UNITED REPUBLIC OF TANZANIA

MINISTRY OF AGRICULTURE, LIVESTOCK AND FISHERIES.

TANZANIA LIVESTOCK MASTER PLAN

APRIL, 2017

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Acknowledgements

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To efficiently implement the initiative, I call upon every one of us to be focused, transparent, accountable and innovative in implementing the activities as outlined in this initiative. I wish, therefore, to urge all

government staffs, private and other stakeholders to fully commit themselves to the implementation of the Initiative for the benefit of the people of the United Republic of Tanzania.

Hon. Dr. Charles John Tizeba (MP)

MINISTER FOR AGRICULTURE LIVESTOCK AND FISHERIES

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Tanzania livestock master plan, 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. It has been 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 at 2.6% is low. This growth largely reflects increases in livestock numbers, rather than productivity gains. The absence of clear roadmaps to develop the livestock sector has persistently hindered successful implementation of these previous investment plans. Severely constrained by low livestock reproductive rates, high mortality and high disease prevalence, detailed inter-disciplinary analysis revealed the potential benefits of a comprehensive livestock master plan (LMP) for Tanzania.

The LMP sets out the investment interventions—better genetics, feed and health services, which, together with complementary policy support—which could help meet the ASDP II targets by improving productivity and total production in the key livestock value chains for poultry, pork, red meat-milk, and dairy cows. 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 livestock keepers in increasing their incomes and on urban consumers through lower animal product prices. The success of the LMP is critical to the achievement of food and nutrition security at household, sectorial and national levels.

Beyond this impact on rural people, the anticipated transformation of the livestock sector has the potential to impact positively on urban consumers through lower animal product prices. The success of the LMP is critical to the achievement of food and nutrition security at household, sectorial and national levels.

Development of the LMP

Using the most recently available data, from 2013 to 2015, the Ministry of Agriculture, Livestock and Fisheries (MALF), supported by the International Livestock research Institute (ILRI) and by the Bill & Melinda Gates Foundation, employed the Livestock Sector Investment and Policy Toolkit (LSIPT) to develop herd and sector models and a baseline assessment of the current state of agricultural development in Tanzania. This 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). The LSA results then formed the basis for the development of the Livestock Master Plan 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 MALF, were tested in accordance national development objectives. The criteria used to assess the investment interventions were to:

- Reduce poverty
- Achieve food security
- Contribute to economic growth
- Contribute to exports
- Contribute to industrialization

Using measurable economic or environmental indicators for the above objectives, four key livestock value chains—live animals and red meat and milk (from indigenous cattle, sheep, and goats), dairy with crossbred cows, and chicken and pigs—were identified in the LSA as producing the greatest productivity increases contributing to national economic development objectives and the long-run development of the sector. The LMP, moreover, 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 four major production typology zones of Tanzania: central; coastal and lake; highlands; and commercial specialized dairy. The rigorous ex-ante technical and financial analysis conducted of alternative intervention options (investment scenarios) carried out by MALF is thus a guide to the choice and prioritization of public and private investments with the highest payoffs for livestock sector transformation.

LSA LMP Commodity Value Chains: Tanzania

Based on results of the LSA analysis, to reach the objectives and goals of the GOT, the key VCs targeted in the LMP roadmaps are:

1. Red meat (and milk) from cattle, sheep, and goats
   - Improved traditional red meat-milk
   - Ranches
   - Specialised 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

Crossbred dairy cow development

The projected increase in national cow milk production as a result of the proposed interventions—including artificial insemination and synchronization, combined with improved feed and health interventions, value addition and complementary policy changes—during the ASDP II period (2017–2022) is 77% a surplus of 1002 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%. 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 UHT to raise foreign exchange earnings. 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%.

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 742,524 tonnes between 2017 and 2022. This would not, however, 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.

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 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.

Poultry development

Successful poultry interventions would allow the sub-sector to move to improved family poultry with semi-scavenging crossbreds 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, as well as increasing the contribution of poultry to GDP by 182%, from TZS 256 billion to 723 billion and substantial contributing 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 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. With assistance of policies encouraging large 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 be exported to generate foreign exchange earnings.

Pigs/Pork 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 22,025 to 37,191 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 significant 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 to 80 billion between 2017 and 2022. This would bring the production-consumption deficit for pork meat from 8000 tonnes to a 1350 tonne surplus between 2017 and 2022.

Improving pork meat requires a focus on upon controlling African swine fever pigs, 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 pork 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, while enabling an increase in exports and foreign exchange earnings.

Meat production-consumption balance

Perhaps most importantly, the growth of the poultry and pig sub-sectors would enable Tanzania to close the projected total national meat production-consumption gap. This would also make it possible to increase the share of white meat to total meat consumption from the current 9–41% by 2032, but only if chicken is substituted for red meat. Taking advantage of the benefits of the potential poultry revolution would thus 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 put downward pressure on domestic meat prices and enable an increase in the export of live animals (of cattle, sheep, and goat), potentially raising foreign exchange earnings.

Priority investment and complementary policy interventions

The huge deficit in projected demand (without investments) for red meat is being driven by high human population and income growth. Limited access to land for improving feed production, including on grazing lands, and the low genetic potential of local breeds of cattle and small ruminants are main constraints to increased red meat production. That said 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 much due to outbreaks of African swine fever and a lack of demand in the country.

