-scale processing for product transformation and value addition would likely lead to lower domestic meat prices, while enabling an increase in exports and foreign exchange earnings by enabling red meat to be exported. However, taking advantage of the benefits of the potential ‘white meat revolution’ would require substantial investments in promotional activities to change tastes and preferences from beef, as well as from local to exotic chicken meat and eggs.

Figure 2: Production-consumption balance for white meat with and without additional investments for Tanzania, 2016–2031.

Thousand tonnes/year



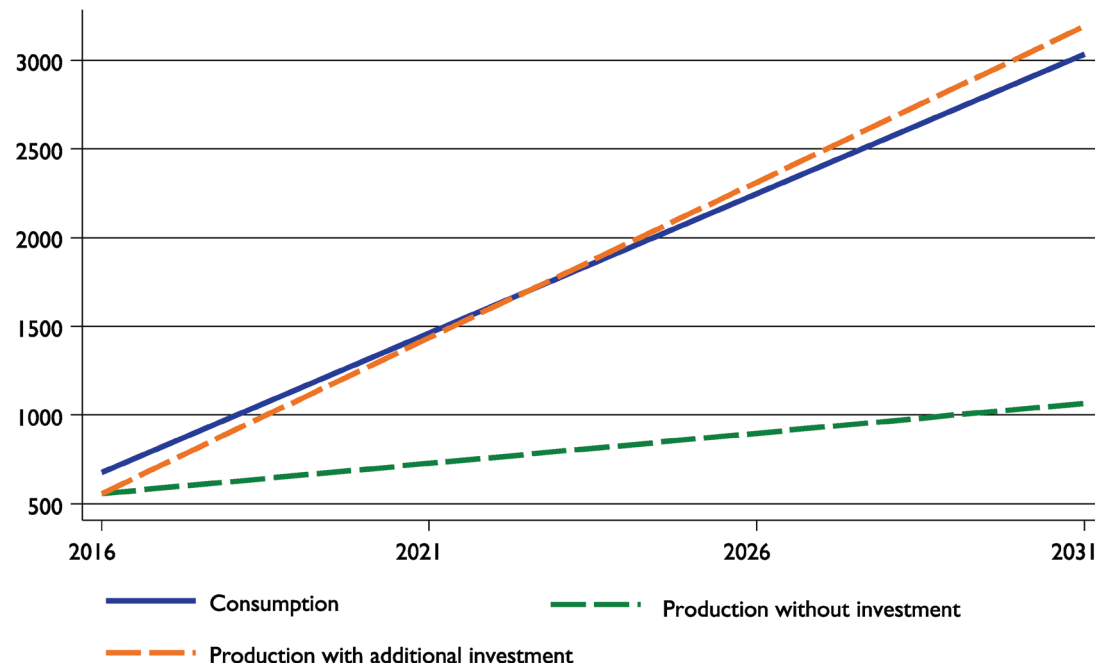
All meat

The projected all meat production ‘with additional combined investment’ in the livestock sector is estimated at 3.2 million metric tonnes in 2031/32, a 199% increase from the without additional investment scenario. The self-sufficiency rate also increases from 35% to 105%, resulting in a surplus of 158 thousand metric tonnes which represents a potentially exportable quantity of not only primarily beef, but also perhaps other ruminant meats (goat meat and mutton) to surrounding countries, and even surplus chicken and eggs.

Figure 3: Production-consumption balance for all meat with and without additional investments for Tanzania, 2016–2031.

Thousand tonnes/year

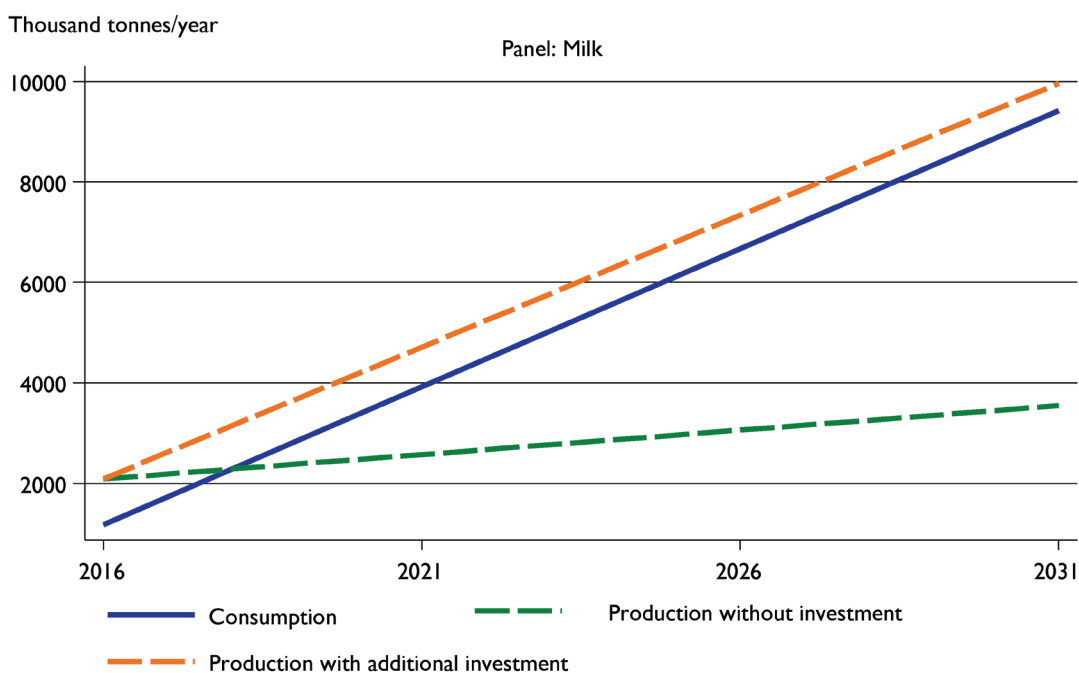
Panel: All meat



Cow dairy

The scenario analysis with the current dairy investment level shows that there would be a production-consumption gap of 5.4 million litres of milk in 15 years (Figure 4). The 'with investment' scenario analysis for additional dairy investments shows the gap in projected milk consumption can be closed and a surplus produced through artificial insemination and hormone synchronization, combined with improved feed and health interventions, value addition processing to help ensure a market for fresh milk, and complementary policy changes. Thus, with additional investments there could be a surplus of about 0.5 million litres of milk in 2031/32 which would provide raw material for domestic industries and export, after meeting domestic consumption requirements.

Figure 4: Production-consumption balance for cow milk with and without additional investments for Tanzania, 2016–2031.



Main results and conclusions of the livestock sector analysis

- Significantly increasing poultry production and consumption is key for increasing the contribution of animal-source foods in achieving greater household and national food security.
- The projected gap in milk demand could be closed and a surplus produced through the use of artificial insemination and hormone synchronization for breed improvement, combined with feed and health interventions addressing YASM.
- Livestock genetic improvement priorities should focus on dairy crossbreeds and exotic chicken pure breeds for both family and large-scale investment.
- Animal health interventions for YASM (vaccinations, parasite control) are critical to ensure improved productivity, thereby increasing animal and product off-take of meat and dairy.
- Feed is the biggest constraint to animal productivity improvement. Challenges of access to land appropriate for grazing, and land for feed production need to be addressed to overcome the existing animal feed deficit.
- Land allocation and ownership policies need to change to favour the investments required to increase feed for meat and milk production.
- The policy priority should focus on creating a more conducive environment for investment in commercial meat and milk production and processing.
- The huge projected deficit in consumption of red meat is driven by an increasing human population and urbanization as well as rapid income growth.
- Emphasis to improve cattle off-take needs to focus on increasing beef production from on-farm fattening and commercial feedlots.

-
- Red meat production cannot be expected to increase much over time and or to help significantly in closing the projected 'all meat' production-consumption gap due to the present limited access to land for feed production and grazing, the need to expand animal health services, and the low genetic potential of local cattle breeds and small ruminants.
 - Animal health services need to expand dramatically, especially in remote areas where pastoralists predominate, and public-private partnerships could be used where private investments are risky and the returns are low.
 - Pork is prone to African swine fever and its demand is limited, hence it cannot be a priority solution for closing the meat supply gap.

Investing in chicken production has the most potential to close the meat production-consumption gap and could enable export of ruminant animals and red meat. However, domestic consumer preferences for white meat and particularly chicken meat would need significant investment and effort in changing consumer preferences for red meat, especially beef and goat meat.

Dairy development roadmap 2017/18–2021/22

Dairy development roadmap (2017/18–2021/22)

Vision

The overall vision of the dairy development roadmap is increased milk production that meets the domestic demand and the surplus is exported. This goal will be achieved by increasing dairy cow productivity through improvements in dairy cow genetics, health and nutrition and by expanding the national dairy cow herd and improving the processing and marketing of dairy products.

Overall target

The number of crossbred dairy cattle at the national level will increase by about 3.8 times from the current 783,000 to 2,985,000 by 2021/22.

Table 2: Current and projected number of crossbred cattle by production zone in Tanzania

	Livestock production zone	Number of crossbred cattle in improved family dairy and commercial specialized dairy						% change
		Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Improved family dairy	Coastal and lake	156,857	339,596	568,881	842,297	1,162,868	1,394,338	789
	Highlands	375,337	460,801	556,671	665,979	790,043	930,286	148
	Total in improved family dairy	532,194	800,397	1,125,552	1,508,276	1,952,911	2,324,624	337
Commercial specialized dairy	Commercial specialized	250,800	304,348	369,330	448,185	543,877	660,000	163
National number of crossbreeds		782,995	1,104,745	1,494,882	1,956,462	2,496,788	2,984,624	281

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The production of milk at the national level will increase from 2,159 million litres in the base year to 3,816 million litres in 2021/22, an increase of about 77% over five years. Though most of this change is expected to come from improvement and increased production by dairy cows, improvement of cattle for red meat production will also contribute to milk production (the next section).

Productivity improvement interventions in the dairy cow production system will result in 31% increase in the average annualized milk productivity of a cow in traditional and improved family dairy subsystem and a 26% increase in commercial specialized dairy. The national average annualized milk production of a cow will increase from 179 litres to 254 litres over five years (2016/17–2021/22).

Table 3: Current and projected milk production in Tanzania

Livestock production zone	National and production system milk production (thousand litre)						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Central	848,140	884,466	922,348	961,853	1,003,049	1,046,010	23
Coastal and lake	751,923	841,687	942,166	1,054,641	1,180,542	1,321,474	76
Highlands	344,186	401,149	467,541	544,920	635,106	740,219	115
Commercial specialized dairy	214,885	272,832	346,405	439,819	558,423	709,011	230
Total milk production	2,159,134	2,400,134	2,678,461	3,001,233	3,377,121	3,816,714	77

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 4: Annualized milk productivity of cows in traditional and improved family dairy and commercial specialized dairy subsystems

Livestock production zone	Milk production per reproductive female per year (litre)						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Traditional and improved family dairy	165	174	184	194	205	216	31
Commercial specialized dairy	1,757	1,839	1,925	2,015	2,108	2,207	26
National	179	192	206	221	237	254	42

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Mainly due to dairy but also red meat improvement interventions, the GDP contribution of milk at the nation level is expected to increase from TZS 808,342 million in 2016/17 to TZS 1,415,671 in 2021/22, a 75% increase (Table 5).

Table 5: GDP contribution of milk at national level

Livestock product	GDP contribution by commodity (TZS million)						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Milk	808,342	904,209	1,011,445	1,131,399	1,265,578	1,415,671	75

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Target production subsystems for cow dairy improvement interventions

The dairy production system in Tanzania can be divided into three major categories: traditional cow meat-milk, improved family dairy, and commercial specialized dairy subsystems (Nell et al. 2014). The traditional cow meat-milk production subsystem is not specialized on a single commodity and both milk and meat are important products. However, milk is a priority commodity in improved family dairy and commercial specialized dairy subsystems. Both of these subsystems use crossbred/pure temperate dairy breeds like Holstein, Jersey and Ayrshire and they differ mainly on the level of intensification and specialization (Nell et al. 2014).

In the improved family dairy subsystem, the level of input by farmers is lower compared to the commercial specialized dairy subsystem. The input level in improved family dairy subsystem depends on marketing opportunities and income from sale of milk. Cattle are kept under semi and zero-grazing settings with cultivated fodder, crop residue and grass cut from communal land providing most of the feed. Channels for selling milk rely on direct marketing of milk to the consumer and milk collection centres.

The commercial specialized dairy subsystem is more commercialized and specialized and has higher input of feeds and animal health services compared to the improved family dairy subsystem. This subsystem is divided into small and medium-sized farms, based on herd size. In small farms, farmers keep between two and three mostly crossbred cows that are not mixed with indigenous cattle.

Farmers in the medium commercial and specialized dairy subsystem own larger herds of cattle, often more than 100 cows, with a national average of 450 animals. These farms are government or privately-owned farms with their own input delivery systems. The milk produced in these farms is sold directly to milk processing plants or processed within the farms.

Table 6: Dairy production subsystems in Tanzania

Dairy subsystems	Herd size	Classified under	Average milk production (litre/day)	Average lactation length (days)	Parturition rate
Improved family dairy	1-5	Crop-livestock mixed agriculture	6–8	250–270	0.7
Commercial specialized dairy	5-100 (small) >100 (medium)	Urban and peri-urban specialized dairy	10–12	310	0.75–0.8

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The development of the cow dairy system in Tanzania is targeted at improving and expanding the improved family dairy subsystems in coastal and lake and highlands zones and the commercial specialized dairy subsystem across the country. Many of the challenges, opportunities, interventions, improvement assumptions and investments are shared between the two subsystems, but are presented separately in this report.

Improved family dairy production in coastal and lake, and highlands zones

Table 7: Key challenges and strategies related to improved family dairy production

No.	Key challenges	Strategies
1.	<ul style="list-style-type: none"> Feed availability and quality Erratic supply of feed quality and quantity Limited availability and high cost of forage feed and limited supplementation Limited access to land for grazing, production of forage and forage seed due to an unclear land tenure system Mineral deficiencies in most of the forage 	<ul style="list-style-type: none"> Strengthening the extension service and training on forage production, conservation and feeding Policy interventions to make land available for investors for forage seed and forage production Enforcing feed and forage seed quality standards Using appropriate fertilizers in forage production.
2.	<ul style="list-style-type: none"> Low genetic potential of indigenous animals for milk production Inadequate and inefficient artificial insemination services 	<ul style="list-style-type: none"> Providing training support and incentives to livestock farmers to work as artificial insemination technicians Establishing and strengthening dairy heifer multiplication farms through private, public and private-public joint ventures Promoting, expanding, and strengthening privatization of artificial insemination and hormone synchronization services
3.	<ul style="list-style-type: none"> Animal health services High calf mortality Inefficient animal health services Inadequate supply of drugs Poor quality control of drugs and supplies High prevalence of transboundary diseases and trypanosomosis 	<ul style="list-style-type: none"> Rationalizing and strengthening the animal health regulatory capacity at the national and local government authorities (LGAs) levels under the coordination of the MLF Improving availability and quality control of vaccines and drugs
4.	<ul style="list-style-type: none"> Marketing and processing Unreliable transport system Narrow product range which is concentrated on short shelf-life products i.e. liquid and fermented milk Poor milk marketing and low price of milk Fluctuations in milk supply due to seasonality (dry and wet seasons) An absence of quality-based pricing incentives Poor milk quality control and enforcement mechanisms Existing informal trade of raw milk which poses threat to spreading zoonoses Limited promotion of dairy-product consumption 	<ul style="list-style-type: none"> Promote investment in long shelf-life milk products such as UHT and powdered milk Introduction of quality-based standards and pricing to encourage quality milk supply Strengthen enforcement of milk and milk products quality standards Formalize milk trade by training and licensing milk traders Scale up school-milk feeding program to promote milk consumption

No.	Key challenges	Strategies
5.	<p>Policy</p> <p>Pricing policies have disincentive effects on milk processing</p> <p>Overregulation of the dairy industry resulting to multiple taxes which is a burden to investors</p>	<p>Introduction of a protective trade policy that includes increasing import tariffs or bans and/or subsidies for domestically-produced milk products to enable competition with imports</p> <p>Put in place indicative prices for milk products</p> <p>Reduce bureaucracy and facilitate investment in the dairy industry</p>

Interventions to achieve targets

All production zones are expected to benefit from the cow dairy improvement interventions. Expanding and improving the commercial specialized dairy subsystem will be implemented in all over the country while expanding and improving the improved family dairy subsystem will target coastal and lake, and highlands zones. The major criteria used to select the production zones for improved family dairy subsystems include feed availability, climatic condition (temperature), prevalence of endemic diseases like trypanosomiasis, existing experience in dairying, product marketing infrastructure, and comparative advantage of each zone for dairy.

Main activities

Feed improvement interventions

The feed balance estimate in the coastal and lake and highlands zones shows significant deficit. Maintaining moderately high productive crossbred dairy cattle therefore should be accompanied with a significant increase in amount of feed produced/purchased. In the coastal and lake zone, up to 60% and in highlands zone up to 40% of the feed requirement should be either produced/purchased to keep the crossbred dairy cattle productive. The type of feeds produced/purchased could be:

- Improved forage (grass/legumes/fodder trees and shrubs)
- Concentrate feeds (locally made and industrial by-products)
- Strengthen the existing forage/forage seed/ quality control laboratories

Genetic improvement interventions

- Use artificial insemination with and without hormone synchronization and/or proven bulls for crossbreeding/breeding.
- Increase the number of crossbred cattle in the improved family dairy system through crossbreeding/breeding of indigenous and crossbred cattle using exotic dairy cattle breeds like Friesian, Ayrshire, Jersey, Brown Swiss and Mpwapwa.
- Strengthen existing national and zonal artificial insemination centres and establish a new semen production centre.
- Acquire five new liquid nitrogen plants
- Training and capacity building for 6,650 artificial insemination technicians
- Encourage establishment of bull centres
- Encourage establishment of crossbred heifer multiplication farms
- Purchase and distribute crossbred heifers for under-resourced dairying beginners (2,000 every year)
- Sensitize farmers on the formation of breed societies

Animal health improvement interventions

- Set up an East Coastal fever vaccination program to vaccinate of 300,000 dairy cattle annually.

- Implement vaccination campaign for foot-and-mouth disease, Rift Valley fever, contagious bovine pleuropneumonia, brucellosis, East Coastal fever, transboundary diseases and perform routine internal and external parasite control programs.
- Improve the capacity for livestock disease surveillance and diagnosis.
- Rehabilitate veterinary centres.

Milk and dairy products improvement interventions

- Provide incentives and ease the bureaucracy for investors seeking to establish milk processing plants.
- In addition to small- and medium-scale pasteurized milk processing plants; promote establishment of high capacity milk processing plants (at least two processing plants: one UHT milk and one milk powder).
- Promote the establishment of and strengthen the dairy cooperative/societies in high potential areas through training, sensitization, equipping and facilities.
- Encourage/establish at least 150 milk collection centres/chilling plants (cold chain).
- Strengthen the Dairy Board (office and laboratory) to improve quality regulation and marketing of milk in milk shed areas
- Strengthen the capacity of the milk quality assessment and safety control laboratory
- Strengthen school-milk feeding programs to benefit 500,000 children in five years—starting from 100,000 children on the base year and adding new 100,000 children every year.

Extension services improvement interventions

Training to livestock keepers and improved family dairy farmers on better husbandry, breed improvement and feeding practices.

Assumptions and targets of interventions and outputs

Farmers adopting the cow dairy improvement interventions will have higher cost of feed and veterinary services due to following up of the recommended frequency of vaccination, internal and external parasite treatments. The veterinary cost of adopting farmers is expected to be doubled from TZS 7,500 to TZS 15,000.

Moreover, due to the current shortage of feed, the per cent of feed purchased will increase to between 7–15% of the feed requirement of cattle in improved family dairy subsystems, from the current 0% purchase. Feed produced in the farm is also expected to grow likewise.

Cattle receiving the dairy improvement interventions are expected to show the following improvements in productivity:

- Parturition rate increased from 0.58 to 0.70 in coastal and lake zone and from 0.60 to 0.70–0.75 in the highlands zone.
- Mortality rate decreased by 50%.
- Live weight of cattle increased by 7–20% in both coastal and lake and highlands zones
- Lactation length of local breed cattle in coastal and lake and highlands zones increased from 180 to 250 days and 270 days for small and medium improved family dairy crossbred cattle subsystems, respectively.
- Daily milk production of local breed cattle in coastal and lake and highlands zones increased from the current 1.5 and 2 litres/day, respectively, to 8 litres/day in improved family dairy crossbred dairy cattle.

At the national level, the dairy improvement intervention is expected to result in increases of crossbred dairy cattle numbers and milk production in the improved family dairy subsystem.

The number of crossbred dairy cattle in improved family dairy (coastal and lake, and highlands) subsystem increases from 532,194 to 2,324,624 in 2021/22 (Table 2)

The cow dairy improvement intervention in improved family dairy subsystems of coastal and lake and highlands zones will result in increase of milk production from 1,096 million litres in 2016/17 to 2,062 million litres in 2021/22.