Conclusions

Key take-away 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 promotion to change consumer preferences for red meat, especially beef and goat meat
- The projected gap in milk demanded could be closed and a surplus produced through AI and 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 very serious existing feed deficit
- Red meat production cannot be 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 be help much in closing the meat gap due to their low numbers, in addition to limited 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 are needed to generate higher incomes and animal productivity, and to lead to the achievement of national development objectives: improved genetics, health and feed. 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 synchronization, feed and health interventions addressing young and adult stock mortality (YASM) to help facilitate a surplus in milk demanded;
- Targeting animal health interventions for young and adult stock mortality (vaccinations, parasite control) ensuring improved productivity, thereby increasing animal and product off take of meat and dairy;
- Prioritizing beef production from on-farm fattening and commercial feedlots as a way of reducing the red meat deficit;
- 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 very serious existing feed deficit
- Improving the quality and quantity of livestock feed resources through introducing improved forage crops and improved animal feed management practices, feed production on irrigated land, as well as increased access to existing lands appropriate for grazing;

Complementary policy interventions

- Animal health services need to expand dramatically, especially in remote areas where pastoralists predominate, and PPPs should be tried where private investments are too risky and the returns are too low;
- Undertaking investments in promotional activities to change tastes and preferences from beef to white meat, especially chicken;
- Prioritizing investments in genetic improvement by focusing on crossbreds and exotic chicken 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 for meat and milk production;
- Promoting land leasing, including land under irrigation, for animal and feed production and providing of tax incentives and subsidized leasing rates to private entrepreneurs;
- Promoting exports to more remunerative markets in the region through the introduction of a practical and affordable system of animal ID and traceability, as well as food safety and animal health programs through the monitoring of abattoirs and disease surveillance;
- Promoting substantial private investment in livestock product transformation through high value-added processing; and
- Improving the enabling environment for agribusiness investment through the streamlining of regulations and procedures in order to attract and maintain substantial levels of private investment.

Introduction

Tanzania livestock master plan and livestock sector analysis

The Tanzania livestock master plan was developed by a joint team from the Tanzanian Ministry of Agriculture, Livestock and Fisheries (MALF) and the International Livestock Research Institute (ILRI). Its development was overseen by a high-level technical advisory committee (TAC) convened under the auspices of the MALF Livestock Permanent Secretary, Dr. Maria Mashingo, and chaired by Catherine Dangat, the Director for Policy and Planning. The TAC was comprised of the directors of key MALF livestock-related departments and other government agencies, and representatives from the private sector, civil society organizations and development partner agencies.

Data collection and quantitative diagnostics were 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 developed by the World Bank, Agricultural Research Centre for International Development (CIRAD) and the Food and Agriculture Organization of the United Nations working under the auspices of the African Union Inter-African Bureau for Animal Resources.

The LMP is a series of five-year development plans or roadmaps for the key livestock VCs and production systems within each VC, chosen based on GoT priority development objectives. 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 (Gantt charts).

The LMP is based on a 15-year sectorial analysis (2016/7-2031/32) that informs the development of the plan. The elaboration of 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, VCs, the livestock sub-sector, the agricultural sector, and the national economy. A set of quantitative tools from the Livestock Sector Investment and Policy Toolkit (LSIPT) were used to carry out the sector analysis. This toolkit was developed by a group of international agencies[1] under the aegis of ALive at AU-IBAR. 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 the ownership by all relevant livestock sector stakeholders.

[1] CIRAD (France), FAO and the World Bank were the main contributors.

With technical backup support from international and local research organizations, these roadmaps are meant to be implemented by the MALF, together with other GoT ministries and agencies, at both federal 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 (LSA)

Introduction

Using the most recently available and reliable data, and the Livestock Sector Investment and Policy Toolkit (LSIPT)[2], the Ministry of Agriculture, Livestock and Fisheries (MALF), backstopped by the International Livestock research Institute (ILRI), and supported by the Bill & Melinda Gates Foundation, developed a herd and livestock sector model and then carried out an assessment of the current state of the sector (for 2016/17) and the long-term potential for livestock development in Tanzania over 15-years (a Livestock Sector Analysis (LSA)).

The results of this LSA guided in turn the preparation of Livestock Master Plan (LMP) which is a series of five-year investment implementation plans or 'roadmaps', to be used to help implement the present larger national program of Tanzania, the Agricultural Sector Development Program II (ASDP II) starting in 2017. The LMP is also meant to help realize the various existing strategies and policies of Tanzania, namely the: Tanzania Development Vision 2025, Five Year Development Plan (2016/2017 -2021/2022), MKUKUTA II, National Livestock Policy 2006, Agricultural Sector Development Strategy II (ASDS II) and Livestock Sector Development Strategy (2010).

The baseline analysis of the Livestock Sector Analysis (LSA) shows that 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 5.0 million sheep. Other livestock include 2.0 million pigs, 33.3 million local chicken and 15.6 million improved chicken (as also reported in the MALF Budget Speech, 2016/17). **Goat meat and mutton currently accounting 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 Short Horn Zebu (TSHZ) characterized by small size mature body weight (200-350 kg.); Long Horn Cattle (LHC) such as

[2] This toolkit was developed by a group of international agencies under the aegis of ALive at AU-IBAR. CIRAD (The International Agricultural Research Center of France), FAO and the World Bank were the main contributors.

the Ankole breed characterized by large matured body weight (500-730 kg); and the Boran breed featured with large body weight (500-800 kg).

The country has many other outstanding natural resources to support livestock development which include: 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 the productivity and production potential of these animal resources can be sufficiently improved to provide adequate levels of animal source foods (ASFs) needed to feed the rapidly growing population, with its rapidly increasing income and growing demand for ASFs. Presently, livestock activities contribute only 7.4% to the country's GDP and the annualized growth rate of the sector is low at 2.6% per annum. 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 (Tanzania Livestock Modernization Initiatives - TLMI, 2015).

The widely accepted baseline results for the sector, and the LSA investment scenario results shared below pointing to high returns to investment in livestock, show there is a need to strategically increase investments in the 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 MALF under the LSA on productivity enhancing technology interventions, combined with better policies, the following present 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 indigenous cattle, sheep, and goats), dairy with crossbred cows, and chicken 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 MALF 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 priority technology interventions identified include:

- Improving the quality and quantity of livestock feed resources through 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, both cross-breeding and introduction of 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 young and adult stock mortality (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 livestock sector is very attractive and has significant impact on household incomes (See: Table 1) and nutritional security, as well as the national economy. For all species and commodity value chains, the Internal Rate of Returns (IRRs) obtained were 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 in 2031, the with-additional investment intervention

resulted in an increase of GDP which varied from 8% for cattle ranch in Central Zone to 1187% for cattle fattening.

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

		Increase in GDP contribution from additional investments in livestock by 2031 by production system and zone		% change in Nutrition contribution	
Value chain and production zone	Internal Rate of Return (IRR%)	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 -Large scale (Central)	18%			10%	49%
Ranch cattle (Central)	39%	87%	8%	NA	NA
Improved traditional cattle - Small scale (Coastal & Lake -- C&L)	77%			5%	15%
Improved traditional cattle medium -large scale (C&L)	58%			35%	105%
Ranch cattle (Coastal and Lake)	6.6%	131%	57%		
Improved traditional cattle - Small scale (Highland)	18%			2%	5%
Improved traditional cattle - Large scale (Highland)	15%				25%
Ranch cattle (Highland)	73%	196%	48%	NA	NA
Urban and peri-urban dairy cattle small scale (all zones)	35%			27%	42%
Urban and peri-urban dairy cattle medium-large scale (all zones)	73%	1748	958%	14%	114%
Cattle fattening (all zones)	72%	4696%	1187%	NA	NA
Improved traditional pigs small scale (all zones)	86%			3%	1%
Improved traditional pigs medium-large scale (all zones)	17%			8%	5%
Specialized pig operation (all zones)	22%	651%	165%	1%	2%

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 the specialized pig operation 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-large scale cattle (C&L) is modest in ROI, 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- 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

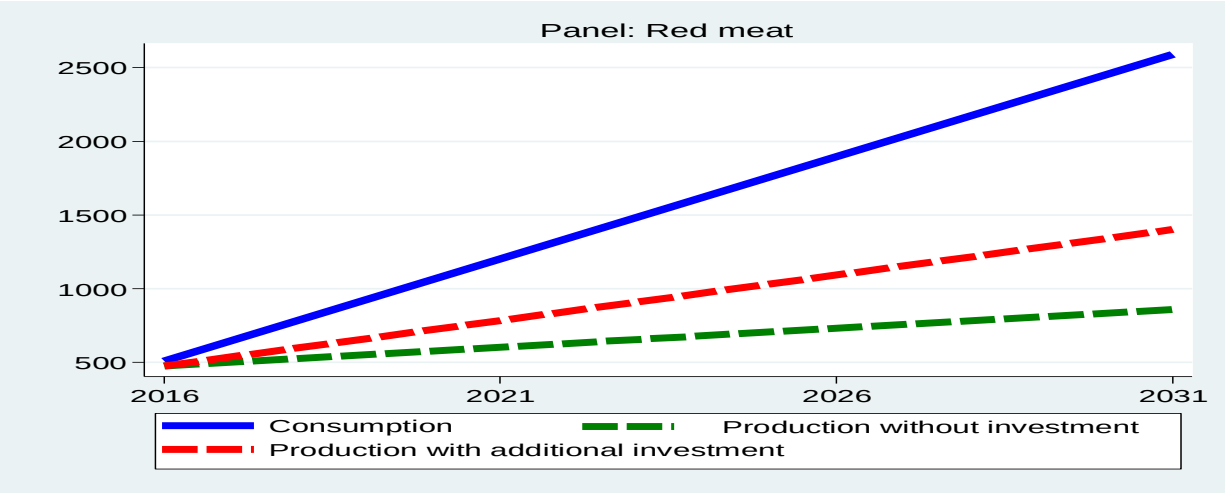
Without additional investments in the sector the projected red meat production-consumption gap in 15 years (by 2031/32) is estimated to be 1.7 million tonnes, driven by existing poor animal genetics, health, and feed constraints. Moreover, the scenario analysis with the current level of dairy investments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

The key results and conclusions of the "with additional investment" scenario analysis in the LSA for each priority livestock value chain are the following:

Red meat

Due to 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-long term (15 years) mean the red meat production shortage will not likely be closed in the same 15 year period (See: Figure 1). Moreover, even with increased red meat from ruminants, supplies will not help much to close the projected "all-meat" production-consumption gap. Beef is the dominant component of 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 production while goat meat and sheep meat accounted for 14% and 4%, respectively. The projected production-consumption (P-C) 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%) without additional investment and 82% % with additional investment.

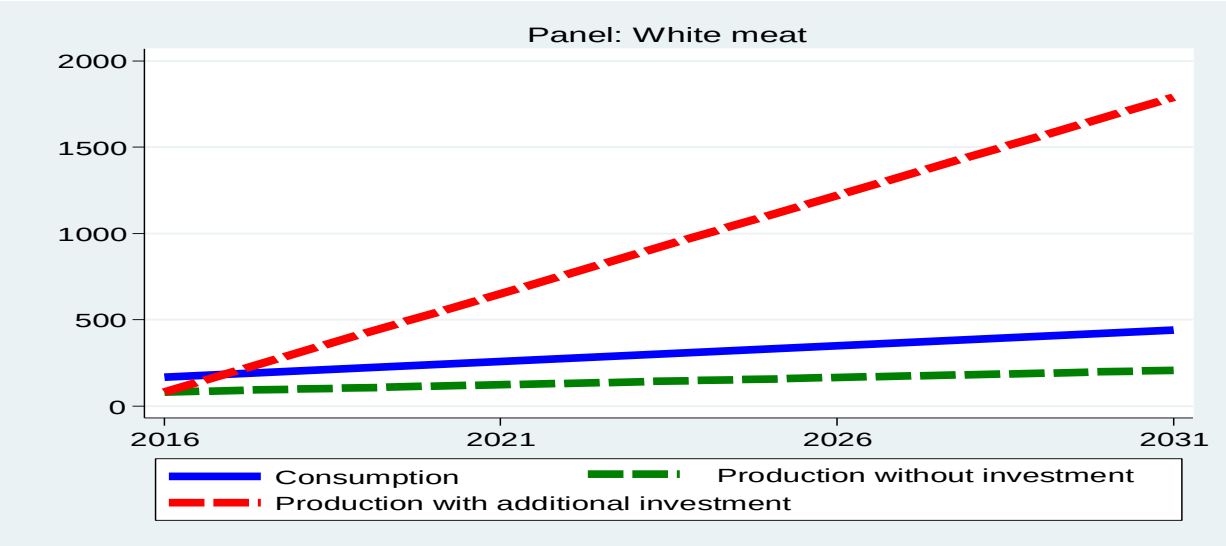
Figure 1: Production-consumption balance for red meat with and without additional investments for Tanzania, 2016/7-2031/32