Table 8: Increase in milk production due to cow dairy improvement in improved family dairy subsystem of coastal and lake, and highlands zones

Livestock production zone	Milk production in improved family dairy subsystem (thousand litre)						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Coastal and lake	751,923	841,687	942,166	1,054,641	1,180,542	1,321,474	76
Highlands	344,186	401,149	467,541	544,920	635,106	740,219	115
Total milk production	1,096,109	1,242,836	1,409,707	1,599,561	1,815,648	2,061,693	88

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 9: Average daily milk production change per cow in coastal and lake, and highlands zones due to cow dairy improvement interventions in improved family dairy subsystem

Livestock production zone	Average daily milk production per reproductive female (litre)						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Coastal and lake	1.50	1.62	1.74	1.88	2.02	2.18	45
Highlands	2.00	2.14	2.30	2.47	2.65	2.84	42

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The average annualized milk production of a cow in the improved family dairy subsystem of coastal and lake zone increases from the 157 litres in 2015/16 to 240 litres in 2020/21.

The average annualized milk production of a cow in improved family dairy subsystem of highlands zone increases from the current 215 litres to 343 litres in 2020/21.

Table 10: Annualized milk production of cow in coastal and lake and highlands zones

Livestock production zone	Milk production per reproductive female per year						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Coastal and lake	157	171	186	202	220	240	53
Highlands	215	236	259	285	313	343	59

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Investments

The investments in cow dairy cattle development in the coastal and lake and highlands zones can be categorized into six major groups—feed, breed, health, extension, research, and marketing improvement investments.

Investments related to feed improvement include improving pasture and forage and concentrate feed production and marketing through construction of commercial animal feed plants, improving existing feed and forage seed quality control laboratories (equipment and human resource capacity building). This is estimated to cost a total of TZS 44 billion.

The investment to improve animal health is shared with cattle, sheep and goats as many of the interventions will serve all the three species. Animal health improvement investments will support the vaccination campaign to control and prevent East Coastal fever, contagious bovine pleuropneumonia, foot-and-mouth disease, Rift Valley fever, and brucellosis and improve the capacity of veterinary centres, diagnostic laboratories for surveillance and diagnosis and construction and rehabilitation of dip tanks. Similar to the health improvement investments, investments to improve livestock extension services will serve all ruminant species.

Cattle breed improvement investment is estimated to cost around TZS 52.6 billion for over five years. This investment will be aimed at strengthening existing national and zonal artificial insemination centres, establishing a new semen production centre, acquiring new liquid nitrogen plants, training and building the capacity of 6,650 artificial insemination technicians, establishing bull centres, purchasing and distributing crossbred heifers for under-resourced farmers, and establishing crossbred heifer multiplication farms.

Investments to improve the capacity of research centres to carry out research on breed improvement, feed, health, marketing and value chain and dairy extension services are estimated to cost up to TZS 22 billion.

Investment to improve milk marketing and processing is estimated to cost over TZS 106 billion. The construction of UHT and milk powder processing plants, formation and strengthening of dairy cooperative societies in high potential areas (training, sensitization, equipping and facilities), establishing milk collection/ chilling centres (cold chain), strengthening dairy board to regulate milk quality in lake and coastal, and highlands zones, strengthening the capacity of milk quality and safety control laboratory and school-milk feeding programs is expected to improve the marketing and processing of milk.

Table 11: Five-year dairy improvement investment (2017/18–2021/22)

S/no	Investment intervention	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
I	Animal feeding							
i	Pasture establishment and paddocking Land preparation, pasture establishment and paddocking in newly-established 150 medium farms (50 Ha)	7,920	7,920	7,920	7,920	7,920	39,600	Private–100%
ii	Commercial animal feeds plants Construction of two plants (TZS 1,100 million per plant)	-	1,100	-	1,100	-	2,200	Private–100%
iii	Feeding technologies and land acquisition (production, processing and storage) for newly established 150 medium farms	176	176	176	176	176	880	Public–80% Private–20%
iv	Feed quality control (laboratories and capacity building) and improving the existing (first five years)	-	440	-	-	-	440	Public–100%
v	Strengthen the existing pasture/forage seed quality control laboratories	880	-	-	-	-	880	Public–100%
	Subtotal	8,976	9,636	8,096	9,196	8,096	44,000	
2	Animal health	-	-	-	-	-	-	
i	East Coastal fever vaccination program for 300,000 dairy cattle per year	-	-	-	-	-	-	Income mentioned in red meat improvement scenario
ii	Implement programs for eradication of contagious bovine pleuropneumonia, foot-and-mouth disease, Rift Valley fever (capacity for surveillance, diagnosis and vaccination campaign)	-	-	-	-	-	-	
iii	Rehabilitate 100 veterinary centres	-	-	-	-	-	-	
3	Animal breeding and genetics investments							
i	Strengthen existing national and establish a new semen production centre	2,200	-	11,000	-	-	13,200	Public–100%
ii	Strengthen existing and acquire two liquid nitrogen plants	-	1,100	-	1,100	-	2,200	Public
ii	Training and capacity building for 6,650 artificial insemination technicians	554	554	554	554	554	2,772	Public–10% Private–90%
iii	Establishing bull centres and purchase 20 proven bulls	198	198	198	198	198	990	Private–50% Public–50%
iv	Purchase and distribution of crossbred heifers for under-resourced dairying beginners (2,000 every year)	4,400	4,400	4,400	4,400	4,400	22,000	Public–90% Private–10%
v	Strengthen existing LMUs and establish four crossbred heifer multiplication farms	2,750	-	2,750	2,750	2,750	11,000	Public-private partnership 50%/50%

S/no	Investment intervention	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
vii	Sensitize farmers on the formation of breed societies	440	-	-	-	-	440	Public–50% Private–50%
	Subtotal	10,542	6,252	18,902	9,002	7,902	52,602	
4	Extension	-	-	-	-	-	-	Income mentioned in red meat improvement scenario
	Strengthening extension services for dissemination of appropriate livestock technologies	-	-	-	-	-	-	
5	Research							
	Research on breed improvement, feeds and forage, animal health and value addition of livestock products and by-products	-	10,000	-	12,000	-	22,000	Public–100%
	Subtotal	-	-	22,000	-	-	22,000	
6	Marketing and value addition	-	-	-	-	-	-	
i	Construction of 1 UHT in coastal and lake, and 1 milk powder processing plant in highlands zone	-	11,000	17,600	-	-	28,600	Public-private partnership–50%/50%
ii	Formation and strengthening of dairy cooperative and primary societies in high potential areas (training, sensitization, equipping and facilities)	220	220	220	220	220	1,100	Public–50% Private–50%
iii	Establish 150 milk collection/chilling centres (cold chain)	1,980	1,980	1,980	1,980	1,980	9,900	Public–50% Private–50%
iv	Strengthen Dairy Board to regulate milk quality in highlands, lake and coastal zones in four milk sheds (office and laboratory)	550	-	-	-	-	550	Public–100%
v	Strengthen the capacity of milk quality and safety control laboratory at the Tanzania Veterinary Laboratory Agency (TVLA)	330	-	-	-	-	330	Public–100%
vi	School-milk feeding programs to benefit 500,000 children	4,400	8,800	13,200	17,600	22,000	66,000	Public-private partnership–50%/50%
	Subtotal	7,480	22,000	33,000	19,800	24,200	106,480	
	Grand total investment	26,998	47,888	59,998	49,998	40,198	225,082	Public–47% Private–53%

Impacts

Return on investment (ROI)

The herd level internal rate of return (IRR) for the 15-year investment in improved family dairy systems of small cattle herds in coastal and lake, and highlands zones is 13.7% and 23.1% with a net present value (NPV) of TZS 605,735 and TZS 8,514,420, respectively.

The herd level IRR for 15-year investment in improved family dairy systems of medium cattle herds in coastal and lake, and highlands zones is 7.5% and 20.4% with NPV of 350,593 and 26,615,979 TZS, respectively.

Milk production

Due to the dairy and red meat improvement interventions in coastal and lake, and highlands zones, the production of milk in the zones is expected to increase from 751,923 and 214,885 thousand litres to 1,321,444 and 740,539 thousand litres over five years (2016-2020), respectively. An increase of 76% in coastal and lake zone and 115% in highlands zone (Table 8).

GDP impacts

Mainly due to dairy but also with a small contribution of red meat improvement intervention, the GDP contribution of milk for coastal and lake, and highlands zones is expected to increase from TZS 273,437 and TZS 149,567 in 2015/16

Activities	Investment activities timing									
	2017/18		2018/19		2019/20		2020/21		2021/22	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Construction and rehabilitation of dip tanks										
Support the vaccination campaign of contagious bovine pleuropneumonia, foot-and-mouth disease, Rift Valley fever, peste des petits ruminants, contagious caprine pleuropneumonia, and brucellosis and improve the capacity of veterinary centres, diagnostic laboratories for surveillance and diagnosis										
Strengthening the capacity of existing livestock training institutes										
Establish and/or strengthen ward livestock resource centres and provide extension officers with the necessary equipment (toolkit)										
Training to livestock keepers and improved family dairy farmers on better husbandry, breed improvement and feeding practices										
Research on breed improvement, feeds and forage, animal health and value addition of livestock products and by-products;										
Encourage construction of UHT and milk powder processing plants										
Formation and strengthening of dairy cooperative (training, sensitization, equipping and facilities)										
Establish milk collection/chilling centres (cold chain)										
Strengthen Dairy Board to regulate milk quality in highlands, lake and coastal areas in four milk sheds (office and laboratory)										
Strengthen the capacity of milk quality and safety control laboratory (TVLA)										
Implement school milk feeding programs to benefit 1,500,000 children										

Complementary intervention and success requirements

The following are crucial aspects of the dairy improvement interventions and success requirements

- Plan and carry out extensive crossbreeding/breeding schemes in selected areas using artificial insemination, artificial insemination with hormone synchronizing and/or bull of dairy cattle breeds.

- Improve the efficiency of existing artificial insemination, artificial insemination with hormone synchronizing and/or bull crossbreeding/breeding services.
- Reduce cumbersome procedures to ease land availability for local and foreign investors in feed and dairy production and processing.
- Encourage establishment of heifers' multiplication centres.
- Provide continuous training and refresher courses to artificial insemination technicians.
- Strengthen the extension service and training to dairy cattle owners in dairy cattle husbandry and milk and milk products handling.
- Improve the animal health service.
- Enforce forages, concentrate feeds and forage seed quality standards and create conducive environment for production and marketing of feeds and feed seeds.
- Enforce milk quality standards and support establishment/functioning of milk processing plants.

Commercial specialized dairy production

Key challenges and strategies in commercial specialized dairy production

Many of the challenges and strategies listed in the improved family dairy section are also pertinent for commercial specialized dairy production. Thus, only specific challenges and strategies which are important to commercial specialized dairy are listed here.

Table 15: Key strategies and challenges in commercial specialized dairy production

Key challenges	Strategies to address challenges
1. Feed availability and quality Cumbersome procedures of owning land for commercial forage production Shortage of concentrate feed and roughage (both in quality and quantity) Lack of effective feed quality control and standards enforcement mechanisms	Making land available for commercial forage production by investors Promoting and enforcing outsourcing contracts to produce forage for specialized dairy Enforcing feed quality standards, quality monitoring and control Promoting the establishment of flour mills and oil processing plants which will make more concentrate feed ingredients available i.e. wheat bran, wheat short and seed cakes
2. Marketing and processing Lack of diversity of dairy products and packaging that meets consumption needs of different consumers Shortage of dairy technologists	Promoting investment in UHT milk, powdered milk production, and other value-added products like yogurt, ice cream and cheese, etc. Building the capacity of the dairy technology training institute(s)
3. Policy and investment support Poor milk quality control and enforcement mechanisms Few commercial specialized dairy farms and milk processing plants	A need for milk-quality standards control and enforcement, as well as grading and pricing policies A need for an effective land acquisition policy for dairy investments (preferential treatment for accessing land for specialized dairy production, milk processing and feed production) A need for incentives for investors to establish dairy processing plants and specialized dairy farms

Interventions to achieve targets

The major interventions proposed to improve the commercial specialized dairy are feed improvement (production, marketing and processing of feed), increasing the number of crossbred dairy cattle and commercial specialized dairy farms, encouraging private artificial insemination and health service providers and improving marketing of milk and milk products.

Main activities

Feed improvement interventions

Make land accessible for forage production for the commercial specialized dairy farms and forage producers. Strengthen the existing forage/forage seed/quality control laboratories.

Increasing the number of commercial specialized dairy farms

Provide incentives to investors and ease the bureaucracy in establishing commercial specialized dairy farms.

The number of crossbred dairy cattle and commercial specialized dairy farms in commercial specialized dairy subsystem is expected to increase by 120–163% and 164%, respectively. The number of commercial specialized dairy farms is targeted to increase from 159,000 to 420,000 in small and from 204–400 farms in medium commercial specialized dairy subsystems (Table 16).

The number of crossbred dairy cattle will increase from 159,000 in 2015/56 to 420,000 in 2020/21 in small commercial specialized dairy farms and from 250,800 in 2015/16 to 660,000 in 2020/21 in the medium ones.

Table 16: Changes in number of crossbreds and dairy farms in commercial specialized dairy subsystem

Livestock production subsystem	Items	Number of farms and crossbred cattle in commercial specialized dairy						% change
		Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Small commercial specialized dairy	Herd size	5	5	5	5	5	5	0
	No of farms	31,800	37,236	43,601	51,054	59,781	70,000	120
	Number of crossbreds	159,000	193,093	234,497	284,779	345,843	420,000	164
Medium commercial specialized dairy	Herd size	450	477	505	535	566	600	33
	No of farms	204	233	267	306	350	400	96
	Number of crossbreds	91,800	111,254	134,831	163,404	198,033	240,000	161
Total crossbreds in commercial specialized dairy		250,800	304,348	369,330	448,185	543,877	660,000	163

Animal health interventions

Improve availability of drugs, vaccines and medical equipment and support to enhance the effectiveness of private health service providers.

Improve the availability of vaccines for foot-and-mouth disease, Rift Valley fever, contagious bovine pleuropneumonia, East Coastal fever and brucellosis

Genetic improvement interventions

Encourage private artificial insemination service providers

Improving marketing and processing of milk and milk products

Interventions proposed to improve marketing and processing of milk and milk products in improved family dairy subsystems equally work for commercial specialized dairy subsystems.

Assumptions and targets

Commercial specialized dairy farmers adopting the cow dairy improvement interventions will increase their cost of acquiring quality feed and veterinary services.

- The per cent of feed purchased will increase from 10–17% and 20% in small and medium commercial specialized dairy subsystems
- The veterinary cost will increase from TZS 15,000–20,000 per year/cow

Cattle receiving the cow dairy improvement interventions are expected to show the following productivity improvements

- An increase in parturition rate from 0.70–0.75 in small and up to 0.80 in medium commercial specialized dairy subsystem.
- A decline in mortality rate of juveniles from 10–6% in both small and medium commercial specialized dairy.
- A daily milk production increase from 8–10 litres in small and 9–12 litres in medium commercial specialized dairy.

At the national level, the dairy improvement intervention is expected to result in an increase in the number of crossbred dairy cattle and milk production in the commercial specialized dairy subsystem.

- The number of crossbred dairy cattle will increase from 250,800 to 660,000, a 163% increase in five years (Table 14).
- Milk production in the subsystem will increase from 214,885 thousand litres in 2016/17 to 709,011 thousand litres in 2021/22 (Table 3).
- The average annualized milk production of a cow in the commercial specialized dairy subsystem is targeted to increase from the current 1,757 litres to 2,207 litres in 2021/22 (Table 4).

Investments

The investment listed for improved family dairy subsystem, above, equally work for the commercial specialized dairy subsystem and the investment will be shared among both subsystems.

Impacts

Return on investment

The herd level IRR for 15-year investment in commercial specialized dairy of small and medium cattle herd sizes appears to be very high with net present value (NPV) of TZS 7.4 million and TZS 1,384 million, respectively.

Milk production

Due to the dairy improvement interventions in the commercial specialized dairy, the production of milk in the subsystem is expected to increase from 214,885 thousand litres to 709,011 thousand litres over five years (2016-2020), an increase of 230% (Table 3).

GDP impacts

Dairy improvement interventions in the commercial specialized dairy will increase milk's contribution to GDP from commercial specialized dairy subsystem from the current TZS 76,678 million to TZS 276,130 million, a 247% increase in five years (Table 17).

Table 17: GDP contribution of cow milk production in the commercial specialized dairy subsystem

Livestock production	Contribution of cow milk (TZS millions)						% change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Commercial specialized dairy subsystem	79,678	102,163	130,993	167,959	215,357	276,130	247

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Additional increase in income from dairy investments

Dairy improvement interventions in commercial specialized dairy system resulted in 30-31% increase in income per animal when 'without' and 'with additional investments' scenarios are compared (Table 18).

Table 18: Change in income per animal due to dairy improvement interventions in commercial specialized dairy

Production zone/system	Herd size	Income per animal (without additional investment)	Income per animal (with additional investment)	% change
Commercial specialized dairy	Small herd	311,068	408,949	31
	Medium herd	643,394	834,544	30

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Activities time line and sequencing: Gantt chart

The Gantt chart presented in the improved family dairy improvement section, above, works equally well for both commercial specialized dairy and improved family dairy subsystems.

Complementary intervention and success requirements

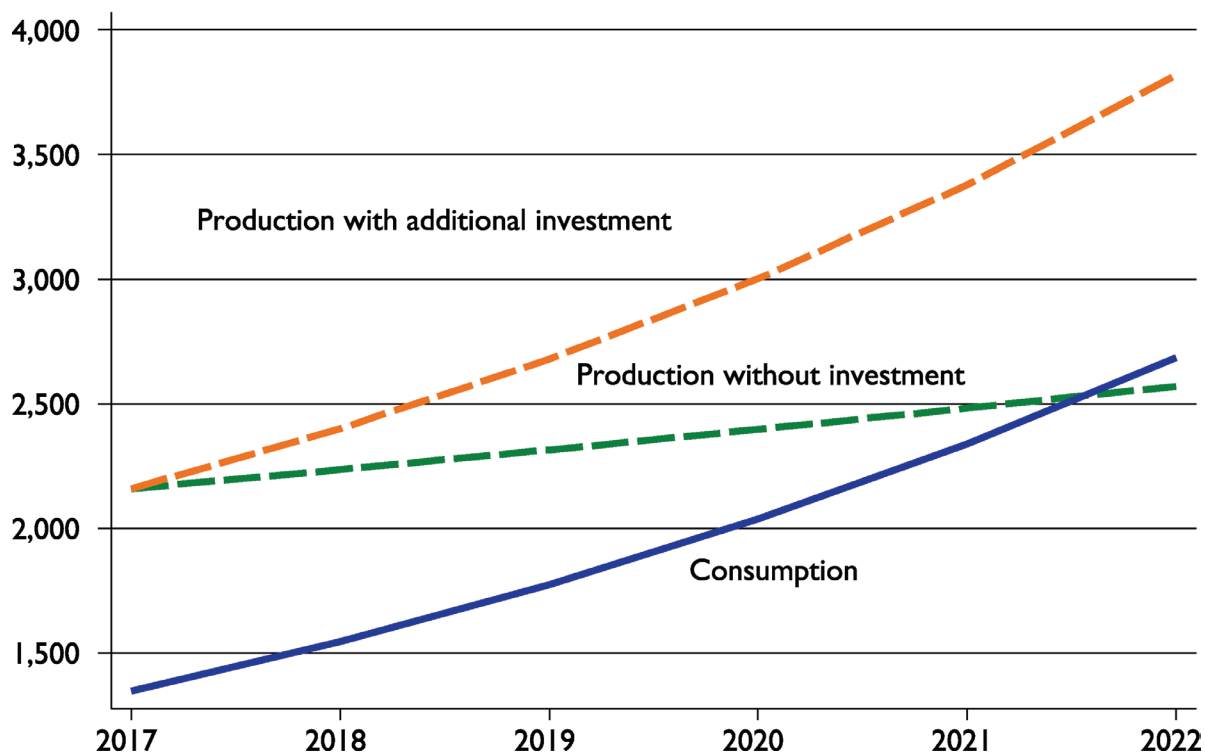
The following are crucial aspects of the dairy improvement interventions and success requirements for the commercial specialized dairy subsystem.

- Provide incentives to investors and ease the bureaucracy in establishing commercial specialized dairy farms.
- Make land accessible for forage production for commercial specialized dairy farms and forage producers.
- Encourage establishment of heifer multiplication centres.
- Enforce milk quality standards and support the establishment and functioning of milk processing plants.
- Enforce forages, concentrate feed and forage seed quality standards and create conducive environment for production and marketing of feeds and feed seeds.
- Improve availability of drugs, vaccines and medical equipment and support to enhance the role of private health and artificial insemination service providers.

Dairy production and consumption balance

The projected quantities of cow milk consumption and production 'with additional investment' and 'without investment' over the five-year LMP period are shown in Figure 5. Without investment, it is projected the production gap will start developing toward the end of the plan period and investment is, therefore, required to avoid production gaps during and beyond the LMP period.

Figure 5: Projected cow milk consumption and production with and without investment, 2017–2022 (in thousand tonnes).



Conclusions

The interventions proposed to improve cattle milk production and productivity will transform traditional farms engaged in family dairy into improved and more market-oriented family dairy systems by:

- raising and realizing the genetic potential of local breeds for significantly higher milk production through crossbreeding with exotic dairy breeds using artificial insemination with or without hormone synchronization and bull semen, combined with better feed and health services.

Milk production and productivity of the commercial dairy system will also increase significantly by:

- bringing more crossbred cattle into the commercial cattle dairy system, and
- increasing the availability of forage feeds by improving forage feed production and marketing.