White meat

Improving "white meat" requires a focus on controlling New Castel (ND) and African Swine Fever (ASF) disease in chicken and pigs, respectively to increase their productivity and thus 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, thus resulting in a total all meat deficit of 2.0 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. Moreover, improving and increasing pork meat production to help close the projected all-meat consumption gap projected in 15 years would require a focus on preventing and controlling African swine fever, to increase pig productivity and pork production.

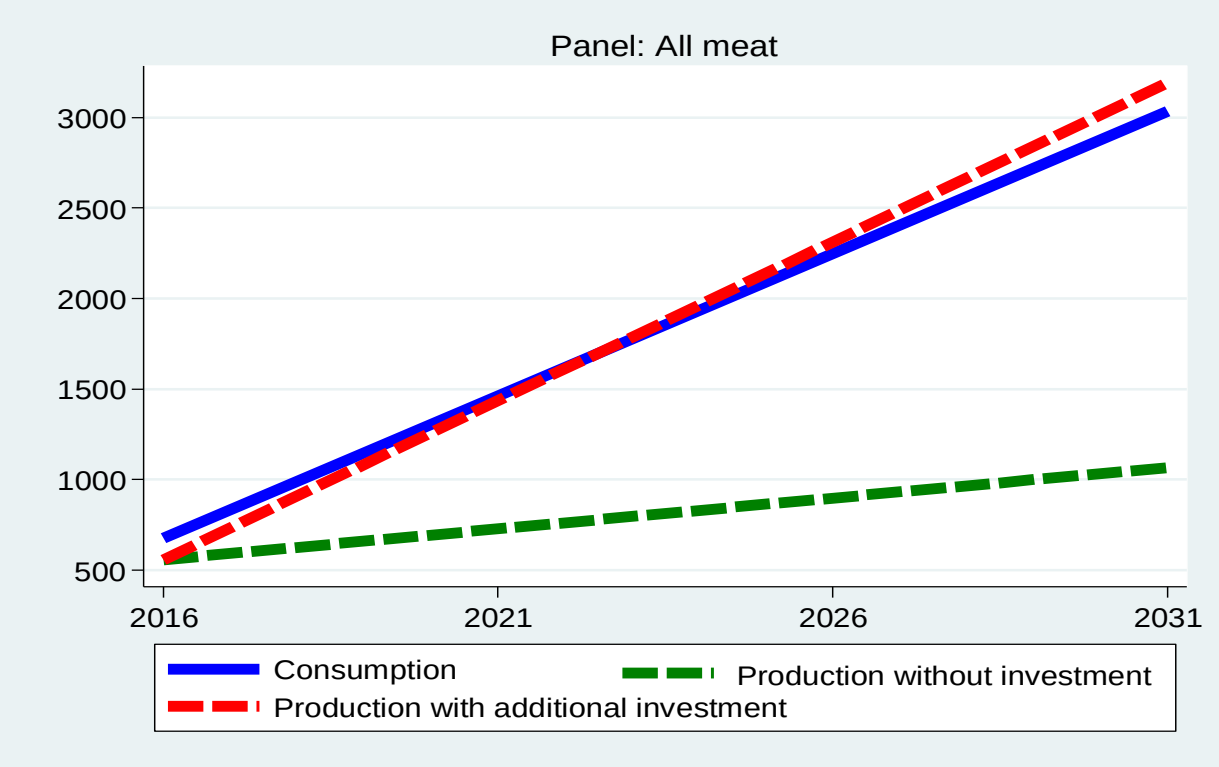
Figure 2: Production-consumption balance for white meat with and without additional investments for Tanzania, 2016-2031



All meat:

The projected all meat production "with additional" combined investment in the livestock sector is estimated at 3.2 million metric tons 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 tons which represents a potentially exportable quantity of primarily beef, but perhaps other ruminant meats (goat meat and mutton) to surrounding countries, and even surplus chicken and eggs.

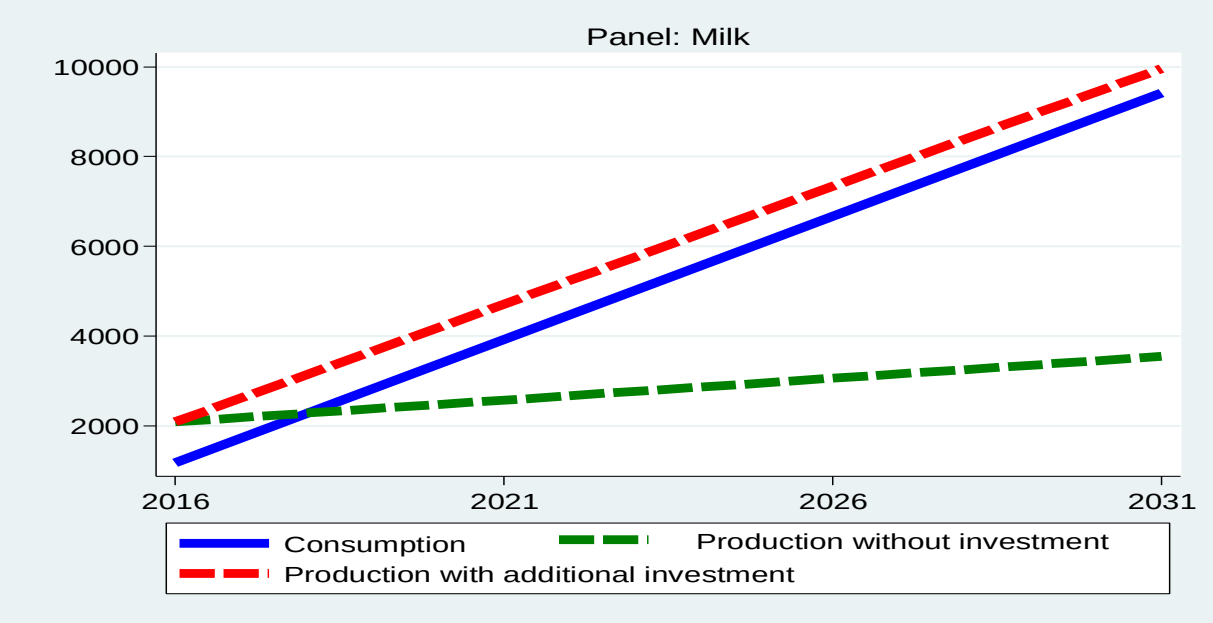
Figure 3: Production-consumption balance for all meat with and without additional investments for Tanzania, 2016-2031