Local cattle, or the vast majority of individual animals, also offer a huge potential for bridging the gap between the national milk consumption and production. The interventions—mainly targeted at improving animal reproductive and weight gain performance—also affect milk production and productivity significantly in all typology zones. These interventions will be achieved by:

- Improving the natural grazing (pasture and range) land, coupled with health interventions to reduce mortality.

These combined interventions will result in:

A 77% increase in national cattle milk production from 2,087 million litres in 2017 to 3,687 million litres in 2022 (over the five-year development plan period). The production of a surplus of 1,002 million litres of cow milk over projected domestic consumption requirements by year 2022.

This surplus could substitute for imported milk products and be used domestically for new or additional industrial purposes or exported as milk powder or UHT (Figure 5) to raise foreign exchange earnings.

In addition to the above activities, the critical conditions which need emphasis for success of the plan are:

- Encouraging the private sector to invest in milk processing plants and dairy farms.
- Ensuring availability of more and better feed seed, forage production and marketing. and health services in all areas, whether breed improvement is implemented or not.
- Ensuring more effective extension services to support production, processing and marketing of quality milk.

Red meat systems roadmap 2017/17–2021/22

Red meat systems roadmap (2017/17–2021/22)

Tanzania produces about 493,000 metric tonnes of red meat (by year 2016/2017) whereby 83% is beef and the remainder comes from sheep and goats. Most of this produce (97%) come from pastoral and agro-pastoral communities. The red meat produced is predominately for domestic consumption, with little exports. The country still has not been able to meet its domestic demand for red meat, and meeting this demand, as well as exploiting the export potential for red meat, are possible only if the limitations of unavailable resources, such as animal feeds, are overcome.

Vision

The projected year 2021 domestic demand gap for red meat arising due to rapidly growing population, increasing urbanization, and rising incomes is reduced; and live animal and meat exports are increased to generate foreign exchange earnings.

Overall target

To reach production of 742,000 tonnes of red meat by year 2021, through improvement of grazing land resources, animal health, and genetics; and use of appropriate feeding technology.

By 2021, a total of 2 million heads of animals passing through the ranch, feedlot and non-traditional (culled dairy cattle) operations is achieved; and the contribution of the traditional sector to the overall red meat produced is reduced from the current level of 97% to 10%.

Improved traditional red meat production

Targets

Interventions aimed at increasing traditional red meat output are expected to bring the following changes:

- An increase in the area of the grazing/pasture from 10–13%.
- Promoting allocation and establishment of pasture/fodder production areas from almost 0%, at present, to 5%.
- Increasing the parturition rate from 4–5%.
- Reducing mortality rate to 25–50% for all age and sex categories.
- An increase in dressing percentage by 2%.
- Live weight increase by 10% for all age and sex categories.
- Off-take rate increases from 10–16% for small-scale farms; 10–14% for medium-scale farms; and from 18–26% in ranches.

- Increasing the herd size of ranches by a range of 10–37% through purchasing of additional heifers in the first three to four years; and maintain constant herd size, once the carrying capacity is achieved.
- The number of ranches increased by 18%.
- The number of cattle in a fattening cycle, in feedlots, increased by 33%.
- The number of fattening cycles per year, in a feedlot, increased by 17%.
- To increase the number of feedlot units by over 100%.

Table 19: Annual increase in number of cattle

Production zone	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Traditional cattle system							
Central	13,583,842	14,098,320	14,632,283	15,186,470	15,761,646	16,358,606	20
Coastal and lake	11,985,328	12,301,694	12,626,411	12,959,700	13,301,786	13,652,901	14
Highlands	3,912,379	4,095,903	4,288,036	4,489,182	4,699,763	4,920,222	26
Total	29,481,549	30,495,917	31,546,730	32,635,351	33,763,194	34,931,729	18
Ranching system							
Central	12,330	12,988	13,682	14,413	15,182	15,993	30
Coastal and lake	19,297	19,525	19,755	19,988	20,224	20,463	6
Highlands	41,400	46,037	51,193	56,927	63,303	70,393	70
Total	73,027	78,550	84,630	91,328	98,709	106,848	46
Cattle* in feedlot							
Feedlot	78,111	115,878	171,905	255,020	378,323	561,242	619
Dairy subsector	260,293	315,888	383,356	465,235	564,601	685,191	163
Total	338,404	431,765	555,261	720,255	942,924	1,246,432	268

*The number includes culled cattle from the dairy subsector that are sent for fattening at feedlots

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

- The total number of cattle in the three production zones shows an 18% increase (29–34 million by 2021/22).
- The total number of cattle in the ranching system shows a growth of 46% (from 73,000 heads in 2016/17 to 106,000 in 2021/22).
- The number of cattle (local cattle and those culled cattle from dairy operations) reaching the feedlots show a 268% increase (from 338,404 heads to 1.2 million heads by 2021).

Table 20: Annual increase in number of sheep and goats in the traditional system

Production zone	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Sheep							
Central	1,976,019	2,050,120	2,127,000	2,206,762	2,289,516	2,375,373	20
Coastal and lake	2,409,396	2,488,665	2,570,542	2,655,113	2,742,466	2,832,693	18
Highlands	757,303	782,370	808,266	835,020	862,659	891,213	18
Total	5,142,718	5,321,155	5,505,808	5,696,895	5,894,641	6,099,279	19
Goats							
Central	6,682,562	7,052,939	7,443,845	7,856,416	8,291,855	8,751,427	31
Coastal and lake	7,540,489	8,120,743	8,745,647	9,418,639	10,143,419	10,923,972	45
Highlands	3,495,950	3,665,154	3,842,547	4,028,526	4,223,507	4,427,925	27
Total	17,719,001	18,838,835	20,032,039	21,303,582	22,658,780	24,103,323	36

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The total sheep population shows a 19% increase (reaches 6 million by 2021/22). The total number of goats in all production zones showed an increase of 36% by 2021/22 (from 17 million in 2016/17 to 24 million in 2021/22).

Table 21: Contribution of cattle to national red meat production (in tonnes)

Meat production	2016/17	2017/18	2018/19	2019/20	2020/21	2021/2022	% change
Cattle in traditional system							
Central	171,523	181,562	192,188	203,436	215,343	227,946	33
Coastal and lake	156,875	165,207	173,981	183,222	192,953	203,201	30
Highlands	65,566	70,923	76,718	82,985	89,765	97,099	48
Total	393,964	417,692	442,887	469,643	498,060	528,245	34

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 22: Contribution of cattle ranching system to the national red meat production (in tonnes)

Production zone	2016/17	2017/18	2018/19	2019/20	2020/21	2021/2022	% change
Central	284	296	309	322	336	350	23
Coastal and lake	425	505	600	713	847	1,006	136
Highlands	1,042	1,146	1,260	1,385	1,522	1,674	61
Total	1,752	1,947	2,169	2,420	2,705	3,029	73
Cattle from feedlots fattening and the dairy subsector							
Feedlot	7,433	11,454	17,648	27,194	41,902	64,565	769
Dairy subsector	5,376	6,603	8,110	9,961	12,235	15,028	180
Total	12,809	18,056	25,758	37,155	54,137	79,593	521

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The potential contribution of cattle to red meat overall production zones grows from 393,964 tonnes in 2016/17 to 528,245 tonnes by 2021/22 (a 34% increase). The contribution of cattle ranching system to red meat production grows from 1,752 tonnes in 2016/17 to 3,029 tonnes by 2021/22 (a 73% increase). The contribution of feedlot and dairy subsector system to the national red meat production grows from 12,809 tonnes in 2016/17 to 79,593 tonnes by 2021/22 (a 521% increase).

Table 23: Per cent contribution of cattle to national red meat by production system

Production system	2016/17	2017/18	2018/19	2019/20	2020/21	2021/2022	% change
Cattle							
Traditional	97.05%	96.23%	95.12%	93.61%	91.58%	88.87%	-8.43
Ranches	0.35%	0.37%	0.38%	0.39%	0.40%	0.41%	15.02
Feedlots	1.51%	2.16%	3.09%	4.39%	6.20%	8.70%	477.73
Culled commercial dairy cattle	1.09%	1.24%	1.42%	1.61%	1.81%	2.02%	85.94
Total	100 %	100%	100%	100%	100%	100%	

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 24: Contribution of sheep meat to national red meat production (in tonnes)

Meat production	2016/17	2017/18	2018/19	2019/20	2020/21	2021/2022	% change
Sheep							
Central	6,242	6,738	7,273	7,850	8,473	9,146	47
Coastal and lake	11,059	11,670	12,314	12,993	13,710	14,467	31
Highlands	3,149	3,361	3,587	3,829	4,087	4,362	39
Total	20,450	21,768	23,174	24,672	26,270	27,975	37

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The amount of sheep meat produced grows from 20,450 tonnes in 2016/17 to 27,975 tonnes by 2021/22 (a 37% increase). The amount of goat meat produced grows from 64,894 tonnes in 2016/17 to 103,681 tonnes by 2021/22 (a 60% increase).

Table 25: Contribution of goat meat to national red meat production (in tonnes)

Production system	2016/17	2017/18	2018/19	2019/20	2020/21	2021/2022	% change
Central	25,096	27,246	29,579	32,113	34,863	37,849	51
Coastal and lake	26,373	29,516	33,033	36,970	41,375	46,305	76
Highlands	13,424	14,469	15,595	16,809	18,117	19,527	45
Total	64,894	71,231	78,208	85,891	94,355	103,681	60

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Challenges and strategies

Table 26: Key challenges and strategies in enhancing red meat production in Tanzania

Challenges	Strategies
Feed	
Lack of sufficient grazing areas to meet the feed needs of the animals	Rehabilitation of rangeland/grazing land
Poor-quality grazing land resources	Acquiring substantial additional area for grazing land and for pasture/fodder production
Inadequate knowledge on the use of crop residues and by-products	Training and capacity building and skill development to increase the use of crop residues and by-products
Limited availability of concentrates and feed supplements, when needed.	Increased and better use of agro-industrial by-products from the processing of cereal/grains/oil seeds/sugarcane as concentrates for animal feeding. Promote appropriate storage and marketing of concentrates and feed supplements
Genetics	
Low genetic improvement extension coverage	Selection within the local breeds
Poor animal data recording system	Establishing community-based breeding programs, which include developing an animal recording scheme Promoting animal identification and traceability scheme.
Animal health	
Poor animal health extension services	strengthening animal health regulatory capacity under the coordination of the livestock ministry
Inefficient animal health services	
Inadequate supplies and qualities of vaccines and drugs	
Poor control of drugs and supplies	
Marketing and processing	
Poor market infrastructure	Strategic capacity building spearheaded by the second phase of the agricultural sector development program (ASDP II)
Poor technical knowledge of value chain actors, especially processors and technicians	Building additional infrastructure.
Inadequate market information	
Poor linkages between producers, processors and export abattoirs.	
Policy	
Absence of a breeding policy	Developing clearly defined guidelines on land use and access rights
Loss of land to alternative investments outside livestock	Implementing appropriate land policies.
A lack of protective trade policies	Gazetting grazing land

Interventions to achieve targets¹

Most of interventions for red meat production are expected to be done in the central, and coastal and lake production zones. The interventions in these zones do not involve artificial insemination and genetic progress through improved selection of indigenous breeds is anticipated to be slow.

The main proposed technological interventions in the central zone are:

- Feed improvement through better range management, oversowing with grass and legumes, and the control of invasive species. The intervention to improve rangeland productivity includes water development and rangeland improvement by shrub clearing, and the application of thinning technique where major shrub encroachment takes place.
- Reduction in young and adult stock mortality: The relevant health interventions include improving access to quality of veterinary services through rationalized use of public/private veterinary services; parasite control and treatment and vaccinations.
- Breed improvement through better selection and management of male breeding animals.
- Introduction of a herd/flock recording scheme for breed improvement.

However, other interventions will target the research, extension, market and value additions for the red meat products.

In the highlands zone, the following interventions will be carried out:

- Breed improvement, involving artificial insemination with semen of exotic breed primarily for dairy development. However, the culled dairy cattle will be channelled to beef production.
- Breed management and improvement through the implementation of a herd/flock recording scheme.
- Training/extension to improve the capacity of farmers to select and manage male breeding animals.
- The reduction of young and adult stock mortality with vaccines and anti-parasites.
- The introduction of integrated fodder crops with food crops.
- The timely harvesting of grass, and storage and conservation of hay from communal grazing lands.
- Increased efficiency of crop residue use (proper storage, supplementation, treatment including physical treatment-chopping, and urea).
- Oversowing and rotational grazing.

Investments

- The time span of the project is five years.
- Total investment budget is estimated at TZS 342,240 million where by 56% of the budget source is public. Private, and public-private partnerships will provide 43% and 1% of the total budget, respectively (Table 27) to be spent over the five years.
- For all the scenarios, the annual discount rate assumed is 10%, which is the assumed current social opportunity cost of capital in Tanzania.

Thirty-six per cent (36%) of the investment budget will cater for animal breeding and genetics. However, 75% of this budget will be sourced from the private sector (Table 28). Most of the public fund (60%) will be used in animal feeding and health interventions. The public-private partnerships will only suffice some budget for marketing and value addition which generally has the big proportion of public funds.

¹. The detailed red meat interventions for all production are presented in the LSA report.

Table 27: Total investment and recurrent costs red meat production

Investment category	Responsible actor (TZS million)			Total investment cost (TZS million)
	Public	Private	Public-private partnerships	
Animal feeding	57,607	21,625		79,231
Animal health	58,087	6,888		64,975
Animal breeding and genetics	12,230	109,574		121,804
Research	5,940	1,760		7,700
Extension services	9,900	1,100		11,000
Marketing and value addition	47,414	5,817	4,300	57,530
Total investment	191,177	146,763	4,300	342,240

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 28: The per cent contribution of public, private and public-private partnerships investments for red meat production

Key investment area	Proportion by responsible actor			Proportions by key investment area
	Public	Private	Public-private partnerships	
Animal feeding	30%	15%		23%
Animal health	30%	5%		19%
Animal breeding and genetics	6%	75%		36%
Research	3%	1%		2%
Extension services	5%	1%		3%
Marketing and value addition	25%	4%	100%	17%
	100%	100%	100%	100%

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

About 46% of the investment budget will be allocated to the central zone. The coastal and lake zone will use 42% of the budget the remaining portion will be used in the highlands zone.

Central zone

- The time span for the project is five years.
- The investment cost is estimated at TZS 156 billion (see Table 29, 30 and 31) to be spent over the five years span of the project, covering animal feeding, animal health, breeding, research, extension services, marketing and value addition.
- For all the scenarios, the annual discount rate assumed is 10%, which is the assumed current social opportunity cost of capital in Tanzania.

Table 29: Investment cost in the central production zone

Key intervention for investment	Cost (TZS million)	Proportion
Animal feeding	35,974	23%
Animal health	29,718	19%
Animal breeding and genetics	54,743	35%
Research	3,128	2%
Extension services	4,692	3%
Marketing and value addition	26,590	17%
	156,409	100%

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Coastal and lake zone

Similar to the central zone, Table 30 shows the investment in coastal and lake zone with a total of over TZS 142 billion.

Table 30: Investment cost in coastal and lake production zone

Key intervention for investment	Cost (TZS million)	Proportion
Animal feeding	31,932	22%
Animal health	26,127	18%
Animal breeding and genetics	49,350	34%
Research	2,903	2%
Extension services	4,354	3%
Marketing and value addition	29,029	20%
Total	145,147	100%

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Highlands zone

There is very minimal investment for red meat in the highlands production zone. Major intervention for the highlands is on dairy development, which indirectly benefits the red meat production. However, the investment on animal feed that focuses on rangelands development is included in the red meat intervention as shown in Table 31.

Table 31: Investment cost in the highlands production zone

Key intervention for investment	Cost (TZS million)	Proportion
Animal feeding	10,985	27%
Animal health	8,950	22%
Animal breeding and genetics	17,087	42%
Research	1,221	3%
Extension services	1,627	4%
Marketing and value addition	814	2%
Total	40,683	100%

Impacts

Return on investment (ROI)

The internal rate of return on investment in red meat is negative in the first five years, but positive or higher returns above the 10% discount are attainable within 15 years.

Table 32: Returns on investment (ROI)

Production zone	Central	Highlands	Coastal and lake
Small-scale	16.9%	89.5%	-26.6%
Medium-scale	-6.8%	540.8%	-31.1%
Ranch	-	102.5%	36.9%

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Production impacts

Table 33: Red meat production for baseline year (2016) and 2021 with intervention

Products	Total red meat in 2016/17 (tonnes) —baseline	Total red meat in 2020/22 (tonnes) — with intervention	% change in production
Meat in central zone			
Cattle	171,807	228,296	33
Sheep	6,242	9,146	47
Goats	25,096	37,849	51
Total	203,145	275,291	36
Meat in coastal and lake zone			
Cattle	157,301	204,206	30
Sheep	11,059	14,467	31
Goats	26,373	46,305	76
Total	194,733	264,979	36
Meat in highlands zone			
Cattle	66,609	98,773	48
Sheep	3,149	4,362	39
Goats	13,424	19,527	45
Total	83,182	122,662	47
Grand total	481,061	662,931	38

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 34: Total red meat by species (cattle, sheep and goats)

Products	Total red meat in 2015 (tonnes)—baseline	Total red meat in 2020 (tonnes)—with intervention	% change in production
Total red meat			
Cattle	395,716	531,275	34
Sheep	20,450	27,975	37
Goats	64,894	103,681	60
Total	481,061	662,931	38

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The total red meat from grows from 481,061 tonnes in 2016/17 to 662,931 tonnes in 2020/21, showing an increase of 38%.

Livestock's contribution to GDP

Table 35: Livestock GDP contribution for baseline year (2016/17) and 2021/22 with red meat interventions

Products	Total livestock GDP 2016/17—baseline (TZS million)	Total livestock GDP 2021/22— with intervention (TZS million)	% change in national livestock GDP contribution
Meat in central zone			
Cattle	600,130	779,505	30
Sheep	17,702	25,069	42
Goats	81,851	114,929	40
Meat in coastal and lake zone			
Cattle	558,562	624,701	12
Sheep	40,602	52,523	29
Goats	83,479	134,674	61
Meat in highlands zone			
Cattle	232,949	305,601	31
Sheep	12,183	15,463	27
Goats	59,473	79,025	33
Total	1,686,930	2,131,490	26

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The GDP contribution of red meat coming from the production zones shows an overall increase of 26% comparing the base year with the 2021/22 projection. This amounts to TZS 1.6 trillion in 2016/17, and 2.1 trillion in 2021/22.

Table 36 Activity timeline and sequencing: Gantt chart

Activities	2016/17		2017/18		2018/19		2019/20		2020/2011	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Parasite control and treatment										
Adult stock immunization										
Young stock immunization										
Animal disease surveillance										
Strategic feed supplementation to the dams										
Introduction of flock/herd recording scheme										
Fodder production initiatives to get land										
Rangeland or grazing land rehabilitation										
Extension work to support improved feeding of cattle, sheep, and goats										

Complementary interventions and success requirements

The following government action is required:

- Provide producers with knowledge, skill and enable them access to sufficient production factors (including land, water and finance).
- Improve the policy environment.
- Ensure adequate forage is made available to producers.
- Ensure sufficient vaccine production to meet farmers' demand.
- Ensure adequate feed supplements are available to farmers.

Specialized cattle feedlots and culled dairy cattle

Targets

Table 37: Number of cattle units in the feedlot system

Units	2016/17	2021/22	% change
Fattening	78,111	561,242	619
Culled dairy cattle	260,293	685,191	163

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 38: Contribution of the cattle feedlot system to the national meat production

Amount of meat (tonnes)	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Fattening	7,433	11,454	17,648	27,194	41,902	64,565	769

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 39: Contribution of the dairy production system to national meat production

Amount of meat (tonnes)	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Small-scale dairy units	3,408	4,180	5,127	6,289	7,714	9,461	178
Medium-scale dairy units	1,968	2,423	2,983	3,672	4,521	5,567	183
Total	5,376	6,603	8,110	9,961	12,235	15,028	180

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 40: Challenges and strategies for developing specialized cattle feedlots and dairy cattle systems

Challenges	Strategies to address challenges
Feed	
Limited access to land for production of forage seed and forage	Making land available for investors in forage production
Inability to meet feed demand by commercial feedlots	Promoting and enforcing land contracts to produce forage for commercial feedlots
Poor access to and inadequate quality concentrate feed	Promoting the establishment of flour mills and thus making more concentrates available
Ineffective or absent feed quality control standards and enforcement mechanisms	Strengthening feed quality control authority to expand its operations Promoting the establishment of agro-industries for increased availability of by-products that could be used as feed supplements
Animal health	
Poor animal health extension services	Strengthening the animal health regulatory capacity under the coordination of the livestock ministry
Inefficient animal health services	
Inadequate supplies of drugs	
Poor-quality control of drugs and supplies	
Poor animal disease surveillance	
Lack of livestock traceability and identification system	
Inadequate quality control in abattoirs	
Marketing and processing	
Absence of quality-based pricing	Building the capacity of meat technology training staff at the Tanzania Meat Board
Lack of holding area and feedlot space	Increasing training of meat processors
Lack of knowledge and skill on meat-cutting and grading	Promoting forward contracting of feedlots and abattoirs
Poor links to export abattoirs	Investing in export infrastructure for animal holding and quarantine, as well as programs to ensure food safety and animal health through disease surveillance, monitoring of abattoirs, and an animal identification and traceability system etc.
Policy	
A lack of meat quality standards and enforcement of controls, grading, and pricing policies;	Introducing a trade policy to reduce the importation of cooking oil and grain flour
Poor implementation of policy on breeding	Developing and implementing animal welfare policies
A need to develop land policies, or strengthen the existing ones that are related to feed production and land acquisition for feedlot investment	
Inadequate feed quality monitoring and control	
Need for further incentives to establish feedlots (including land access in appropriate locations conducive to feed production, linkages with export market, and infrastructure such as road access, power and water supply	
Lack of policy incentives to promote domestic production of oil seed to increase availability of oil cakes and limit importation of cooking oil	

Interventions to achieve targets

Increasing the number of cattle fattened

The specialized production feedlot system will be improved through better feed and health services, increasing the number of cattle feedlot units, and the number of cattle being fattened. Producers (fatteners) will be given training on cattle fattening procedures, including cattle selection and feeding and on improving the efficiency of the beef value chain, which targets quality beef marketing.