Dairy (with cows):

The scenario analysis with the current dairy investment level shows that there would be a production-consumption gap of 5.4 million liters in 15 years (Figure 4). The scenario analysis for additional dairy investments (the "with-case" scenario) shows the gap in projected milk consumption can be closed and a surplus produced through Artificial Insemination (AI) and 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 liters 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



Tanzania LSA main results and conclusions

- Significantly increasing poultry production and consumption are the keys to achieving greater household and national food security for animal source foods (ASFs)
- The projected gap in milk demanded could be closed and a surplus produced through AI and synchronization for breed improvement, combined with feed and health interventions addressing young and adult stock mortality (YASM)
- Livestock genetic improvement priorities are thus dairy crossbreds and exotic chicken pure breeds for both family and largescale 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. Access to land appropriate for grazing, and land for feed production, needs to be addressed to overcome the very serious existing feed deficit
- Land allocation and ownership policy need to change to favor the investments required to increase feed for meat and milk production
- The policy priority is 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 very high human population and urbanization growth, as well as rapid income growth

- Emphasis to improve cattle offtake and beef production needs to be put on increasing beef production from on-farm fattening and commercial feedlots
- Red meat production cannot be 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
- Animal health services need to expand dramatically, especially in remote areas where pastoralists predominate, and PPPs should be tried where private investments are too risky and the returns are too low
- Small ruminants cannot be expected to help much to close the meat gap also due to their low numbers, in addition to limited feed resources and low genetic potential of indigenous breeds
- Pork is prone to African Swine Fever and its demand is limited, hence it cannot be a priority solution for closing the meat gap
- Investment in chicken has the most potential to close the 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 promotion to change consumer preferences for red meat, especially beef and goat meat

Finally, based on results of the LSA analysis, the key VCs targeted in the LMP roadmaps are:

1. Red meat (and milk) from cattle, sheep, goats and camels

- Improved traditional red meat-milk (ITMM) systems in all production zones (MRS, MRD and LG)
- SP cattle feedlots

2. Poultry

- IFP in all production zones
- SP poultry – broilers and layers

3. Cow dairy

- IFD systems in MRS
- SP dairy

Dairy Development Roadmap (2017/18 – 2021/22)

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

Vision

Increased milk production meets the domestic demand for milk and the surplus is exported by increasing dairy cow productivity through improvements in dairy cow genetics, health and nutrition and by expanding dairy cow herd and improving the processing and marketing of dairy products.

Overall Target

- The number of crossbreed 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 crossbreed cattle by production zone in Tanzania

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

- The production of milk at national level will increase from 2,159 million liters in the base year to 3,816 million liter in 2021/22, an increase of about 77% over 5 years. Though most of the change in the national milk production is expected to come from improvement and increased production by dairy cows, red meat improvement of cattle will also contribute to the increase in milk production (the next section).

Table 3: Current and projected milk production in Tanzania

Livestock production zone	National and production system milk production (1,000 liter)						% 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%**

- 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 IFD sub-system and a 26% increase in commercial specialized dairy (CSD). The national average annualized milk production of a cow will increase form 179 liter to 254 liter over five years (2016/17 – 2021/22).

Table 4: Annualized milk productivity of cows in traditional and IFD and CSD sub-systems

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

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

Table 5: GDP contribution of milk at national level

	GDP contribution by commodity (Million TZS)						% Change
Livestock product	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%

Dairy production sub-systems and target production sub-systems for cow dairy improvement intervention

The dairy production system in Tanzania can be divided into three major categories, traditional cow meat-milk, improved family dairy (IFD) and commercial specialized dairy (CSD) sub-systems (Arend Jan Nell, *et al.* 2014). The traditional cow meat-milk production sub-system doesn't specialized on a single commodity and both milk and meat are important products. However, milk is a priority commodity in IFD and CSD. Both IFD and CSD sub-systems use crossbred/pure temperate dairy breeds like Holstein, Jersey and Ayrshire in the production and the sub-systems differ mainly on the level of intensification and specialization (Arend Jan Nell, *et al.* 2014).

In the IFD sub-system the level of input used by farmers is lower compared to the CSD sub-system and the input level depends on marketing opportunity and income from the milk. Cattle are kept under semi and zero grazing system with cultivated fodder, crop-residue and grass cut from communal land. Milk outlet is mainly depending up on direct marketing of milk to the consumer and milk collection centers.

The CSD sub-system on the other hand is more commercialized and specialized dairy system with higher input and output. For further understanding of the sub-system, it is divided into small and medium farms, based on the herd size. Small CSD farms have smaller herd size starting from 2-3 cows, keeping crossbred cattle without mixing with indigenous cattle. The sub-system has similarities with the IFD sub-system but uses high level of inputs; especially for feed and animal health.