Table 41: Projected number of cattle fattened

	2016	2021	% change
Number of animals fattened/unit/year	90	112	24
Number of fattening units	2,367	5,000	53
Total cattle fattened	213,030	512,000	58

Activities	2015/16		2016/17		2017/18		2018/19		2019/2020	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Disease surveillance	█	█	█	█	█	█	█	█	█	█
Establishing quarantine facilities	█	█	█	█	█					
Establishing identification and traceability tools	█	█	█	█	█	█	█	█	█	█
Quality control in abattoirs	█	█	█	█	█	█	█	█	█	█
Identifying potential locations for feedlot establishment	█	█	█							
Creating new feedlots	█	█	█	█	█	█				
Ensuring MLF support for establishment of feedlots in strategic locations	█	█	█	█	█	█				
Establishing abattoirs	█	█	█	█	█	█	█	█	█	█

Complementary interventions and success requirements

- Industry strategy developed by the government in collaboration with the Tanzanian industry association.
- Access enabled to sufficient production factors (including land, water and finance).
- Conducive policy and investment environment required to attract and facilitate private sector investment in feedlots and abattoir operations.
- Strategic use of the feed sources coming from new and existing sugar plantations and other types of large-scale crop production investments in Tanzania.

Figure 6: LMP targets for production, consumption, and production-consumption balance for beef.

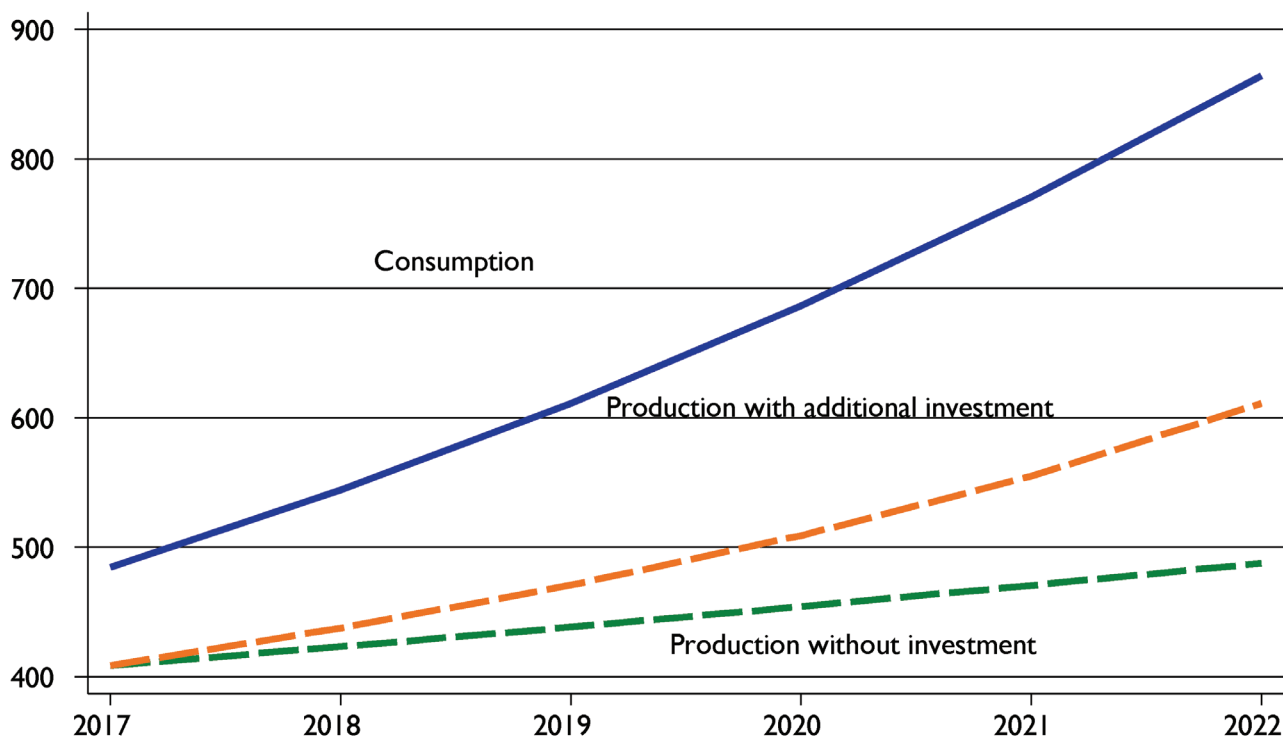


Figure 7: LMP targets for production, consumption, and production-consumption balance for sheep meat.

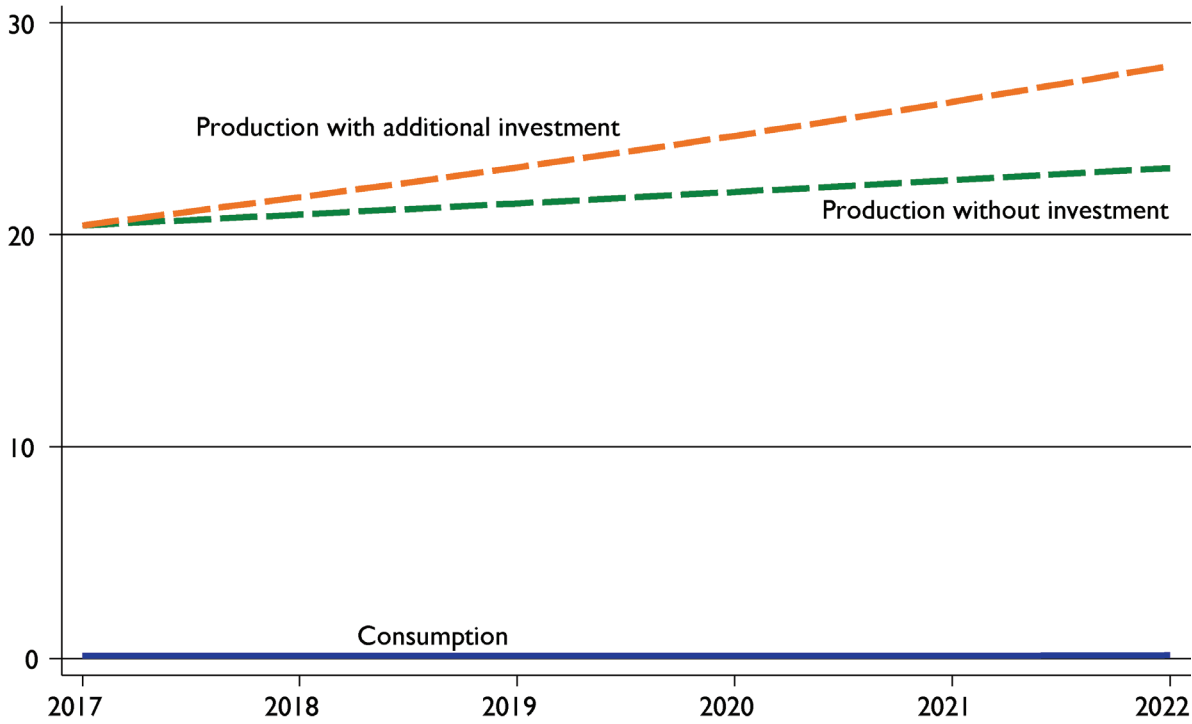


Figure 8: LMP targets for production, consumption, and production-consumption balance for goat meat.

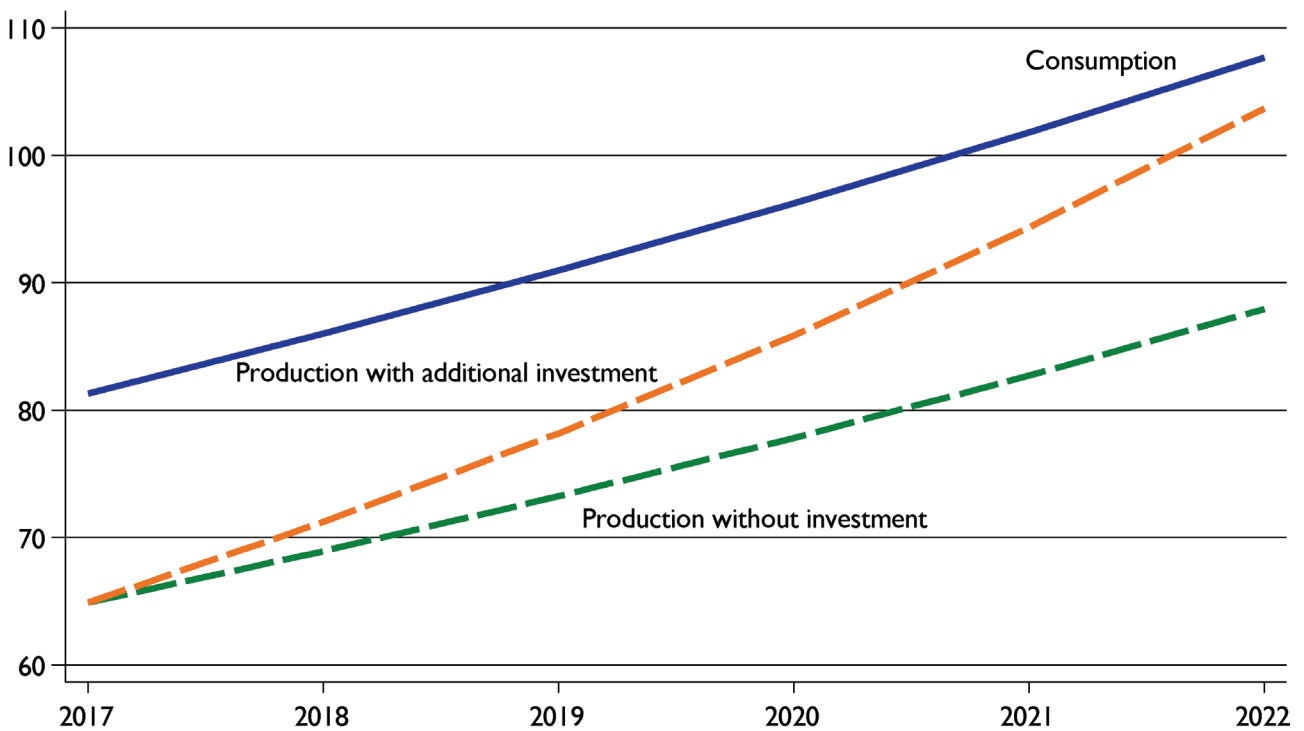
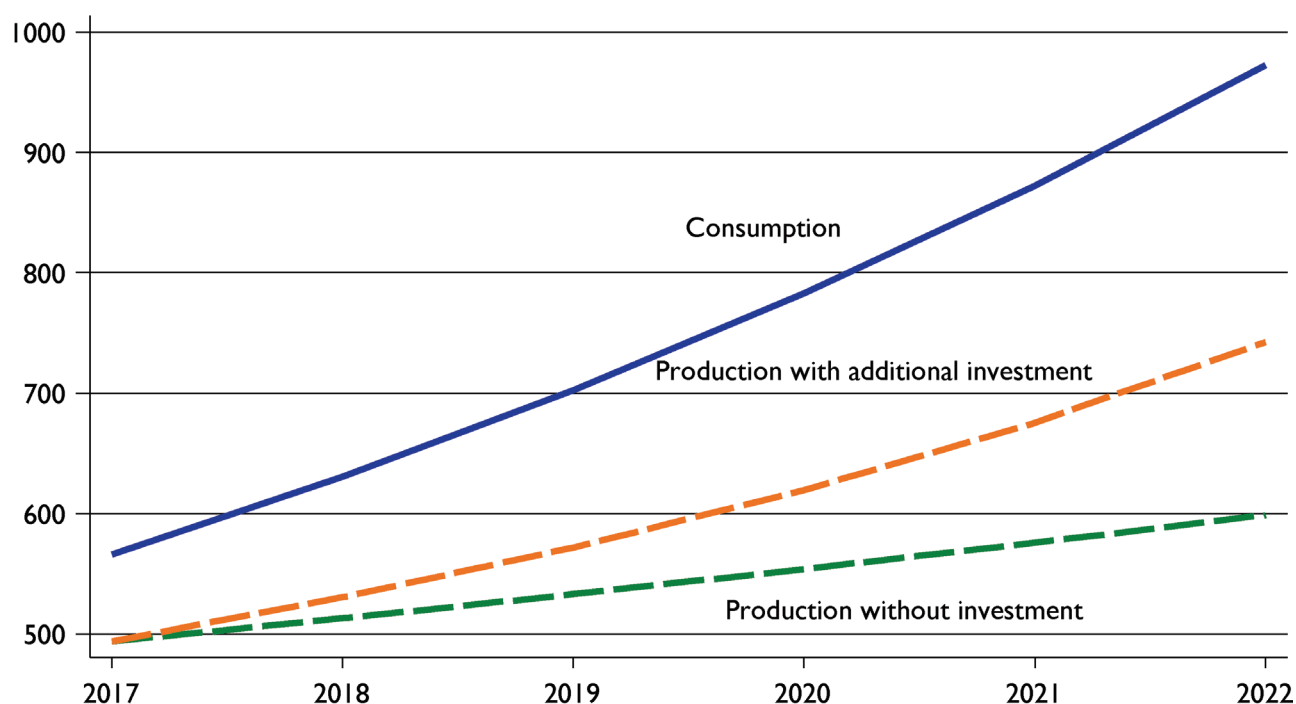


Figure 9: LMP targets for production, consumption, and production-consumption balance for red meat.



Conclusions

Given the indicated production increases, there is significant contribution by the traditional, ranches, and feedlot production systems towards improving food security, meeting the red meat consumption and nutrition, and contributing towards economic growth. However, this can only be realized if:

- The government and private sector make investments in time and fund the activities adequately.
- Meeting the livestock feed needs becomes a priority, and is followed by efforts towards increasing pasture and fodder production and increasing the availability of roughages such as crop residues and agro-industrial by-products. The bulk of additional concentrate feed needed, particularly in feedlots, is expected to come from investment by the private sector in agro-processing industries.
- An industry strategy is put in place to enable access to sufficient production factors including land, water and finance.
- The policy environment is improved to attract and enable sustainable growth of feedlots.
- Linkages are established for a viable stocker and feeder program where the improved young male stocks from the traditional sector are channelled to feedlot operations, thus reducing the grazing pressure on the grazing land in the traditional system.
- The establishment of new feedlot operations takes into account the spatial distribution of sugarcane factories, agro-industrial processing plants, and milling industries.

Production of red meat grows from 493,869 tonnes in 2016/17 to 742,524 tonnes in 2021/22, an increase of 50%.

Consumption of red meat grows faster, from 508,094 tonnes of red meat in 2016/17 to 867,302 tonnes by 2021/22, an increase of 71%

Even if all the above conditions are met, the red meat production and consumption balance for the period 2016/17–2021/22 remains at a deficit amounting to 124,778 tonnes by 2021/22.

Chicken development roadmap 2017/18–2021/22

Chicken development roadmap (2017/18–2021/22)

Vision

By 2022, the chicken industry is to a large extent efficient and commercially run, both in commercial and household operations, using improved and highly productive breeds to ensure household food security and higher incomes, and significantly contributes to achieving national all-meat food security, and higher national income while being resilient to climate change and conserving the environment.

Overall target

The overall target is to raise annual chicken meat production almost eightfold from about 60,800 to 465,600 tonnes and egg production from about 3.0 to 4.2 billion by year 2021/22 through improved traditional family chicken (ITFC), tropical improved chicken (TIC) and expanded specialized/commercial chicken (SCC)—with layers and broilers—subsystems.

Improving traditional family chicken and promoting and expanding tropical improved chicken subsystems

Targets

Table 47: Number of hens and chicken meat and eggs production in improved traditional family chicken and tropical improved chicken subsystems (2016/17–2021/22)

Chicken subsystem	Unit (tonnes)	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Improved traditional family chicken (ITFC)	In millions	4.2	4.4	4.7	5.0	5.4	5.7	37
Traditional improved chicken (TIC)	In millions	0.02	0.04	0.11	0.28	0.76	2.01	NA*
Total	In millions	4.22	4.44	4.81	5.28	6.16	7.71	NA*
ITFC eggs	In millions	101.2	119.2	140.3	165.3	194.6	229.2	127
TIC eggs	In millions	0.79	2.2	6.1	16.8	46.5	129.1	NA*
Total eggs		101.99	121.4	146.4	182.1	241.1	358.3	350
ITFC meat	In thousands	31.8	34.5	37.5	40.8	44.3	48.2	52
TIC meat	In thousands	0.01	0.03	0.1	0.2	0.6	1.7	NA*
Total meat	In thousands	31.81	34.5	37.6	41	44.9	49.9	57

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

- The number of hens in the ITFC grows from 4.2 million in the base year to 5.7 million in 2021/22, a 37% increase.
- The number of chicken in the TIC grows from 0.02 million to 2.01 million.
- Chicken meat production from ITFC increases from 31.8 thousand tonnes in the year 2016/17 to 48.2 thousand tonnes in the year 2021/22, a 52% increase.
- Chicken meat production from the TIC increases from 0.01 thousand tonnes in the year 2016/17 to 1.7 thousand tonnes.
- Total meat from the family system increases from 31.81 thousand tonnes to 49.9 thousand tonnes, a 57% increase.
- Egg production from ITFC increases from 101.2 million in the year 2016/17 to 229.2 million in the year 2021/22, a 127% increase.
- Egg production from TIC increases from 0.79 million in the year 2016/17 to 129.1 million in the year 2021/22.
- Total egg production from the family system increases from 109.99 million in the year 2016/17 to 358.3 million in the year 2021/22, a 350% increase.

*Tropical improved chicken (TIC) is a newly introduced chicken system with a small number of birds in the base year hence comparing the near non-existent number of TICs in the base year with those in the fifth-year number does not make sense.

Key assumptions for the family chicken system

- The average number of hens/flock in improved traditional family chicken grow from two to four.
- The average number of chicken/flock in tropical improved chicken remains 25.
- The number of eggs laid per hen/year increases from 50 to 90.
- The mortality in chicken before marketing will be reduced from 50–10%
- The average live weight of chickens (growers) sold will increase from 1.1–1.4kg.
- The number of eggs and chicken consumed on-farm/year increases from 10–20, a 100% increase.
- The costs of veterinary drugs increase from TZS 50/chicken to TZS 100/chicken, a 100% increase.

Table 48: Key challenges and strategies related to traditional family chicken system

Challenges	Strategies to address the challenges
Feeds	
Limited access to land to produce maize and soybeans for formulation of chicken feed	Enforce Grazing Land and Animal Feed Resources Act 2010 and related regulations
Low nutritive value of feed ingredients used in feed formulation such as maize, maize bran, grain sorghum, rice bran and fish meal in terms of energy, protein, mineral and amino acid profile	Build capacity for animal feed inspectors in various levels Prepare guidelines for inspection of processed chicken feeds Create awareness through sensitization on need/ requirements for quality chicken feeds
Low nutritive value and low quality of commercial chicken feeds in terms energy, protein, mineral and amino acid profile and high crude fibre	Build capacity for good processing practices among animal feed processors
Presence of physical and chemical contaminants such as charcoal, sand and dust in chicken feed ingredients and feeds	Regulate the export of oil crops and import of cooking oils Strengthen mechanisms to control feed quality
Low institutional capacity to monitor quality of chicken feed produced and processed	Give tax breaks and other incentives to encourage private sector in chicken feed processing industries
Low incentive for the private sector to invest in chicken feed processing plants	

Challenges	Strategies to address the challenges
<p>Animal health</p> <p>High prevalence and impact of diseases particularly Newcastle, salmonellosis, Marek's disease among small-scale chicken producers</p> <p>Poor handling and poor-quality drugs and vaccines associated with inadequate human resource for supervising and monitoring drugs use and unreliable cold chain supply of chicken vaccines</p> <p>Poor housing and sanitation for chickens</p>	<p>Strengthen enforcement of Animal Disease Act 2003 and its regulations</p> <p>Formulate biosafety guidelines for disease control and other relevant guidelines</p> <p>Enforce stricter disease controls on the importation of commercial replacement stock</p> <p>Produce Newcastle Disease vaccine with high efficacy and institute mandatory mass vaccination against the disease</p> <p>Create awareness among small producers on best practices in chicken housing and sanitation</p>
<p>Marketing and processing</p> <p>Chicken farmers' marketing organizations are limited in geographical scope with most operating in Dar-es-salaam and other urban areas</p> <p>Weak chicken farmer's groups and platforms Existing farmers marketing organizations are poorly structured and there is lack of a related apex national association.</p> <p>Lack of slaughter facilities for chicken</p> <p>Lack of chicken meat processing facilities</p> <p>Weak biosafety facilities and hazard analysis and critical control points (HACCP)</p> <p>Weak consumers preference for exotic chicken meat and eggs</p>	<p>Promote establishment of Tanzania chicken traders' associations</p> <p>Construct chicken slaughtering and processing facilities and promote chicken meat and eggs marketing.</p> <p>Institutionalize mandatory biosafety and HACCP procedures</p> <p>Intensify the promotion and extension work to change the attitudes of consumers towards consuming eggs and meat from hybrid and exotic breeds</p>
<p>Policy</p> <p>Most of the hatcheries and breeder chicken farms are not registered, do not have registered veterinarians and operate within residential areas without standard operating procedures</p> <p>There are many complaints from farmers on high mortality of chicks from some hatcheries due to salmonellosis and emergence of Marek's disease in pullets (layers).</p> <p>Weak policies related to land acquisition for chicken feed production.</p>	<p>Promote registration of hatcheries and breeder farms</p> <p>Establish standard operating procedures and guidelines for operation of hatcheries and breeder farms</p> <p>Institutionalize biosafety measures and HACCP facilities for chicken meat, eggs and feeds</p> <p>Create favourable policies for land acquisition for chicken feed production</p>

Interventions to achieve targets

The interventions to transform the family chicken system involve improving indigenous chicken productivity through improved breed selection, importation of high-yielding pure tropical scavenging brooding breeds and importation of semi-scavenging tropical breeds. These measures should go along with a reduction of reproductive wastage by introducing brooding and artificial incubation facilities such as hay box brooders and small-scale incubators; and health, feed and management interventions.