Farmers in the medium CSD sub-system own larger size of cattle, greater than hundred with a national average of 450 animals. These farms are government or privately owned farms with their own input delivery system. The milk produced in these farms directly go to milk processing plants or processed within.

Table 6: Dairy production sub-systems in Tanzania

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

The improvement of the cow dairy system in Tanzania targeted at improving and expanding the IFD (in coastal and lake and highland zones) and CSD sub-system (in all over the country). Many of the challenges, opportunities, interventions, improvement assumptions and investments are shared between the two sub-systems, however, attempt is made to present them separately for each IFD and CSD sub-systems.

Improved Family Dairy (IFD) Production in Coastal and Lake (C&L) and Highlands (Hi)

Key challenges and strategies related to IFD:

	Key challenges	**Strategies**
1.	**Feed availability and quality**	
	• Erratic supply of feed (both in 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 (unclear land tenure system); • Mineral deficiencies in most of the forage	• 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.	**Low genetic potential of indigenous animals for milk production**	
	• Inadequate and inefficient AI services.	• Providing training, backup support and incentives to livestock farmers to work as AI technicians. • Establishing and strengthening dairy heifer multiplication farms through private, public and private-public joint ventures; • Promoting, expanding, and strengthening privatization of AI, and AI with synchronization services;
3.	**Animal health services**	

	• High calf mortality; • Inefficient animal health services; • Inadequate supply of drugs; • Poor quality control of drugs and supplies; • High prevalence of TBD and Trypanosomosis	• Rationalizing and strengthening the animal health regulatory capacity at the National and Local Government Authorities (LGAs) level under the coordination of the Ministry • Improving availability and quality control of vaccines and drugs
4.	**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 pose threat to zoonosis; and • Limited promotion of dairy-product consumption;	• Promote investment in long shelf life milk products such as UHT and powdered milk production; • 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 of milk traders; • Upscale the on-going school milk feeding programs to promote consumption.
5.	**Policy**	
	• Pricing policies causing disincentives to involve in milk processing industries • Over regulation of the dairy industry resulting to multiple taxes which is	• Introduction of protective trade policy that includes increasing import tariffs or bans and/or subsidies for domestically-produced milk products

	regarded as a burden to investors	to enable competition with imports; • Put in place indicative prices for milk products • Reduce the bureaucracy and facilitate investment in the dairy industry

Interventions to achieve targets

All production zones are expected to benefit from the cow dairy improvement interventions. Expanding and improving the CSD will be implemented in all over the country while expanding and improving the IFD sub-system will target C&L and Hi zones. The major criteria used to select the production zones for IFD sub-systems include feed availability, climatic condition (temperature), and 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 Costal and Lake and Hi 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 C&L zone up to 60% and in Hi zone up to 40% of the feed requirement should be either produced/purchased to keep the crossbreed 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 byproducts)
- Strengthen the existing forage/forage seed/ quality control laboratories

Genetic improvement interventions

- The use of AI with and without synchronization and/or proven bulls for crossbreeding/breeding
- Increase the number of crossbred cattle in the IFD 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 AI centers; and establish a new semen production center.
- Acquire 5 new liquid nitrogen plants

- Training and capacity building for 6,650 AI technicians
- Encourage establishment of bull centers
- Encourage establishment of crossbred heifers multiplication farms
- Purchase and distribution of crossbred heifers for under resources dairying beginners (2,000 every year)
- Sensitize formation of breed societies

Animal health improvement

- ECF vaccination program – vaccination of 300,000 dairy cattle per year
- Implement vaccination campaign of FMD, RVF, CBPP, Brucellosis and ECF/TBDs and perform a routine internal and external parasite control treatments
- Improve the capacity for disease surveillance and diagnosis
- Rehabilitate veterinary centers

Improve marketing and processing of milk and milk products

- Provide incentives and ease the bureaucracy to investors trying to establish milk processing plants
- In addition to small and medium scale pasteurized milk processing plants; promote establishment of high capacity at least 1 UHT and 1 powder milk processing plants
- Promote establishment of and strengthen dairy cooperative/societies in high potential areas through training, sensitization, equipping and facilities
- Encourage/establish milk collection/ chilling centers (cold chain) – establish at least 150 centers
- Strengthen Dairy Board to regulate milk quality – to be established in four milk sheds (Office and laboratory)
- Strengthen the capacity of milk quality and safety control laboratory
- Strength school milk feeding programs to benefit 500,000 childrenin five years – starting from 100,000 children on the base year and adding new 100,000 children every year.

Extension services

- Trainings to livestock keepers and IFD 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

- 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 **7,500** To **15,000** TZS)
- Due to the current shortage of feed, the percent of feed purchased increase to 7% - 15% of the feed requirement of cattle in IFD sub-systems, 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 increase from **0.58** to **0.70** in C&L zone and from 0.60 to 0.70-0.75 in Hi zone
- Mortality rate decrease by 50**%**
- Live weight of cattle increase by 7%- 20% in both C&L and Hi zones
- Lactation length of local breed cattle in C&L and Hi zones increase from 180 to 250 days for small and 270 days for medium IFD crossbreed dairy cattle
- Daily milk production of local breed cattle in C&L and Hi zones increases from the current 1.5 and 2 liters/day, respectively, to 8 liters/day in IFD crossbreed dairy cattle

At national and production zone level, the dairy improvement intervention expected to result in increase of crossbred dairy cattle number and milk production in IFD sub-system

- The number of crossbred dairy cattle in IFD (C&L and Hi) sub-system increases from 532,194 to 2,324,624 in 2021/22 (Table 2)
- The cow dairy improvement intervention in IFD sub-systems of C&L and Hi zones will result in increase of milk production from 1,096 million liters in 2016/17 to 2,062 million liters in 2021/22.