Adoption and coverage of the intervention at 40% and 30%, respectively, will impact 12% of the total indigenous ITFC chicken over the five-year project period. Tropical improved chicken will grow from 15,000–2,000,000 chickens in five years, a huge development.

The interventions in the improved traditional family chicken (indigenous and imported pure breeds) aims at upgrading the flock size from 2–8 hens. Eggs laid per year will increase from 50–90 and average weight of sold chicken will increase from 1.1–1.4 kg. Through the semi-scavenging tropical crossbreeds such as Kuroiler, holding per family will remain 25 chickens and it is expected to grow to at least 150 eggs per hen/year with 2.8 kg live weight for mature chicken. With the additional animal health services, chicken mortality before marketing will dropped down from 50–10%. The average number of eggs consumed on-farm/year will increase from 10–20 and chicken consumed from 5–10; both 100% increases.

Investments

See the investment details in Table 53.

Impacts

Investment impacts

The internal rate of return of the investment for improved traditional family chicken is 75% and for tropical improved chicken is 58% which justifies the value of the investment. This is at a discount rate of 10%.

Production impacts

- Total meat from the family system (ITFC and TIC) increases from 31.81 thousand tonnes to 49.9 thousand tonnes, a 57% increase.
- Total egg production from the family system (ITFC and TIC) increases from 109.99 million eggs in the year 2016/17 to 358.3 million eggs in the year 2021/22, a 350% increase.

GDP impacts

The GDP contribution from the family chicken (ITFC and TIC) will increase from 21,310.6 to 54,355.1 million for eggs and 153,326.93 to 275,188.72 million for chicken meat respectively in the year 2021.

Table 49: GDP contribution 2031 with current and with additional investment scenarios

Products	Chicken GDP 2016/17 (TZS millions)	Chicken GDP 2021/22 (TZS millions)	% change
Improved traditional family chicken (ITFC) meat	153,843.49	276,115.6	79
Crossbreed family chicken meat	52.5	8,266.3	NA
Total family chicken meat	153,895.9	284,381.9	85
ITFC eggs	22,678.3	57,843.5	155
Tropical improved chicken (TIC) eggs	122.5	20,570.0	NA
Total family chicken eggs	22,800.8	78,413.5	244
Total family chicken meat and eggs	176,696.7	362,795.4	105

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

GDP contribution from the family chicken system increases from TZS 176,696.7 million in 2016/17 to TZS 362,795.4 million in 2021/22, a 105% increase as a result of additional interventions.

Table 50: Intervention activity timeline and sequencing: Gantt chart

Investment interventions	Investment activity timing				
	2017/18	2018/19	2019/20	2020/21	2021/22
Establishing three chicken feed processing plants					
Improving the capacities of chicken feed quality control laboratories					
Land investment for feed (yellow-maize and soybean) production (sorghum to complement maize)					
Upgrading and expand Newcastle Disease, fowl pox and Gumboro vaccines production plant					
Establishing and monitor the chicken industry biosafety program					
Identifying suitable tropical pure reproducing/brooding chicken breeds					
Identifying suitable tropical semi-scavenging crossbred chicken breeds					
Testing breeds at the Tanzania Livestock Research Institute (TALIRI) and at farm-level and developing appropriate business models					
Strengthening/upgrading seven public chick multiplication centres					

Investment interventions	Investment activity timing				
	2017/18	2018/19	2019/20	2020/21	2021/22
Establishing eight new public and private crossbred semi-scavenging and commercial day-old chick multiplication centres and 30 mothering units and distribution centres for four-weeks vaccinated chicks					
Establishing 10 public and private hatchery facilities and 100 private distribution centres for selected four-weeks vaccinated reproducing/brooding chicken					
Reducing reproductive wastage of brooding hens using artificial incubation (10,000 incubators/year)					
Reducing reproductive wastage of brooding hens using chicken brooder box (10,000 hay brooding box/year)					
Supporting the Livestock Training Agency (LITA) and private institutions to implement farmers' skills and training programs on commercial livestock production					
Promotion of exotic chicken meat and eggs consumption					
Establishment of chicken slaughterhouses and cold storage for eggs and chicken meat					
Building capacity of MLF, local government authorities, and livestock keepers on record keeping, data management and dissemination					

Specialized commercial chicken production

Targets

Table 51: Number of chicken and chicken meat production in specialized chicken subsystems

Chicken subsystem	Unit	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Specialized layers	million	13.32	13.99	14.68	15.42	16.19	17.00	28
Specialized broilers	million	3.29	5.64	9.64	16.49	28.20	48.23	1,362
Total specialized chicken	million	15.61	19.63	24.32	31.91	44.39	65.23	318
Specialized layer	Tonnes	9,988.3	10,591	11,231	11,909	12,629	13,391	34
Specialized broiler	Tonnes	19,058.7	35,075	64,550	118,796	218,628	402,354	2,011
Total	Tonnes	29,047	45,666	75,782	130,705	231,256	415,745	1,331

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

- The number of chickens in the specialized chicken layers subsystem grows from 13.3 million in 2016/17 to 17 million in 2021/22, a 28% increase.
- The number of chickens in the specialized chicken broilers subsystem grows from 3.3 million in 2016/17 to 48.2 million in the year 2021/22, a 1,362% increase.
- Chicken meat production from specialized chicken increases from 29,047 tonnes in 2016/17 to 415,745 tonnes in the year 2021/22, a 1,331% increase.

Table 52: Egg production from specialized layers

Chicken subsystem	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	Change in %
Specialized chicken egg (thousands)	2,864,947	3,035,292	3,215,766	3,406,971	3,609,544	3,824,162	33

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

- Egg production from specialized layers increases from 2.86 billion in 2016/17 to 3.82 billion in the year 2021/22, an increase of 33%.

Key challenges and strategies related to the specialized layers and broilers system

The specialized layers and broilers systems are facing the challenges as those of the traditional family chicken system and need similar strategies transforming the system. Refer to Table 48 above for the details.

Interventions to achieve targets

The interventions for specialized chicken improvement involve increasing the scale of operations and volume of production from the specialized chicken farms i.e. specialized chicken layers and specialized chicken broilers. The major intervention proposed for the specialized chicken layers and specialized chicken broilers is increasing their number in the country and the number of specialized farm units. The average number of broilers per specialized farm/year increases to 1,020 per cycle and the average number of layers stays the same at 1,300.

Impacts

Return on investments

The internal rates of return of the investment in specialized broilers and specialized layers is 57% and 36%, respectively, which is way above the 10% discount rate. These returns justify the investment and imply the profitability of both specialized layers and broilers. As shown in Table 53, the total investment required during the first five years to develop the sector amounts to TZS 753 billion which is shared by the public and private sector.

Table 53: Five-year chicken meat and egg production improvement investment costs (2017/18–2021/22)

Investment interventions	Investment cost (TZS million)					Total	Budget source
	2017/18	2018/19	2019/20	2020/21	2021/22		
Animal feeding							
Establishing three chicken feed processing plants		2,970		5,940		8,910	Private (100%)
Improving the capacities of chicken feed quality control laboratories	1,320		1,320			2,640	Public* (100%)
Land investment for feed (yellow maize and soybean) production (sorghum to complement maize)	36,300	36,300	46,200	60,500	62,700	242,000	Private (100%)
Animal health							
Upgrading and expanding Newcastle Disease, fowl pox and Gumboro vaccines production plant	13,200	19,360	13,200			45,760	Public (100%)
Establishing and monitoring the chicken industry biosafety program	2,200	3,300	1,320	1,320	1,210	9,240	Public (100%)
Animal breeding and genetics							
Identifying suitable tropical pure reproducing/brooding chicken breeds	3,960	2,200				6,160	Public (100%)
Identifying suitable tropical semi scavenging crossbred chicken breeds	2,200	1,760				3,960	Public (100%)
Testing breeds at the Tanzania Livestock Research Institute (TALIRI) and at farm-level and developing appropriate business models	2,200	3,520				5,720	Public (100%)
Strengthening/upgrading seven public chick multiplication centres	1,100		2,200		2,420	5,720	Public (100%)
Establishing eight new public and private crossbred semi-scavenging and commercial day-old chick multiplication centres and 30 mothering units and distribution centres for four week-old vaccinated chicks	3,163	3,163	6,325	6,325	6,325	25,300	Public (20%), Private (80%)
Establishing 10 public and private hatchery facilities and 100 private distribution centres for selected four week-old vaccinated reproducing/brooding chicken	7,508	7,508	15,015	15,015	15,015	60,060	Public (20%), Private (80%)

Investment interventions	Investment cost (TZS million)					Total	Budget source
	2017/18	2018/19	2019/20	2020/21	2021/22		
Extension							
Reduce reproductive wastage of brooding hens using artificial incubation (10,000 Incubators/year)	22,000	26,400	33,000	35,200	37,400	154,000	Public (30%), Private (70%)
Reducing reproductive wastage of brooding hens using chicken brooder box (10,000 hay brooding box/year)	8,800	9,900	11,000	12,100	13,200	55,000	Public (20%), Private (80%)
Supporting the Livestock Training Agency (LITA) and private institutions to implement a farmers' skills and training programs on commercial livestock production	3,696	3,696	3,696	3,696	3,696	18,480	Public (50%), Private (50%)
Promoting exotic chicken meat and eggs consumption	220	440	1,100	1,320	1,760	4,840	Public (60%)
Marketing and value chain							
Establishment of chicken slaughtering house, cold storage for eggs and chicken meat			6,325		6,600	12,925	Public (10%), Private (90%)
Policy, planning and M&E							
Building capacity of the MLF, local government authorities, and livestock keepers on record keeping, data management and dissemination ⁺	1,210	1,320	1,430	1,540	1,786	7,286	Public (80%), Private (20%)
Total investment	121,644	134,404	162,206	163,031	172,187	753,361	Public (26%), Private (74%)

^{*}Represents government and NGO funds. NGO funds assumed to feed into the achievement of the national government/public goals

⁺This investment serves across all commodities

Production impacts

- Chicken meat production from specialized chicken increases from 29,047 tonnes in 2016/17 to 415,745 tonnes in the year 2021/22, a 1,331% increase.
- Egg production from specialized layers increases from 2.86 billion in 2016/17 to 3.82 billion in the year 2021/22, an increase of 33%.

GDP impacts

The GDP contribution of the specialized commercial chicken system increases from the current TZS 55 billion to TZS 303 billion in five years. Eggs from the specialized system contributed TZS 61 billion during the same 5-year investment period.

Table 54: GDP contribution from commercial specialized chicken system (baseline GDP compared with 2021/22 from additional investment)

GDP contributions	2016/17 (TZS millions)	2021/22 (TZS millions)	% change
Chicken meat GDP	55,148	303,567	450
Eggs GDP	24,123	61,110	153
Total	79,121	364,67	361

Source: LS IPT livestock sector analysis (2016), MLF Tanzania

The total GDP contribution of the specialized chicken system increases from TZS 79 billion to TZS 365 billion by the fifth investment year, which is a 360% increase.

Total production

Chicken meat

The total chicken meat production from the family and commercial specialized systems increases by 665% over five years.

Table 55: Total chicken meat and eggs production with additional investment

Products	Unit	Chicken meat 2016/17 (tonnes)	Chicken meat 2021/22 (tonnes)
Total chicken meat from the Family system	Tonnes	31,773	49,855
Total chicken meat from Commercial specialized system	Tonnes	29,047	415,745
Total chicken meat production	Tonnes	60,820	465,600
Total eggs family system	Thousands	101,956	358,305
Total eggs from specialized system	Thousands	2,864,947	3,824,162
Total eggs production	Thousands	2,966,903	4,182,457

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Eggs

The total eggs production from the family and commercial specialized systems increased by 41% over five years.

Total GDP

Table 56: Family and commercial specialized chicken production systems GDP contribution with additional investment

Products	GDP 2016/17 (TZS millions)	GDP 2021/22 (TZS millions)	% change
Family chicken meat contribution	153,896	284,382	85%
Specialized chicken meat contribution	55,148	303,567	450%
Total meat contribution	209,044	587,949	181
Family chicken eggs contribution	22,800	78,415	244%
Specialized chicken eggs contribution	24,123	61,110	153%
Total eggs contribution	46,923	139,525	197
Total meat and eggs GDP contribution	255,967	727,474	184

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Overall the GDP contribution of the total chicken meat and eggs production increased from the current TZS 256 billion to TZS 723 billion in five years, an increase of 184%.

Change in annual incremental income

Table 57: Annual incremental income as a result of the intervention

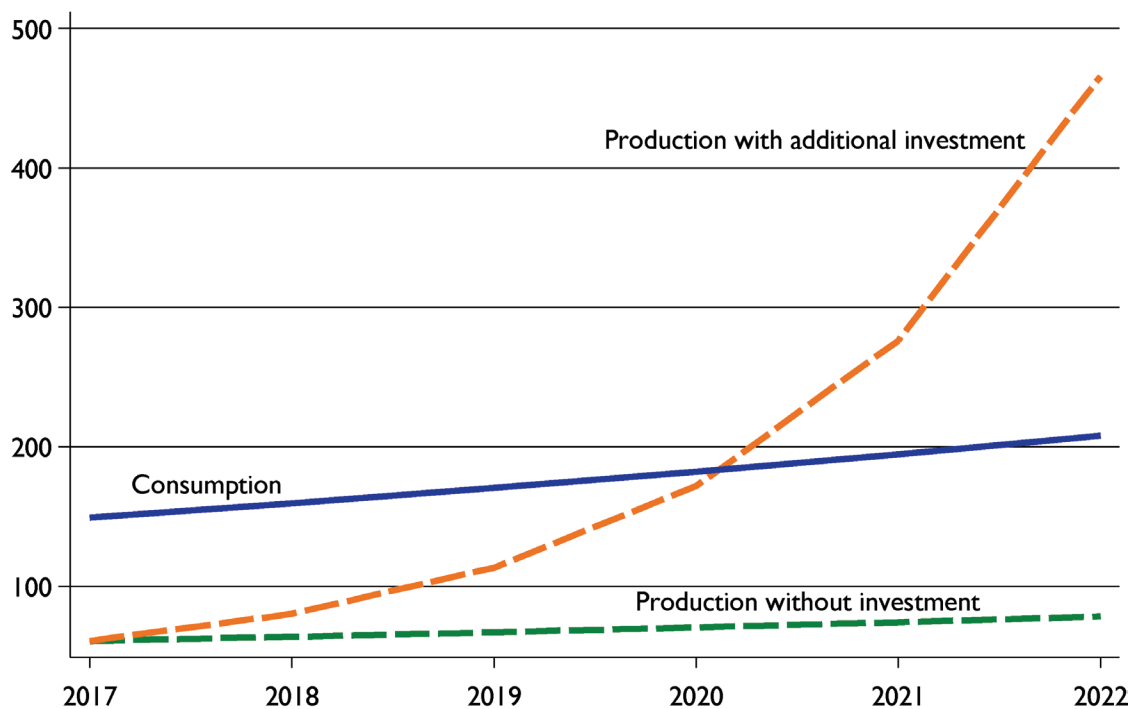
Chicken subsystem	2016/17	2021/22	Annual incremental income per place	% change
Family chicken	41,345	54,557	13,212	32
Improved family chicken	19,496	20,746	1,250	6
Specialized layer	3,720	5,342	1,622	44
Specialized broilers	2,954	4,541	1,587	54

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Production and consumption

The figure below shows that under a ‘business as usual’ or ‘without additional investment’ scenario, there is and there will be a substantial shortage of chicken meat production to meet the current as well as the future domestic consumption demand. However, with the proposed additional investment, the shortage will be removed and there will be surplus beginning from year 2020.

Figure 10: Projected chicken meat consumption and production with and without additional investment 2017–2022 (in thousand tonnes).



Tanzania produces enough eggs to meet its current domestic consumption demand and also have surplus. The chicken investment is mainly to raise a large number of broilers and improved family chicken to produce enough to offset the chicken meat and consumption gaps. Furthermore, it is expected that the increase in chicken meat will also contribute to close the all meat production and consumption gap.

Table 58: Activity timeline and sequencing: Gantt chart

Investment interventions	Investment activity timing				
	2017/18	2018/19	2019/20	2020/21	2021/22
Animal feeding					
Establishing three chicken feed processing plants					
Improving the capacities of chicken feed quality control laboratories					
Land investment for feed production (yellow-maize and soybean)					
Animal health					
Upgrading and expanding Newcastle Disease, fowl pox and Gumboro vaccines production plant					
Establishing and monitoring the chicken industry biosafety program					
Animal breeding and genetics					
Identifying suitable tropical pure reproducing/brooding chicken breeds					
Identifying suitable tropical semi scavenging crossbred chicken breeds					
Testing breeds at TALIRI and at farm level and developing appropriate business models					
Strengthening/upgrading seven public chick multiplication centres					

Investment interventions	Investment activity timing				
	2017/18	2018/19	2019/20	2020/21	2021/22
Establishing eight new public and private crossbred semi-scavenging and commercial DOC multiplication centres and 30 mothering units and distribution centres for 4 weeks vaccinated chicks					
Establishing 10 public and private hatchery facilities and 100 private distribution centres for selected four week-old vaccinated reproducing/brooding chicken					
Extension					
Reducing reproductive wastage of brooding hens using artificial incubation (10,000 Incubators/year)					
Reducing reproductive wastage of brooding hens using chicken brooder box (10,000 hay brooding box/year)					
Supporting the Livestock Training Agency (LITA) and private institutions to implement a farmers' skills and training programs on commercial livestock production					
Promoting of exotic chicken meat and eggs consumption					
Marketing and value chain					
Establishment of chicken slaughtering house, cold storage for eggs and chicken meat					
Policy, planning and monitoring and evaluation					
Building capacity of MLF, LGAs, and livestock keepers on record keeping, data management and dissemination*					

*This investment serves across all commodities

Complimentary intervention and success requirements for specialized chicken

The sustainability of the specialized chicken system depends on the effectiveness of the day-old chicks' production and distribution system. A well-functioning private day-old chicks' industry will be required for their efficient production and distribution to the specialized chicken farms.

Government encouragement of chicken agribusiness investors and a reduction of bureaucratic obstacles will be required.

Government should give priority in land allocation to specialized chicken farms and chicken feeds production enterprises.

- The increase in production of eggs and chicken meat that exceeds domestic demand opens up opportunities for export and processing. Large investments in processing plants will be needed to produce value-added products for industrial uses (e.g. egg powder) or to meet foreign consumer demand for eggs and egg powder. The government should encourage private investors in chicken meat and eggs processing through tax breaks and low-interest loans.
- Availability of chicken feed is a critical factor in the success of specialized chicken operations. There is a need to set up mechanisms for low-cost feed production and formulation at all production levels.
- Specialized chicken enterprises should make efforts to link-up with chicken meat and egg processing enterprises to ensure regular access to market outlets, and with maize producers and cooking oil plants for regular supply of feed.
- Public-private partnerships should be used to manufacture and distribute quality vaccines to keep the exotic chickens healthy.
- Other essential components that need to be carried out by farmer groups and cooperatives include:
 - Setting up out-growers (mother units) schemes for pullet production and distribution
 - Establishment of mini-hatcheries
 - Establishment of feed processing plants and slaughter facilities.

Conclusions

The chicken industry can contribute significantly to improving food and nutrition security, household incomes, and national economic growth in Tanzania. This roadmap presented the challenges that need to be addressed in the sector, the proposed policy and investment interventions required and the indicative required investment funds to develop the sector. The financial viabilities of various interventions and the impacts of interventions on chicken productivity, production and on national economy mainly in terms of GDP are also presented. It is observed that the policy and investment interventions in the improved family chicken and specialized chicken systems will substantially increase chicken meat production which will contribute toward closing the gap in production-consumption for all meats. However, this goal will be realized only if:

- the feed problem is resolved;
- an effective extension system is put in place;
- private investors in the sector (specialized chicken, processing plants, feed producers) are given adequate incentives in terms of tax breaks, subsidized land-leasing rates and priority access to acquire land; and
- protective trade policies to encourage domestic private investors in the chicken business are implemented.

Pig/pork value chain development roadmap 2017/18–2021/22

Pig/pork value chain development roadmap (2017/18–2021/22)

Vision

By 2025 the Tanzania pig industry becomes an efficiently functioning sector with market-oriented farming, processing and dynamic marketing, operating in more sustainable and climate-smart ways, supplying consumers with high-quality and safe pig meat/pork, and contributing to household food and nutritional security, income growth, poverty alleviation and to national economic growth.

Overall target

The overall target is to raise pig meat production from the current 22,000 tonnes (2016/17) to 37,000 tonnes by 2021/22 through improved family and expanded commercial specialized pig production systems.

Modernizing and transforming the traditional free-ranging family pig production system

Targets

Table 59: Number of sow and tonnes of meat in traditional (extensive) family and improved family pig subsystems

Pig subsystem	Unit	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
Traditional family pig system (TFPS)	Number	207,083	223,028	240,202	258,697	278,617	300,070	45
Improved family pig system (IFPS)	Number	77,778	83,767	90,217	97,163	104,645	112,703	45
Total family sows	Number	284,861	306,795	330,419	355,860	383,262	412,773	45
TFPS meat	Thousands of tonnes	12.77	13.71	14.72	15.81	16.98	18.23	43
IFPS meat	Thousands of tonnes	5.96	6.38	6.84	7.33	7.85	8.42	41
Total pigs in IFP	Thousand of tonnes	18.73	20.10	21.57	23.14	24.83	26.65	42

Source: LSIPT Livestock Sector Analysis (2016), MLF Tanzania

- The number of sows in traditional (extensive) family (TFPS) systems increases from 207,083 to 300,070 and the number of pigs in the improved semi-intensive family system increases from 77,778 to 112,703. In both cases the change in number over five years is 45%.
- Pig meat production from the TFPS subsystem increases from 12.8 thousand tonnes to 18.2 thousand tonnes, a

43% increase.

- Pig meat from improved (semi-intensive) family pig subsystem (IFPS) increases from 6 tonnes to 8.4 tonnes, a 41% change over five years.

Targeted productivity changes

- The number of sows in the TFPS household sub-system increases from two to four.
- Mortality of young pigs will decrease from an average of 20% to 18% and 12% to 10% in TFPS and IFPS, respectively.
- The age at first calving decreases from an average of 300–270 days in TFPS.
- The proportion of industrial feed included in the pig ration increases from average of 0% to 4% and from 20% to 40% among TFPS and IFPS, respectively.
- Age at weaning decreases from an average of 60–55 and 45–35 days among TFPS and IFPS, respectively.
- Age of piglets for marketing decreases from 120–112 days and from 60–40 days among TFPS and IFPS, respectively.

Table 60: Key challenges and strategies related to the family pig subsystem

Challenges	Strategies to address the challenges
Genetics	
Limited number of improved pig breeds	Establishing public and private sector specialized commercial pig breeding and multiplication farms
Lack of specialized commercial pig breeding farms	The LMP provides opportunities for designing a pig industry development strategy/program in Tanzania
Low productivity of family-kept pigs partly due to low genetic potential and inbreeding leading to poor quality stock supplied to farmers	Importing new lines of improved high-yielding pig breeds to avoid inbreeding and increase productivity
Inadequate supply of well-bred pig stocks from pig multiplication and breeding farms	Extension and proper management and husbandry practices to lower the probability of inbreeding
	Supporting the Tanzania Livestock Research Institute pig breeding and research activities
Animal health	
A weak animal health delivery system	Strengthening surveillance, early detection/diagnosis
Inadequate health extension staffs	Strengthening national and local government authorities' capacity to recruit additional staff to respond to outbreaks and provide specialized pig extension services
	The MLF will prepare the national pig biosecurity policy guidelines for farmers (small and commercial), feed and meat processors
Widespread pig health and reproductive problems and major devastating diseases such as African swine fever, foot-and-mouth disease, erysipelas, transmissible gastroenteritis and brucellosis that cause heavy mortality	Supporting immunization measures (for foot-and-mouth disease, brucellosis)
	Improving pig farm management practices to benefit producers.
	Enforcing the Animal Pounds Act, and Animal Welfare Act, 2008
	Extensive pig farmers education and developing regulations to stop free roaming
Feeds challenges	
Unreliable supply of commercial feeds	Establishment of private small-scale feed mills and public-private partnerships multilevel feed processing plants
Below standard quality of commercial feeds	Strengthen surveillance system and the regulatory capacity of the central veterinary laboratories (CVL) with MLF involved in monitoring feed quality and safety
High prices of commercial feeds and premixes such as amino acids, minerals and vitamins that are necessary to adhere to standard pig nutritional diets	Organize commercial pig producers for massive importation of essential feed ingredients e.g. amino acids, vitamins and trace minerals
	Create suitable conditions for land allocation, and land lease to investors under the provisions of the current land laws, with major tax incentives on land use fees and lease time
Severe feed shortages to supply large pig commercial/specialized pig farms	Develop and implement business models in the production, transportation, processing and distribution of pig feeds
	Expand private sector-led massive cereals and legumes production to supply feed processing plants. Undertake research on alternative pig feeds in terms of nutritive values, and feed conversion impacts on weight gain and meat quality that are suitable in each zone

Challenges	Strategies to address the challenges
Unreliable supply of commercial feeds	Massive production of cereals (yellow maize, maize, sorghum etc.) and legumes (soybeans, other oil seed cakes) to feed commercially farmed pigs Owners of commercial feeds processing plants, large-scale cereal and other alternative feed raw materials are supported to start and run businesses
Marketing and processing challenges	
Weak pig marketing arrangements	Developing the pig value chain to improve pig marketing, trading capacity and smallholder pig production by constructing pig markets, slaughter facilities/ abattoirs and fresh pork marketing outlets
Higher pork price due to marketing inefficiency, high cost of transportation from producers to urban markets	Applying good-manufacturing practices (GMP) in production process, implement HACCP in animal feed manufacturing, pig slaughtering facilities and processing
Lack of pig slaughter facilities/abattoirs, absence of cooling systems (e.g. refrigerators), absence of standard weights and measures	Strengthening swine producer associations (SPAs) to provide credit facilities, offer learning opportunities to farmers' and actors' in the value chain through skills training and joint implementation of biosecurity measures to control devastating diseases such as African swine fever
Lack of access to formal credit sources for investment in pig production	Promote SPAs to innovate and actively participate in the value chain mainstreaming to maximize installed feed and meat processing capacities, own and manage cooperative-owned small-scale feed mills, enforce formal use of weights in meat sales, and infrastructural developments in order to increase the overall volume and values in the market
Lack of quality grading system for pig meat	Establish pig meat quality grading standards and regulatory systems to enforce it Build capacity of animal and livestock production staff on pig ante- and post-mortem inspection skills/techniques
Policy challenges	
Lack of official pig marketing and pig meat transportation policies	Ensure policy guidelines/regulations to reorganize pig marketing/trading system is developed Ensure linkages to slaughter facilities/abattoirs, preservation facilities and processing plants The development, support and implementation of animal welfare strategic plan undertaken
Lack of policy for pig holding and slaughtering facilities	Create enabling policy environments for the establishment of rural small-scale and urban large-scale slaughter facilities Develop policy guidelines, standard operating procedures (SOPs) and awareness campaigns on slaughter facilities' hygiene and food safety
Lack of policy for land allocation for pig production	Ensure policy related to land acquisition or long-term land leasing
Lack of policy that gives incentives to private sector to invest in pig production	Develop and seek government approvals on appropriate policy incentives to encourage foreign direct investments, organizations and individuals to invest in commercial pig production, processing and marketing, building domestic pig auction markets, and pig products and kiosks consumption outlets Ensure sufficient infrastructure and access to feed sources for the production of feed raw materials (cereals, legumes, roots/tubers etc.) to supply large pig farms Introduce protective trade policies to encourage domestic private investment in pig production

Interventions to achieve targets in family pig subsystems

The proposed transformation of the traditional family pig production system involves genetic, health and feeding interventions alongside marketing and policy interventions. The genetic interventions involve importation of tropically adapted and more productive pig sows and boars for breeding and crossbreeding and the establishment of pig breeding and multiplication farms.

The animal health interventions involve strengthening disease control for priority pig diseases such as African swine fever, transmissible gastro enteritis, erysipelas, worms, and mange; strengthening biosecurity and allied facilities; surveillance through local government authorities and zonal veterinary labs; and the building of staff capacity on national mandatory pig or commodity-based identification and traceability to achieve animal health and safe trade objectives.

The feed interventions involve strengthening the capacity of private small-scale pig feed mills/processors to compound and distribute pig feeds to rural smallholder farmers and strengthening capacity of family pig keeping households to compound and supplement quality pig feed/home rations with locally available and industrial feed materials.

Impacts

Return on investment

The return on the pig investment from the family pig system is 86% and 17% for small- and medium-sized traditional pig systems, respectively. Both have demonstrated an internal rate of return greater than the 10% discount rate used in the analysis of the investment.

Production impacts

Pig meat production from the traditional family pig subsystem (TFPS) increases from 12.8 thousand tonnes to 18.2 thousand tonnes and pig meat from the improved semi-intensive IFPS subsystem increases from 6 tonnes to 8.4 tonnes. Total pig meat production from the family system increases from 18.7 tonnes to 26.7 tonnes, a 42% increase in five years.

GDP impacts

Because of the additional intervention, the GDP contribution of the traditional family pig system increases from TZS 27.5 billion in 2016/17 to TZS 39 billion. Similarly, the GDP that comes from the improved family pig system increases from TZS 11 billion to TZS 15 billion during the same period. Due to the additional investment, the total GDP contribution of the family pig production subsystem increases from TZS 38.6 billion to TZS 54.4 billion, a 41% growth.

Table 61: Family pig GDP contribution with additional investment

Products	Pig meat GDP 2016/17 (TZS millions)	Pig meat GDP 2021/22 (TZS millions)	% change
TFSP meat contribution	27,457.50	39,151.30	43
IFPS meat contribution	11,118.70	15,282.60	37
Total family pig meat system contribution	38,576.20	54,433.90	41

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Expanding the commercial specialized pig production subsystem

Targets

Table 62: Population growth of sows and pig meat production in the commercial/specialized pig production (CSP) subsystem

Pig subsystem	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% change
CSP (numbers)	57,580	70,746	86,922	106,796	131,215	161,218	180%
CSP meat (tonnes)	3,295	4,156	5,241	6,610	8,336	10,514	219%

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

The number of sows in the commercial specialized pig subsystem increases by 180% from 57,580 to 161,218 sows.

With each sow having 6 followers, the total number of pigs in this subsystem increases from 403,360 to 1,128,526.

Pig meat production from the specialized pig system increases from 3.3 thousand tonnes to 10.5 thousand tonnes over five years which constitutes a 219% growth. This growth is as a result of the following changes:

- Delay in weaning: successful service from 15–11 days
- Proportion of industrial feed included in the ration rising from 70–79%
- Age of piglets marketed reducing from 40–36 months
- Daily weight gain of piglets rising from 0.7–0.8 kg

Key challenges and strategies related to the commercial specialized pig system

Genetics challenges and strategies to address the challenges

The genetic challenges and strategies for addressing them are similar to those in the family pig subsystem in Table 60.

Animal health challenges and strategies

Apart from the low level of biosafety measures in the commercial specialized pig subsystem, which can be addressed through implementation of a strict biosafety measures at farm level and HACCP at feed plants, the animal health problems and strategies to them challenge are similar to those in the family pig subsystem (refer to Table 60).

Feeds challenges and strategies

These are the same as those in the family pig subsystem in Table 60. However, to deal with the serious feed shortage in the specialized system, suitable conditions for land allocation, and leasing of land to investors under the provisions of the current land laws, with major tax incentives on land use fees and lease time should be created.

Marketing and processing challenges and strategies

These are the same as those of the family pig subsystem in Table 60.

Policy challenges and strategies

These are the same as those of the family pig subsystem.

Intervention to achieve targets in commercial specialized family pig subsystems

The proposed expansion and upscaling of the commercial specialized pig production system involves genetic, health and feed interventions alongside marketing and policy interventions. The genetic improvement measures involve importation of 4,000 tropically adapted pig sows and 200 boars for breeding and crossbreeding and establishment of 10 private and 10 public pig breeding and multiplication farms.

The animal health interventions involve strengthening disease control for priority pig diseases such as African swine fever, transmissible gastro enteritis, erysipelas, worms, and mange, strengthening biosafety facilities, and building staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives.

The feed interventions involve strengthening capacity of private small-, medium- and large-scale pig feed mills/processors and making land available for pig feed (maize and other cereal) production. See Table 63 for the detailed investment interventions.

Investment requirements for transforming the pig sector

The total 15-year investment requirement to transform the pig industry amounts to TZS 195.375 billion or USD 88.8 million over a 15-year period. Thirty-seven per cent (37%) of the investment which is TZS 73.202 billion or USD

33.145 million will be required in the first five years, followed by 35% in the second and the remaining 28% in the final five years. Most of the investment is in the first year due to capital items and requirements for setting a leap in production and value addition activities.

In the first five years, overall the major portion of the investment is in animal health and product safety (33%) and marketing (29%). Out of the total investment, 22% is covered by the public and 78% by the private sector. The pig sector is basically of private interest and the public sector will play a major role in setting up regulations for the sector, the overall development and facilitation of activities in the sector and providing incentives to attract and encourage the private investors.

Table 63: Five-year investment cost to transform the family pig system and expand the commercial specialized system (2016/17 to 2021/22)

Type of investment	Total (TZS million)	Budget source
1 Animal feeding		
Strengthen capacity of 150 private small-scale pig feed mills/processors to compound and distribute feeds to farmers	1,450	Public–35% Private–65%
Strengthen capacity of public sector to regulate, and 30 private feed and meat processors to prepare own hazard analysis and critical control points (HACCP)	154	Public–100%
2 Animal health		
Strengthen disease surveillance at central and zonal veterinary laboratories (procure capital lab equipment)	1,200	Public–45% Private–55%
Train staff on novel lab technologies and methods to test blood/organ samples for early diagnosis of key pig diseases especially African Swine fever	180	Public–30% Private–70%
Strengthen veterinary laboratories capacity: procure in-line and offline feed quality analyzer equipment to check hazards, nutrient level, and residues	140	Public–100%
Procure equipment to check/validate feed intoxication and biological contamination	72	Public–100%
Build laboratory staff capacity on residues validation testing procedures/methodology	460	Public–100%
Build capacity of meat inspectors in 100 local government areas (LGAs) for safe meat marketing	1,100	Public–40% Private–60%
Equip pig abattoir and personal protective equipment (PPEs) for pig meat inspectors	1,056	Public–35% Private–65%
Strengthen biosafety facilities and plans of 300 pig farms to control pig diseases	5,280	Public–35% Public-private partnership–65%
Build capacity of 100 LGA for cost-effective pig disease surveillance and control strategies	8,250	Public–15% Public-private partnership–85%
Strengthen biosafety infrastructures in 300 pig farms in 100 LGAs and national biosafety services	660	Public–45% Private–55%
Facilitate pig identification, registration and traceability	2,200	Public–5% Public-private partnership–95%
Build staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives	550	Public–35% Private–65%
3 Animal breeding		
Import 4,000 tropically adapted and productive pig sow breeds for breeding	4,400	Public–50% Private–50%
Import 230 tropically adapted and more productive pig boar breeds for breeding	660	Public–45% Private–55%
Facilitate to establish 10 private pig breeding and multiplication farms	232	Public–15% Public-private partnership–85%

Type of investment	Total (TZS million)	Budget source
Facilitate to establish 10 public pig breeding and multiplication farms	408	Public–100%
4 Research activities		
Identify risk factors for spread of African swine fever, including the role of wild pigs-argasidae-tick interactions in high risk areas	60	Public–100%
Field test the efficacy of novel African swine fever virus diagnostic tests (lateral flow device (LFD) for early detection of virus antigen and ELISA to detect IgM) for the virus	30	Public–100%
Modelling cost-effective measures for prevention and control of African swine fever	22	Public–100%
Improve control and preparedness of pig farmers, Vets and public agencies for African swine fever	7,920	Public–100%
Diagnostic study on swine producer associations managerial, financial and organizational needs and planning to achieve operational efficiency	33	Public–100%
5 Extension services		
Establish 300 swine producers' associations (SPAs) in potential areas	2,280	Public–20% Private–80%
Build capacity for 300 SPAs to revitalize and innovate to address production, trade and development limitations	50	Public–10% Private–90%
Build SPAs capacity to manage pig meat value chain (processing, marketing)	100	Public–25% Private–75%
Enhance leadership capacity to manage pig producer saccos, production and marketing	230	Public–30% Private–70%
Build hands-on capacity to manage pig farm enterprise costs, manure processing and pig industry sustainability	275	Public–30% Private–70%
6 Commercial production, marketing and value addition		
Expand and upgrade the capacity of 50 large-scale specialized investors' pig farms	2,200	Public–5% Private–95%
Establish 50 new commercial specialized pig farms for commercial pig production	4,400	Public–5% Private–95%
Improve capacity of government staff to backstop 30 meat processors and 30 feed processors to implement their own HACCP	1,100	Public–40% Private–60%
Construct pig marketing centres with slaughter facilities in 100 pilot LGAs	8,800	Public–10% Private–90%
Construct mechanized pig slaughter facilities, and processing plant with cold-storage for marketing of chilled pig meat to domestic and exports markets	5,280	Public–5% Private–95%
7 Monitoring and evaluation		
Institutionalize pig database and capacity for program and monitoring	9,600	Public
Bi-annual evaluation of the transformational development in the pig industry	720	Public
Support to program coordination and asset management	1,375	Public
Total	73,202	Public–22% Private–78%

Impacts

Return on investment

The return on the pig investment from the commercial specialized system is 22% and it is big enough to justify the proposed investment. The internal rate of return which is 22% ensures profitability.

Production impacts

Pig meat production from the commercial specialized system increases from 3.3 thousand tonnes to 10.5 thousand tonnes over a 5-year period that constitutes a 219% growth.

GDP impacts

The GDP contribution of the commercial specialized system increases from the current TZS 5.3 billion to TZS 26 billion in five years. With the additional investments, there is a fourfold increase in the GDP contribution of the specialized system.

Total pig meat production

The total pig meat production from the family and commercial specialized systems increases by 69% over the 5-year period (2017–2022) likely attributed to good animal productivity and increasing number of intensive smallholders, and medium- to large-scale farmers.

Table 64: Total pig meat production with additional investment

Products	Pig meat 2016/17 (in tonnes)	Pig meat 2021/22 (in tonnes)	% change
Total pig meat from the family system	18,730	26,650	42
Total pig meat from commercial specialized system	3,295	10,541	219
Total Pig meat production	22,025.00	37,191.00	69

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Total GDP contribution

Overall the GDP contribution of pig meat production increases from the current TZS 44 billion to 80 billion in five years, an increase of 83% from the base year.

Table 65: Family and commercial specialized pig subsystem GDP contribution with additional investment

Products	Pig meat GDP 2016/17 (TZS millions)	Pig meat GDP 2021/22 (TZS millions)	% change
Family pig meat subsystem contribution	38,576.20	54,433.90	41
Commercial specialized subsystem pig meat contribution	5,397.6	26,042.1	382
Total meat contribution	43,973.80	80,476.00	83

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Income impacts

With the additional investment and increase in productivity, the net income per sow increases by 3.1%, 10.2% and 57.1% in the traditional family pig, improved family pig and commercial specialized pig subsystems, respectively. The commercial specialized system sees the most significant incremental income benefit per animal followed by the improved pig family system.