Table 7: Increase in milk production due to the cow dairy improvement in IFD sub-system of Coastal and Lake and Highland zones

Livestock production zone	**Milk production in IFD sub-system of C&L and highland zones (1,000 liter)**						**% 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%
Highland	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%**

Table 8: Change in average daily milk production per cow in coastal and lake and highland zones due to the cow dairy improvement interventions in IFD

Livestock production zone	Average daily milk production per reproductive female (liter)						% 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%
Highland	2.00	2.14	2.30	2.47	2.65	2.84	42%

- Average annualized milk production of a cow in IFD sub-system of C&L zone increases from the 157 liter in 2015/16 to 240 liter in 2020/21
- Average annualized milk production of a cow in IFD sub-system of Hi zone increases from the current 215 liter to 343 liter in 2020/21

Table 9: Annualized milk production of cow in coastal and lake and highland 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%
Highland	215	236	259	285	313	343	59%

Investments

The investments in cow dairy cattle development in the C&L and Hi 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, improve existing feed and forage seed quality control laboratories (equipment and human resource capacity building). This is estimated to cost a total of 44 billion TZS.
- The investment to improve animal health is shared with cattle, sheep and goats as many of the interventions will commonly serve all the three species. Animal health improvement investments will support the vaccination campaign to control and prevent ECF, CBPP, FMD, RVF, and Brucellosis and improve the capacity of veterinary centers, 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 are commonly serving all ruminant species.

- Cattle breed improvement investment is estimated to cost around 52.6 billion TZS for over 5 years. The investment aimed at strengthening existing national and zonal AI centers; and establishing new semen production center, acquire new liquid nitrogen plants, training and capacity building of 6,650 AI technicians, establishment of bull centers, purchase and distribution of crossbred heifers for under resources dairying beginners, establish crossbred heifers multiplication farms
- Investments to improve the capacity of research centers to perform researches on breed improvement, feed, health, marketing and value chain and diary extension services is estimated to add-up to 22 billion TZS.
- Investment to improve milk marketing and processing estimated to cost over 106 billion TZS. Construction of UHT and powder milk processing plants, formation and strengthening of dairy cooperative societies in high potential areas (training, sensitization, equipping and facilities), establish milk collection/ chilling centers (cold chain), strengthen dairy board to regulate milk quality in lake and coastal and Hi zones, strengthen the capacity of milk quality and safety control laboratory and school milk feeding programs assumed to improve marketing and processing of milk.

Table 10: Five year dairy improvement investment (2017/18 – 2021/22)

S/No	Investment Intervention	Investment cost (000,000) TZS						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
1	**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 2 plants (1,100 million TZS 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) – improving the existing (1st five years)	-	440	-	-	-	**440**	Public – 100%
v	Strengthen the existing pasture/forage seed quality control laboratories	880	-	-	-	-	**880**	Public – 100%
	Sub-total	**8,976**	**9,636**	**8,096**	**9,196**	**8,096**	**44,000**	
2	**Animal Health**	-	-	-	-	-	**-**	
i	ECF vaccination Program – vaccination of 300,000 dairy cattle per year	-	-	-	-	-	**-**	Costs mentioned in red meat improvement scenario
ii	Implement programs for eradication of CBPP, FMD, RVF (capacity for surveillance, diagnosis and vaccination campaign)	-	-	-	-	-	**-**	

S/No	Investment Intervention	Investment cost (000,000) TZS						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
iii	Rehabilitate 100 Veterinary centers	-	-	-	-	-	**-**	
3	**Animal Breeding and Genetics Investments**							
i	Strengthen existing National and establish a new semen production center.	2,200	-	11,000	-	-	**13,200**	Public – 100%
ii	Strengthens existing and acquire 2 new liquid nitrogen plants	-	1,100	-	1,100	-	**2,200**	Public
ii	Training and capacity building for 6,650 AI technicians	554	554	554	554	554	**2,772**	Public – 10% Private – 90%
iii	Establishment of bull centers – purchase of 20 proven bulls	198	198	198	198	198	**990**	Private – 50% Public – 50%
iv	Purchase and distribution of crossbred heifers for under resources 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 crossbred heifers multiplication farms – 4 farms	2,750	-	2,750	2,750	2,750	**11,000**	PPP 50%/50%
vii	Sensitize formation of breed societies	440	-	-	-	-	**440**	Public 50% Private 50%
	Sub-total	**10,542**	**6,252**	**18,902**	**9,002**	**7,902**	**52,602**	
4	**Extension**	-	-	-	-	-	**-**	Costs mentioned in red meat improvement scenario
	Strengthening Extension services for dissemination of appropriate livestock technologies	-	-	-	-	-	**-**	
5	**Research**							
	Research on breed improvement, feeds				12,000		**22,000**	Public 100%

S/No	Investment Intervention	Investment cost (000,000) TZS						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	and forage, animal health and value addition of livestock products and by-products;	-	10,000	-		-		
	Sub-total	**-**	**-**	**22,000**	**-**	**-**	**22,000**	
6	**Marketing and Value Addition**	-	-	-	-	-	**-**	
i	Construction of 1 UHT in Coastal and Lake and 1 powder milk processing plant in Highlands	-	11,000	17,600	-	-	**28,600**	PPP 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 milk collection/ chilling centers (cold chain) – Establish 150 centers	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 areas –To be established in four milk sheds (Office and laboratory)	550	-	-	-	-	**550**	Public – 100%
v	Strengthen the capacity of milk quality and safety control laboratory -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**	PPP 50/50
	Sub-total	**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**	

Impacts

Return on Investment (ROI)

- Herd level internal rate of return (IRR) for 15 year investment in IFD systems of small cattle herd size in C&L and Hi zones is 13.7% and 23.1% with a net present value (NPV) of 605,735 and 8,514,420 TZS, respectively.
- Herd level IRR for 15 year investment in IFD systems of medium cattle herd size in C&L and Hi 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 C&L and Hi zones, the production of milk in the zones is expected to increase from 751,923 and 214,885 thousand liters to 1,321,444 and 740,539 thousand liters over five years (2016-2020), respectively. An increase of 76% in C&L and 115% in Hi zones (Table, 7).