Table 66: Incremental income per sow

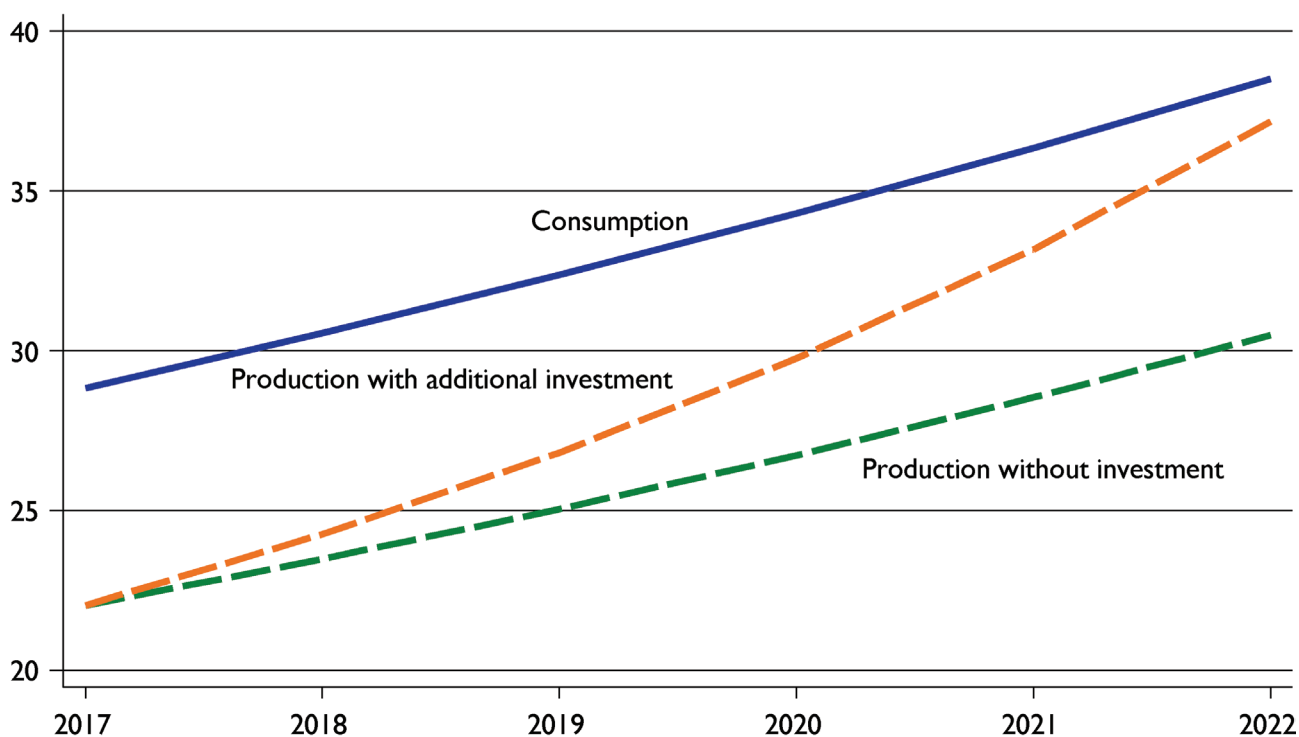
Pig subsystem	Net income per sow	Net income per sow	Incremental income per sow	% change
Traditional family pig subsystem	803,714	829,113	25,399	3.1
Improved family pig subsystem	1,029,362	1,134,622	105,260	10.2
Commercial specialized subsystem	1,654,757	2,599,367	944,610	57.1

Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Production-consumption balance impact

The figure below shows that under the 'business as usual' or 'without additional investment' scenario, there is and there will be a substantial shortage of pig meat production to meet the current as well as the future domestic consumption demand. Even with the proposed additional investment the deficit will not be removed during the first five-year investment period, but it will become much narrower compared with the 'without additional investment' scenario.

Figure 11: Projected pig meat consumption and production with and without additional investment (in thousand tonnes), 2017–2022



Source: LSIPT livestock sector analysis (2016), MLF Tanzania

Table 67: Major activities timing and sequence: Gantt chart

No.	Type of investment	2017	2018	2019	2020	2021
1	Animal feeding					
	Strengthen capacity of 150 private small-scale pig feed mills/processors to compound and distribute feeds to farmers					
	Strengthen capacity of public sector to regulate, and 30 private feed and meat processors to prepare own HACCP	-			-	
2	Animal health	-	-	-	-	-
	Strengthen disease surveillance at central and zonal veterinary laboratories (procure capital lab equipment)					
	Train staff on novel laboratory technologies and methods to test blood/organ samples for early diagnosis of key pig diseases especially African swine fever					
	Strengthen veterinary laboratories capacity: procure in-line and offline feed quality analyser equipment to check hazards, nutrient level, and residues.					
	Procure equipment to check/validate feed intoxication and biological contamination			-	-	-
	Build laboratory staff capacity on residues validation testing procedures/methodology	-				
	Build capacity of meat inspectors in 100 LGAs for safe meat marketing		-		-	

No.	Type of investment	2017	2018	2019	2020	2021
	Equip pig abattoirs and avail personal protective equipment (PPE) for pig meat inspectors		-		-	
	Strengthen biosafety facilities and plans of 300 pig farms to control pig diseases					
	Build capacity of 100 LGAs for cost-effective pig disease surveillance and control strategies					
	Strengthen biosafety infrastructures in 300 pig farms in 100 LGAs and national biosafety services					
	Facilitate pig identification, registration and traceability					
	Build staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives				-	-
3	Animal breeding and genetics					
	Import 4,000 tropically adapted and productive pig sow breeds for breeding	-			-	-
	Import 230 tropically adapted and productive pig boar breeds for breeding	-			-	-
	Facilitate to establish 10 private pig breeding and multiplication farms					-
	Facilitate to establish 10 public pig breeding and multiplication farms					-
4	Research activities					
	Develop capacity to control African swine fever and transform the pig industry in the country					
	Identify risk factors for spread of African swine fever, including the role of wild pigs-argasidae tick interactions in high risk areas			-	-	-
	Field test the efficacy of novel African swine fever virus diagnostic tests (lateral flow device (LFD) for early detection of virus antigen and ELISA to detect IgM) for the virus		-	-	-	-
	Modelling cost-effective measures for prevention and control of African swine fever	-		-	-	-
	Improve control and preparedness of pig farmers, Vets and public agencies for African swine fever					
	Diagnostic study on swine producer associations managerial, financial and organizational needs and planning to achieve operational efficiency	-	-		-	-
5	Extension services					
	Build capacity of 300 swine producer associations (SPAs)					
	Establish 300 SPAs in potential areas					
	Build capacity for 300 SPAs to revitalize and innovate to address production, trade and development limitations					
	Build SPAs capacity to manage pig meat value chain (processing, marketing)					
	Leadership capacity to manage pig producer saccos, production and marketing					
	Build hands-on capacity to manage pig farm enterprise costs, manure processing and pig industry sustainability					
6	Marketing and value additions					
	Expand and upgrade the capacity of 50 large-scale specialized investors' pig farms		-		-	-
	Establish 50 new commercial specialized pig farms for commercial pig production	-			-	-
	Improve capacity of government staff to backstop 30 meat processors and 30 feed processors to implement their own HACCP		-		-	
	Construct pig marketing centres with slaughter facilities in 100 pilot LGAs	-	-			
	Construct mechanized pig slaughter facilities, and processing plant with cold-storage for marketing of chilled pig meat to domestic and exports markets	-	-			

No.	Type of investment	2017	2018	2019	2020	2021
7	Monitoring and evaluation					
	Institutionalize pig database and capacity for program coordination and monitoring					
	Bi-annual evaluation of transformational development of the pig industry	-		-		-

Conclusions

Amid increasing demand for pig meat, pig producers require proper knowledge, skills and business investment plans to run their pig enterprises profitably. It is observed that under a ‘business as usual’ scenario, often without additional investment, there is and there will be a substantial shortage of pig meat production to supply the current as well as the future domestic consumption demands. Even with the proposed additional investment, the deficit will not be removed during the initial years of the first five-year investment phase, demand and supply gap for pig meat will get much more narrowed with the ‘additional investment’ scenario. The transformation of the commercial intensive pig industry will be driven by;

- Adoption of supplementary feeding in the traditional family pig subsystem and adequate production and supply of quality commercial feeds.
- Assured herd health and a drive towards higher fertility and greater pig productivity through intensive smallholder, medium- and large-scale investments; and continuing improvements in herd fertility for the breeding herds.
- A greater focus on indoor pig farming through progressive reduction of the numbers of free-roaming pigs and improvement of traditional units/holdings.
- Strategic development of industrial pig farming/concentrations through invitation and support for foreign direct investments in pig farming as a special target for those in large commercial pig production farms (e.g. commercial specialized farming system).
- Supporting private sector investment in animal health and other pig farming technical and business development services.
- Continued mainstreaming of smallholder pig production activities with commercial pig farms and meat processing plants, massive cereal production, feed processing, breeding activities, marketing and pig meat value addition (slaughter and processing).
- Strengthening swine associations for producers, traders, processors by training and equipping them with knowledge and skills, and giving them access to credit through and collective marketing.

Livestock sectoral analysis key findings on cross-cutting issues

Introduction

The productivity enhancing technologies and policy interventions with the greatest potential for contributing to achieving Tanzania's national agricultural objectives include feed, animal health, and animal genetics development. The constraints and opportunities related to these interventions were analysed using the livestock sector investment and policy toolkit (LSIPT).

Feed

Crop and livestock production are the dominant economic subsectors providing livelihoods, incomes and employment to more than 80% of Tanzania's population. The livestock sector analysis showed feed is the most critical resource constraint to growth and modernization in the livestock sector. Though endowed with natural resources, a large resource base for the country's millions of livestock, the utilization of grazing lands for sustainable livestock production is hampered by seasonal variations in the quality and quantity of forage etc. While the country also produces substantial amounts of cereals and root crops, whose residues are valuable feeds for livestock, these crops are produced primarily for human consumption and some are in short supply.

The livestock feed deficit is aggravated by the effects of climate change on feed quantity and quality. Extended dry seasons, frequent droughts, erratic rainfall manifested by shifts in the onset and cessation of rainfall, and increased temperatures have drastically reduced the availability of both roughages and concentrate feeds. Pasture and water shortages have also led to overgrazing and resource conflicts between livestock keepers and other land users.

The LSIPT was employed to measure the potential supply of forage, fodder and other feed resources and future requirements for cattle, sheep, goats, poultry and pigs in the three production zones and the specialized systems. Results indicated a clear shortage in feed and forage supply in the country, with available resources making up only 26% of required feed on average (with deficits in all types of rainfall years). Unless significant action is taken, projected shortages are set to worsen substantially over the next 15 years with available resources making up only 15% of the feed required.

The central zone is expected to be the most severely affected since the systems there rely most on grazing, leading to increased mortality rates and poorer animal nutritional health. Interventions in this zone should focus on improving pasture productivity in the grazing lands and fodder conservation, and reducing the ruminant livestock population. In other systems and zones, the focus needs to be on intensified on-farm forage production, as well as commercial-scale feed production through irrigation where possible. The intensification of feeding programs, where feasible, should also be pursued in tandem with breeding programs to enhance the genetic potential of livestock.

Animal health

More than 85% of Tanzanians live in rural areas, out of which about 37% keep livestock. The livestock population is estimated at 107 million animals, of which an estimated 88% are kept in smallholder traditional systems. Animal health services—through disease control and prevention—remain one of the main drivers of livestock production and productivity, along with feed and genetics. In 2015 alone, the Tanzanian government recorded 329 animal disease outbreaks involving 32 animal disease conditions and 24,231 clinical cases, causing 5,864 deaths. The control and prevention of animal diseases is a recurring and costly burden to individual livestock keepers, commercial herd owners and the local and national governments.

Transboundary animal diseases and zoonosis are particularly important constraints to livestock production in pastoral and agro-pastoral areas and are by and large the most important constraint to herd health and trade in animals and their products. The main diseases constraining livestock production in Tanzania are Rift Valley fever, foot-and-mouth disease, peste des petits ruminants (PPR), African swine fever, Marek's disease, Newcastle disease, contagious bovine pleuropneumonia (CBPP), brucellosis and East Coast fever.

Based on expert opinion and data on animal diseases, the toolkit was used to assess qualitative and quantitative socio-economic impacts of diseases on household assets, markets/value chains and intensification of production, develop a priority list of animal diseases, and characterize the status of veterinary infrastructure in the country. This work sought to determine the optimal allocation of financial and human resources for surveillance, prevention, control and elimination of selected infectious diseases. The species targeted were food-producing animals: mainly cattle (beef, dairy), small ruminants (sheep and goats), chicken and pigs. The identified priority diseases¹ hampering:

- household assets were CBPP for cattle; Rift valley fever for small ruminants, African swine fever for pigs; and Newcastle disease for poultry;
- markets and value chains were foot-and-mouth disease for cattle; brucellosis for small ruminants; African swine fever for pigs; and salmonellosis for poultry; and
- livestock intensification were foot-and-mouth disease for cattle; PPR for small ruminants; African swine fever for pigs; and salmonellosis for poultry.

Inadequate resources including funds, skilled personnel and logistics have also weakened the ability of national veterinary services to contribute to reducing the impact of reported transboundary and zoonotic diseases and pests. Detecting, controlling and preventing these diseases requires a highly-coordinated public surveillance and response system at all levels in all areas of the country. The department of veterinary services needs to strengthen the country's animal disease surveillance and reporting system including through empowering livestock communities to detect and report disease incidents to facilitate prompt responses to outbreaks.

Animal genetics

The absence of effective livestock breeding and selection programs in Tanzania has hindered the supply of improved breeds to farming communities. Better coordination of the development and protection of animal genetic resources (AnGR) in Tanzania should involve the establishment of reliable and sustainable germplasm delivery systems and the involvement of the private sector in animal genetic improvement.

Employing the LSIPT, an inventory and characterization of AnGR in Tanzania was undertaken. Management, conservation and maintenance policies and practices were evaluated for the three production zones in the country and the findings were discussed with key experts and main stakeholders from the private and public sectors.

Crossbreeding local cattle should focus on the interbreeding of breed-types, taking advantage of additive gene action. It is recommended that for dairy, suitable exotic breeds include Friesian, and for dual-purpose (milk and meat), the

1. The priority disease affecting each species are listed here. The other diseases can be found in the Tanzania livestock master plan.

best breed is Simmentals. For small ruminants, selection should focus on improving growth rates, crossbreeding indigenous stock with the Boer, Saanen, Dorper and Malya.

For poultry breeding, there is a need to develop a national recording program to help identify local breeds and strains for commercial production. Indigenous chickens need to be characterized and selected, and desirable traits for improvement and conservation established. Breeds developed elsewhere also need to be tested.

Inbreeding of pigs needs to be controlled and new or improved breeds introduced. The importation and multiplication of breeds with proven herd performance and track records should be undertaken by the private sector in line with MLF policy and oversight. This oversight will require the establishment and enforcement of a legal framework, including the development of an animal breeding policy and the implementation of the animal breeding bill currently before parliament.

Livestock selection for genetic improvement needs to focus on:

- Ensuring effective breeding, selection and conservation programs are in place, including open nucleus breeding schemes and the renovation of public livestock farms and artificial insemination centres.
- The establishment of data recording systems for on-station and on-farm breed evaluation programs for both locally-adapted and exotic breeds and their crosses.
- The provision of training and support to strengthen animal breeding infrastructure, such as artificial insemination and minus-one-element-technique laboratories.

Priority and complementary institutional and policy recommendations

- The review of existing policies, institutions, laws and regulations highlights a lack of enforcement capacity and the need to modify out-of-date policies are priorities. Land allocation and tenure regulations particularly need to be revised to encourage private sector investment in feed production to alleviate severe shortages. Key policy priorities in related areas include:
 - Offering incentives for the private sector involvement in veterinary service provision in rural areas, including cost sharing for the prevention and control of diseases of economic importance.
 - Establishing a reporting system for the collection of veterinary drugs/vaccines performance at all levels.
 - Strengthening enforcement of the Animal Disease Act 2003 for poultry and the Grazing Land and Animal Feed Resources Act 2010, building the capacity of animal feed and meat inspectors, and formulating and enforcing poultry feed inspection guidelines and biosecurity and other relevant disease control guidelines.
 - Taking measures to promote investment in processing facilities for hides and skins, and ensuring enforcement of relevant trade regulations.
 - Strengthening market price and related information for live animals and products (i.e. hides and skins).
 - Introducing policies and enforcing laws on rangeland improvement: designating grazing areas in rangelands owned by livestock farmers; encouraging environmentally friendly tsetse control; mandating dipping and vaccinations; and incentivizing the adoption of climate change adaptation and mitigation practices.
 - Ensuring the implementation of the draft animal breeding act is accompanied by the provision of sufficient human resources and infrastructure and the establishment of livestock breeders' associations.
 - Enforcing the Grazing Land and Animal Feed Resources Act 2010, and promoting the commercialization of maize and soybean production for livestock feeds, and contract farming for feed raw materials, such as soybean.
 - Reducing the high costs associated with livestock research by increasing investment in facilities, infrastructure and human resources, mandating more inclusive associations and platforms of experts to promote collaboration among researchers and with other stakeholders, including the private sector.
 - Increasing the quantity and quality of extension staff and associated infrastructure and facilities, and clearly delineating roles and responsibilities between ministry and local government authorities.

-
- Strengthening the national livestock identification, registration and traceability system through the addition and enactment of a legislative amendment enabling the private sector supply of identification devices.
 - Reducing social conflict between livestock farmers and other land users, and land degradation from overuse, by strengthening livestock extension support services, legislating the demarcation of land for grazing, and the formation of pastoral and agro-pastoral associations.
 - Building the capacity of livestock ministry staff to conduct detailed economic and statistical analysis, develop implementation roadmaps, formulate policies and evaluate the outcomes.

Tanzania livestock master plan conclusions

The ex-ante impacts of the livestock master plan roadmaps demonstrate that investing in the development of the livestock sector during the ASDP II phase could reduce poverty and improve the food security of rural people, as well as make livestock an increasing contributor to national income growth (GDP), and also to exports and foreign exchange earnings.

For the specific value chains and interventions, the main conclusions and implications of implementing the livestock master plan roadmaps for the ASDP II, as well as conditions critical to achieving success, are as follows:

Crossbred dairy cow development

The projected increase in national cow milk production as a result of the proposed interventions—including artificial insemination and hormone synchronization, combined with improved feed and health services, value addition and complementary policy changes—during the ASDP II period (2017–2022) is 77% or a surplus of 1,002 million litres over projected domestic consumption requirements. This production increase would make it possible to meet the milk production targets in the ASDP II phase, exceeding the growing domestic demand for milk by 35%. Due to increases in the number of crossbred dairy cows of 281% and milk production per cows by 26% (42%), the contribution of the dairy sector to GDP is expected to rise by 75%.

The critical conditions needed for the success of the cow dairy roadmap are:

- Promotion of investment in long shelf life milk products, such as UHT, milk powder and other value-added products like yogurt, ice cream and cheese etc.
- Introduction of quality-based standards and pricing to encourage quality milk supply.
- Strengthening of enforcement of milk and milk products quality standards and comprehensive grading and pricing policies.
- Formalization of milk trade through the training and licensing of milk traders.
- Upscaling of the ongoing school milk feeding programs to promote consumption.
- Building of the capacity of the dairy technology training institute(s).
- Introduction of protective trade policies including higher import tariffs or bans on imported milk products and/or subsidies for domestically-produced milk products.
- Reduction in bureaucracy and promotion of investment in the dairy industry;
- Development and implementation of an effective land acquisition policy for dairy investments (preferential treatment for accessing land for specialized dairy production, milk processing and feed production).
- Provision of incentives for investors to establish dairy processing plants and commercial specialized dairy farms.

Red meat development

The proposed combined interventions for red meat production on traditional family farms and commercial ranches, as well as feedlot development, would result in a 52% increase in total red meat production. Production would grow to 742,500 tonnes between 2017 and 2022. This would not, however, meet expected consumption growth of 71% by year 2022 (to 867,302 tonnes), leaving a 17% deficit (124, 800 tonnes) in the 2017–2022 red meat production and consumption balance.

Due to extremely limited access to land for grazing and feed production, and limited ability to enhance the genetic potential of local ruminant breeds in the medium-term mean, it is unlikely that the red meat production gap can be closed in the next five years. Even with a substantive increase in the supply of red meat from small ruminants—with goat meat and mutton currently accounting for 14% and 4% respectively—this is unlikely to significantly help close the projected meat consumption/demand gap as beef accounts for 82% of the red meat production in Tanzania.

Given the rapidly growing population, and increasing incomes and demand for animal-source foods in Tanzania, such projected deficits would be expected to put upward pressure on red meat prices. Moreover, meeting the growing red meat export goals in the ASDP II period would also be extremely difficult.

- To be successful, the red meat/milk interventions need to be supported by:
- Development of the meat technology training staff, and the provision of training to meat processing staff.
- Promotion of forward contracting by feedlots and abattoirs.
- Investment in export infrastructure for animal holding and quarantine centres, as well as in programs for disease surveillance, monitoring of abattoirs, animal identification and traceability etc.
- Strengthening of the animal health regulatory capacity at national and local levels under the coordination of the MLF
- Development of strategic capacities spearheaded by staff working in the Agricultural Sector Development Program II
- Building of a key infrastructure to support the marketing and processing of livestock and livestock products.
- Development and implementation of standards on meat and feed quality control and enforcement and grading, and pricing policies.
- Introduction of trade policy to reduce the importation of cooking oil and grain flour whose raw materials can be used to increase and improve livestock feeds
- Development and implementation of policies protecting and enhancing animal welfare
- Development of clearly defined guidelines on the right to access and use land and the implementation of appropriate land policies.
- Refraining from uncritically gazetted grazing land, to make land currently held for conservation purposes accessible for pastoral production.

Poultry development

Successful poultry interventions would allow the subsector to move to improved family poultry with semi-scavenging crossbreeds and for substantial increases in the scale of specialized layer and broiler operations. Such a transformation—depending on successful interventions in the areas of breed selection, health services (particularly in treating Newcastle disease), feed, extension, private investment and trade policies—would contribute considerably to improving food and nutrition security and household incomes, as well as the contribution of poultry to GDP by 182%, from TZS 256 billion to 723 billion, and to substantial contributing closing the production–consumption gap for meat.

Projected annual chicken meat and egg production in Tanzania would rise to 465,600 tonnes and 4.2 billion eggs, respectively. This would bring the production-consumption deficit for chicken meat from 130,000 to a surplus of 258,000 tonnes between 2017 and 2022. The combined interventions would result in increases of 666% and 40% respectively in chicken meat and egg production by 2022. Such accomplishments would enable Tanzania to meet the chicken meat and egg demand for its growing population, and produce a very significant surplus for domestic industrial use or export.

Perhaps most importantly, the growth of the poultry subsector would enable Tanzania to close the total national meat production-consumption gap (see Figure 3). It would also contribute to the reduction of greenhouse gas emissions from total meat consumption. Taking advantage of the benefits of the potential poultry revolution would thus require substantial investments in promotional activities to shift tastes and preferences away from beef and mutton, as well as from local chicken meat and eggs, towards exotic chicken meat and eggs.

Moreover, if the surplus chicken meat could substitute for domestic red meat consumption, this would also enable meat exports (of beef, mutton and goat meat) to be increased to raise foreign exchange earnings, in line with the government's meat export policy.

Furthermore, the surplus eggs created could be also processed into egg powder and used domestically for new or additional industrial uses (e.g. in the baking industry), or exported as egg powder to raise foreign exchange earnings.

The above benefits can only be realized with the:

- Establishment of an efficiently functioning private day-old-chick's industry and effective distribution system of the birds for the specialized poultry farms.
- Facilitation by government of the establishment of investment in the poultry agribusiness sector through the reduction of bureaucratic obstacles.
- The allocation of land for the establishment of poultry farms and production of feed.
- Promotion of large-scale private investment in poultry processing plants to produce value added products for industrial uses or to meet consumer demand for processed egg and meat products—through the provision of favourable taxation levels and provision of local interest loans to investors.
- Establishment of a mechanism to encourage low-cost production and formulation of poultry feed critical to the success of specialized poultry farms.
- Facilitation of links between specialized chicken and egg producers with processors, ensuring regular access to market outlets, and both with maize producers and cooking oil plants, ensuring a regular supply of feed.
- Use of public-private partnerships in the manufacture and distribution of quality vaccines needed to keep exotic chickens healthy, where the private sector will not invest.
- Encouragement of farmer groups and cooperatives to establish outgrower schemes for pullet production and distribution, mini-hatcheries, and feed processing plants and slaughtering facilities.

Pig development

The proposed combined interventions for improved family and expanded commercial specialized pig production systems would result in a 69% increase in pig meat production. Production would grow from about 22,000 to 37,200 tonnes between 2017 and 2022. The development of a competently market-oriented farming, processing and a dynamic marketing sector, operating in more sustainable and climate-smart ways, supplying consumers with high-quality and safe pig meat/pork would significantly contribute to increased household income, food and nutrition security, poverty alleviation, as well as increasing the contribution of pork to GDP by 83%, from TZS 44 billion to 80 billion between 2017 and 2022. This would bring the production-consumption deficit for pig meat from 8,000 tonnes to a 1,350-tonne surplus in the five-year period.

Improving pig meat requires a focus on controlling African swine fever to increase pig productivity and meat production to help close the projected all-meat consumption gap projected in 15 years. In the 'without additional investment' scenario, by year 2032, a deficit of 16,000 tonnes of pig meat is estimated, thus resulting in a total all meat deficit of 2 million tonnes. However, industrializing pork production (in large commercial-scale operations) and processing for product transformation will lower domestic meat prices, while enabling an increase in exports and foreign exchange earnings.

The above benefits can only be realized with:

- An increase in the supplementary feeding of family pig herds and in the production and supply of quality commercial feeds.
- An intensification of pig production through a combination of small-, medium- and large-scale investments in genetics, biosafety, health and feed designed to increase fertility and productivity rates.
- A greater focus to indoor pig farming through progressive reduction of the numbers of free-roaming pigs and improvement of traditional units/holdings.
- Strategic development of industrial pig farming concentrations through the attraction of, and support for, domestic and foreign direct investments in pig farming, targeting large commercial pig producers.
- Promotion of private sector investment in animal health, and other pig farming technical and business development services.
- Integration of smallholder pig production activities with specialized pig farms and meat processing plants, massive cereal production, feed processing, breeding activities, marketing and pig meat value addition services (e.g. slaughter and processing).
- Strengthening of swine associations to make them vehicles for commercialization of the pig industry, ensuring they have the right knowledge and skills, and access to credit and collective marketing opportunities.

Total investment in the livestock master plan

The total investment costs required to carry out the LMP roadmap are TZS 1,393.9 billion. The proportion of investment from the public and private sectors is 36% (TZS 502.6 billion) and 64% (TZS 891.3 billion), respectively.

Table 68: Total investment cost required to carry out the livestock master plan roadmap

Investment interventions	Total investment cost in billion TZS			Total cost (USD millions)
	Public	Private	Total	
Cow dairy*	105.8	119.3	225.1	101
Red meat/milk and feedlot	184.8	157.4	342.2	153
Poultry	195.9	557.5	753.4	337
Pig/pork	16.1	57.1	73.2	33
Total	502.6	891.3	1,393.9	624

*Investments to improve pasture productivity and reduce young and adult stock mortality are included in the investment of red meat/milk and feedlot system.

Finally, the results for all the targeted value chains show that investing in the livestock master plan could help transform family farms from traditional to improved market-oriented systems. This includes all the traditional family systems. The specialized commercial production systems for dairy, cattle feedlots, and poultry (broilers and layers) could also be improved through better genetics, feed and health services and by increasing the number of specialized commercial units and animals in them to increase their contributions to rural household income, national livestock production and GDP. Moreover, livestock development does not just have an impact on rural people. The anticipated transformation of the livestock sector also has the potential to impact positively on urban consumers through lower animal product prices. It is, therefore critical to the attainment of food and nutrition security at household, sectorial and national levels.

Annex I: Five-year dairy production improvement investment costs (2017/18–2021/22)

S/no	Investment intervention	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
I	Animal feeding							
i	Pasture establishment and paddocking Land preparation, pasture establishment and paddocking in newly-established 150 medium farms (50 ha)	7,920	7,920	7,920	7,920	7,920	39,600	Private–100%
ii	Commercial animal feeds plants Construction of two plants (TZS 1,100 million per plant)	-	1,100	-	1,100	-	2,200	Private–100%
iii	Feeding technologies and land acquisition (production, processing and storage) for newly established 150 medium farms	176	176	176	176	176	880	Public–80% Private–20%
iv	Feed quality control (laboratories and capacity building) and improving the existing (first five years)	-	440	-	-	-	440	Public–100%
v	Strengthen the existing pasture/forage seed quality control laboratories	880	-	-	-	-	880	Public–100%
	Subtotal	8,976	9,636	8,096	9,196	8,096	44,000	
2	Animal health	-	-	-	-	-	-	
i	East Coastal fever vaccination program for 300,000 dairy cattle per year	-	-	-	-	-	-	Income mentioned in red meat improvement scenario
ii	Implement programs for eradication of contagious bovine pleuropneumonia, foot-and-mouth disease, Rift Valley fever (capacity for surveillance, diagnosis and vaccination campaign)	-	-	-	-	-	-	
iii	Rehabilitate 100 veterinary centres	-	-	-	-	-	-	
3	Animal breeding and genetics investments							
i	Strengthen existing national and establish a new semen production centre	2,200	-	11,000	-	-	13,200	Public–100%
ii	Strengthen existing and acquire two liquid nitrogen plants	-	1,100	-	1,100	-	2,200	Public
ii	Training and capacity building for 6,650 artificial insemination technicians	554	554	554	554	554	2,772	Public–10% Private–90%
iii	Establishing bull centres and purchase 20 proven bulls	198	198	198	198	198	990	Private–50% Public–50%
iv	Purchase and distribution of crossbred heifers for under-resourced dairying beginners (2,000 every year)	4,400	4,400	4,400	4,400	4,400	22,000	Public–90% Private–10%
v	Strengthen existing LMUs and establish four crossbred heifer multiplication farms	2,750	-	2,750	2,750	2,750	11,000	Public-private partnership 50%/50%

S/no	Investment intervention	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
vii	Sensitize farmers on the formation of breed societies	440	-	-	-	-	440	Public-50% Private-50%
	Subtotal	10,542	6,252	18,902	9,002	7,902	52,602	
4	Extension	-	-	-	-	-	-	Income mentioned in red meat improvement scenario
	Strengthening extension services for dissemination of appropriate livestock technologies	-	-	-	-	-	-	
5	Research							
	Research on breed improvement, feeds and forage, animal health and value addition of livestock products and by-products	-	10,000	-	12,000	-	22,000	Public-100%
	Subtotal	-	-	22,000	-	-	22,000	
6	Marketing and value addition	-	-	-	-	-	-	
i	Construction of two processing plants: one UHT in coastal and lake zone and one milk powder in highlands zone	-	11,000	17,600	-	-	28,600	Public-private partnership-50%/50%
ii	Formation and strengthening of dairy cooperative and primary societies in high potential areas (training, sensitization, equipping and facilities)	220	220	220	220	220	1,100	Public-50% Private-50%
iii	Establish 150 milk collection/chilling centres (cold chain)	1,980	1,980	1,980	1,980	1,980	9,900	Public-50% Private-50%
iv	Strengthen Dairy Board to regulate milk quality in highlands, lake and coastal zones in four milk sheds (office and laboratory)	550	-	-	-	-	550	Public-100%
v	Strengthen the capacity of milk quality and safety control laboratory at the Tanzania Veterinary Laboratory Agency (TVLA)	330	-	-	-	-	330	Public-100%
vi	School-milk feeding programs to benefit 500,000 children	4,400	8,800	13,200	17,600	22,000	66,000	Public-private partnership-50%/50%
	Subtotal	7,480	22,000	33,000	19,800	24,200	106,480	
	Grand total investment	26,998	47,888	59,998	49,998	40,198	225,082	Public-47% Private-53%

Annex 2: Five-year red meat production improvement investment costs (2017/18–2021/22)

S/No	Investment intervention	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
1.	Animal feeding							
	Gazette grazing land, demarcation and enforcement of the Grazing Land and Animal Feeds Resources Act 2010.		5,000	3,000	2,000	1,000	11,000	Public–100%
	Rangeland (communal grazing land) improvement–Bush clearing and/or oversowing	20,000	10,338	10,000	5,000	4,000	49,338	Public–60% Private–40%
	Livestock-water development programs (charcoal dams/boreholes for village grazing land)		10,000	5,000	3,893		18,893	Public–90% Private–10%
2.	Animal health							
	Public good vaccination for East Coast fever, CBPP, foot-and-mouth disease, Rift Valley fever, PPR, CCPP and brucellosis diseases	2,552	2,552	2,552	2,552	2,552	12,760	Public–80% Private–20%
	Construction and rehabilitation of dip tanks	1,043	1,043	1,043	1,043	1,043	5,215	Public–60% Private–40%
	Improve the capacity of vaccine production centres, veterinary centres and diagnostic laboratories for vaccination, surveillance and diagnosis		22,000	11,000	11,000		44,000	Public–100%
	Promote private sector engagement in vaccine production		1,000	1,000	1,000		3,000	Public–25% Private–75%
3.	Animal breeding and genetics							
	Purchase of proven breeding bulls (Boran, Ankole and Fipa)	40,518	40,518	40,518			121,554	Public–10% Private–90%
	Purchase of proven breeding bucks of Malya (blended) goat	70	100	80			250	Public–30% Private–70%
4.	Research							
	Grazing land resource (feed/fodder/ water) assessment research		2,750	2,750			5,500	Public–80% Private–20%
	Research on breed improvement, feeds and forage, animal health and value addition of livestock products and by-products;		1,000	1,000	200		2,200	Public–70% Private–30%
5.	Extension services							
	Strengthening the capacity of existing livestock training institutes	5,500		5,500			11,000	Public–90% Private–10%
	Provide extension officers with the necessary equipment (toolkit)							
	Establish and/or strengthen ward livestock resource centres							

S/No	Investment intervention	Investment cost (TZS million)					Budget source	
		2017/18	2018/19	2019/20	2020/21	2021/22		Total
6.	Marketing and value addition							
	Establishment and rehabilitation of secondary livestock markets		1,500	1,000			2,500	Public–100%
	To renovate and equip Kwala and Tarime and Murusagamba livestock quarantine station (for export processing)		10,000	10,000		20,000	40,000	Public–100%
	Renovation and/or constructions of modern abattoirs		3,500	3,500			7,000	Public–50% Private–20%
	• two big abattoirs with a capacity to slaughter 2,000 sheep and goats and 200 cattle per day							Public-private partnerships–30%
	• one modern abattoir with a capacity to slaughter 3,000 sheep and goats and 700 cattle per day							
	Renovation of existing and/or constructions of two new semi-processing and finished leather products processing plants	2,400	2,000				4,400	Private–100%
	Strengthening the meat board to regulate, promote, monitor and coordinate stakeholder activities for improving the meat value chain (traders and producers' associations)		200	130			330	Public–95% Private–5%
	Strengthen the capacity of meat quality and safety control laboratory in the Tanzania Veterinary Livestock Agency		550	550			1,100	Public–100%
	Enhancing livestock identification and traceability system–purchase of equipment (computer, networking and identification kits)		1,200	1,000			2,200	Public-private partnerships–100%
	Total	72,083	115,251	99,623	26,688	28,595	342,240	Public–54% Private–46%

Annex 3: Five-year chicken meat and egg production improvement investment costs (2017/18–2021/22)

No.	Investment interventions	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
1	Animal feeding							
	Establish three chicken feed processing plants		2,970		5,940		8,910	Private–100%
	Improve the capacities of chicken feed quality control laboratories	1,320		1,320			2,640	Public* –100%
	Land investment for feed (yellow-maize and soybean) production (sorghum to complement maize)	36,300	36,300	46,200	60,500	62,700	242,000	Private–100%
2	Animal health							
	Upgrade and expand Newcastle disease, fowl pox, Gumboro vaccines production plant	13,200	19,360	13,200			45,760	Public–100%
	Establish and monitor the chicken industry biosafety program	2,200	3,300	1,320	1,320	1,210	9,240	Public–100%
3	Animal breeding and genetics							
	Identify suitable tropical pure reproducing/brooding chicken breeds	3,960	2,200				6,160	Public–100%
	Identify suitable tropical semi scavenging crossbred chicken breeds	2,200	1,760				3,960	Public–100%
	Testing breeds at the Tanzania Livestock Research Institute and at farm level and developing appropriate business models	2,200	3,520				5,720	Public–100%
	Strengthen/upgrade seven public chick multiplication centres	1,100		2,200		2,420	5,720	Public–100%
	Establish eight new public and private crossbred semi-scavenging and commercial day-old-chick multiplication centres and 30 mothering units and distribution centres for month-old vaccinated chicks	3,163	3,163	6,325	6,325	6,325	25,300	Public–20% Private–80%
	Establish 10 public and private hatchery facilities and 100 private distribution centres for selected vaccinated month-old chicks reproducing/brooding chicken	7,508	7,508	15,015	15,015	15,015	60,060	Public–20% Private–80%
4	Extension							
	Reduce reproductive wastage of brooding hens using artificial incubation (10,000 incubators/year)	22,000	26,400	33,000	35,200	37,400	154,000	Public–30% Private–70%

No.	Investment interventions	Investment cost (TZS million)					Total	Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22		
	Reduce reproductive wastage of brooding hens using chicken brooder box (10,000 hay brooding box/year)	8,800	9,900	11,000	12,100	13,200	55,000	Public–20% Private–80%
	Support the Livestock Training Agency and private institutions to implement farmers' skills and training programs on commercial livestock production	3,696	3,696	3,696	3,696	3,696	18,480	Public–50% Private–50%
	Promotion of exotic chicken meat and eggs consumption	220	440	1,100	1,320	1,760	4,840	Public–60% Private–40%
5	Marketing and value chain							
	Establishment of chicken abattoirs and cold storage for eggs and chicken meat			6,325		6,600	12,925	Public–10% Private–90%
6	Policy, planning and monitoring and evaluation							
	Building capacity of MLF, local government authorities (LGAs), and livestock keepers on record keeping, data management and dissemination ⁺	1,210	1,320	1,430	1,540	1,786	7,286	Public–80% Private–20%
	Total investment	121,644	134,404	162,206	163,031	172,187	753,361	Public–26% Private–74%

*Represents government and NGO funds. NGO funds assumed to feed to the achievement of the national government/public goals

+This investment serves across all commodities

Annex 4: Five-year pig/pork production improvement investment costs (2017/18–2021/22)

No.	Type of investment	Investment cost (TZS million)					Total (TZS million)	Budget source
		2017	2018	2019	2020	2021		
1	Animal feeding							
	Strengthen capacity of 150 private small-scale pig feed mills/processors to compound and distribute feeds to farmers	290	290	290	290	290	1,450	Public–35% Private–65%
	Strengthen capacity of public sector to regulate, and assist 30 private feed and meat processors to prepare own hazard analysis and critical control points (HACCP)	-	54	52	-	48	154	Public–100%
2	Animal health							
	Strengthen disease surveillance at the central veterinary laboratory and the zonal veterinary centres (procure capital laboratory equipment)	280	270	250	220	180	1,200	Public–45% Private–55%
	Train staff on novel lab technologies and methods to test blood/organ samples for early diagnosis of key pig diseases especially African swine fever	36	36	36	36	36	180	Public–30% Private–70%
	Strengthen veterinary laboratories capacity: procure in-line and offline feed quality analyser equipment to check hazards, nutrient level, and residues.	28	28	28	28	28	140	Public–100%
	Procure equipment to check/validate feed intoxication and biological contamination	42	30	-	-	-	72	Public–100%
	Build lab staff capacity on residues validation testing procedures/methodology	-	115	115	115	115	460	Public–100%
	Build capacity of meat inspectors in 100 local government authorities (LGAs) for safe meat marketing	380	-	370	-	350	1,100	Public–40% Private–60%
	Equip pig abattoirs and PPEs for pig meat inspectors	352	-	352	-	352	1,056	Public–35% Private–65%
	Strengthen biosafety facilities and plans of 300 pig farms to control pig diseases	960	1,200	1,200	1,080	840	5,280	Public–35% Public-private partnerships–65%
	Build capacity of 100 LGAs for cost-effective pig disease surveillance and control strategies	1,650	1,650	1,650	1,650	1,650	8,250	Public–15% Public-private partnerships–85%
	Strengthen biosafety infrastructures in 300 pig farms in 100 LGAs and national biosafety services	132	132	132	132	132	660	Public–45% Private–55%

No.	Type of investment	Investment cost (TZS million)					Total (TZS million)	Budget source
		2017	2018	2019	2020	2021		
	Facilitate pig identification, registration and traceability	560	480	440	400	320	2,200	Public–5% Public-private partnerships–95%
	Build staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives	220	180	150	-	-	550	Public–35% Private–65%
3	Animal breeding and genetics							
	Import 4,000 tropically adapted productive pig sow breeds for breeding	-	2,420	1,980	-	-	4,400	Public–50% Private–50%
	Import adaptable tropical productive 230 pig boar breeds for breeding	-	330	330	-	-	660	Public–45% Private–55%
	Facilitate establishment of 10 private pig breeding and multiplication farms	58	58	58	58	-	232	Public–15% Public-private partnerships–85%
	Facilitate establishment of 10 public pig breeding and multiplication farms	102	102	102	102	-	408	Public–100%
4	Research activities							
	Develop capacity to control African swine fever virus and transform the pig industry							
	Identify risk factors for spread of African swine fever, including the role of wild pigs-argasidae-tick interactions in high risk areas	30	30	-	-	-	60	Public–100%
	Field test the efficacy of novel African swine fever virus diagnostic tests (lateral flow device (LFD) for early detection of virus antigen and ELISA to detect IgM for the virus	30	-	-	-	-	30	Public–100%
	Modelling cost-effective measures for prevention and control of African swine fever	-	22	-	-	-	22	Public–100%
	Improve control and preparedness of pig farmers, vets and public agencies for African swine fever	1,800	1,760	1,540	1,500	1,320	7,920	Public–100%
	Diagnostic study on swine producers' associations (SPAs) managerial, financial and organizational needs and planning to achieve operational efficiency	-	-	33	-	-	33	Public–100%
5	Extension services							
	Build capacity of 300 swine producer associations (SPAs)							
	Establish 300 SPAs in potential areas	456	456	456	456	456	2,280	Public–20% Private–80%
	Build capacity for 300 SPAs to revitalize and innovate to address production, trade and development limitations	10	10	10	10	10	50	Public–10% Private–90%
	Build SPAs capacity to manage pig meat value chain (processing, marketing)	20	20	20	20	20	100	Public–25% Private–75%
	Leadership capacity to manage pig farmers' savings and cooperative societies () production and marketing	54	37	48	37	54	230	Public–30% Private–70%
	Build hands-on-capacity to manage pig farm enterprise costs, manure processing and pig industry sustainability	55	55	55	55	55	275	Public–30% Private–70%
6	Commercial production, marketing and value addition							
	Expand and upgrade the capacity of 50 large-scale specialized investors' pig farms	1,200	-	1,000	-	-	2,200	Public–5% Private–95%
	Establish 50 new commercial specialized pig farms for commercial pig production	-	2,100	2,300	-	-	4,400	Public–5% Private–95%
	Improve capacity of government staff to backstop 30 meat processors and 30 feed processors implement their own HACCP	380	-	370	-	350	1,100	Public–40% Private–60%

No.	Type of investment	Investment cost (TZS million)					Total (TZS million)	Budget source
		2017	2018	2019	2020	2021		
	Construct pig marketing centres with slaughter facilities in 100 pilot LGAs	-	-	3,200	2,880	2,720	8,800	Public–10% Private–90%
	Construct mechanized pig slaughters, processing plant, with cold-storage for marketing of chilled pig meat to domestic and exports markets	-	-	2,112	2,112	1,056	5280	Public–5% Private–995%
7	Monitoring and evaluation							
	Institutionalize pig database and capacity for program and monitoring		2,000	3,000	4,000	600	9,600	
	Bi-annual evaluation of the transformational development in the pig industry	150	150	160	130	130	720	
	Support to program coordination and asset management		400	400	450	400	1,650	
	Total investment	9,275	14,415	22,239	15,761	11,512	73,202	Public–22% Private–78%

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