GDP

- Mainly due to dairy but also with a small contribution of red meat improvement intervention, the GDP contribution of milk for C&L and Hi zones is expected to increase from 273,437 and 149,567in 2015/16 to 449,468 and 319,269 million TZs in 2019/20, respectively. Resulting the contribution of milk to the national GDP to grow by 64% in C&L and by 113% in Hi zone.

Table 11: Change in GDP contribution of milk in coastal and lake and highland zones

	GDP contribution of milk (Million TZs)						**% Change**
Livestock production zone	**Base year (2016/17)**	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	
Coastal and Lake	**273,437**	**302,053**	**333,664**	**368,584**	**407,157**	**449,768**	**64%**
Highland	**149,567**	**174,061**	**202,565**	**235,737**	**274,342**	**319,269**	**113%**

Additional increase in income from dairy investments

- Dairy improvement intervention in C&L and Hi zones resulted in 5% – 22% increase in income per animal when without and with additional investments are compared (Table 12)

Table 12: Change in income per animal due to dairy improvement interventions in IFD

Production zone/system	**Herd size**	**Income per animal (without additional investment)**	**Income per animal (with additional investment)**	**% Change**
Coastal and lake zone	Small herd	85,021	89,397	5%
	Medium herd	79,121	83,865	6%
Highland zone	Small herd	114,646	132,463	16%
	Medium herd	93,684	114,122	22%

Activities time line and sequencing: Gantt chart

No	Activities	Investment cost (1,000 USD)									
		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
1.	Encourage establishment of new commercial dairy farms										
2.	Encourage establishment of new commercial dairy feed processing plants										
3.	Strengthen existing feed and seed quality control laboratories (equipment and capacity building)										
4.	Strengthen existing National and establish a new semen production center.										
5.	Acquire 2 new liquid nitrogen plants										
6.	Training and capacity building of 6,650 AI technicians										
7.	Establishment of bull centers										
8.	Purchase and distribution of crossbred heifers for under resources dairying beginners (2,000 every year)										
9.	Establish crossbred heifers multiplication farms										
10.	Sensitize formation of breed societies										
11.	Construction and rehabilitation of dip tanks										
12.	Support the vaccination campaign of CBPP, FMD, RVF, PPR, CCPP, and Brucellosis and improve the capacity of veterinary centers, diagnostic laboratories for surveillance and diagnosis										

No	Activities	Investment cost (1,000 USD)									
		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
13.	Strengthening the capacity of existing Livestock training institutes										
14.	Establish and/or strengthen Ward livestock resource centers and provide extension officers with the necessary equipment (toolkit)										
15.	Trainings to livestock keepers and IFD farmers on better husbandry, breed improvement and feeding practices										
16.	Research on breed improvement, feeds and forage, animal health and value addition of livestock products and by-products;										
17.	Encourage construction of UHT and powder milk processing plants										
18.	Formation and strengthening of dairy cooperative (training, sensitization, equipping and facilities)										
19.	Establish milk collection/ chilling centers (cold chain)										
20.	Strengthen Dairy Board to regulate milk quality in highlands, lake and coastal areas –To be established in four milk sheds (Office and laboratory)										
21.	Strengthen the capacity of milk quality and safety control laboratory -TVLA										
22.	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 perform extensive crossbreeding/breeding scheme in selected areas using AI, AI with synchronizing hormone and/or bull of dairy cattle breeds
- Improve the efficiency AI, AI with synchronizing hormone and/or bull crossbreeding/breeding services
- Reduce cumbersome procedures to ease land availability for local and foreign investors
- Encourage establishment of heifer multiplication centers
- Provide continuous training and refreshment courses to AI 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 (CSD) Production

Key challenges and strategies related to Commercial Specialized Dairy

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

	Key challenges	**Strategies**
1.	**Feed availability and quality**	
	• Cumbersome procedures to own 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, powdered milk production, and other value-added products like yogurt, ice cream, cheese, etc.; • Building the capacity of the dairy technology training institute(s).
3.	**Policy and investment support**	
	• Poor milk quality control and enforcement mechanisms; • Commercial specialized dairy farms and milk processing plants are few in number;	• 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), increase the number of crossbred dairy cattle and CSD farms, encouraging privet AI and health service providers and 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

Increase the number of commercial specialized dairy farms

- Provide incentives to investors and ease the bureaucracy to establish commercial specialized dairy farms.
- The number of crossbreed dairy cattle and CSD farms in CSD sub-system are 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 to 400 farms in medium CSD sub-systems (Table 13)

- The number of crossbreed dairy cattle increases from 159,000 in 2015/56 to 420,000 in 2020/21 in small and increases from 250,800 in 2015/16 to 660,000 in 2020/21 in the medium commercial specialized dairy farms

Table 13: Changes in number of crossbreds and dairy farms in commercial specialized dairy sub-system

Livestock production sub-system		**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-CSD	Herd size	5	5	5	5	5	5	0%
	No. of Farms	31,800	37236	43601	51054	59781	70,000	120%
	Number of Crossbreds	**159,000**	**193093**	**234497**	**284779**	**345843**	**420,000**	164%
Medium-CSD	Herd size	450	477	505	535	566	600	33%
	No. of Farms	204	233	267	306	350	400	96%
	Number of Crossbreds	**91,800**	**111254**	**134831**	**163404**	**198033**	**240,000**	161%
Total number of crossbreds in CSD		**250,800**	**304348**	**369330**	**448185**	**543877**	**660,000**	**163%**

Animal health improvement

- Improve availability of drugs, vaccines and medical equipment and support to enhance the private health service providers
    - Improve the availability of FMD, RVF, CBPP,ECF and Brucellosis vaccines

Genetic improvement interventions

- Encourage private AI service providers

Improve marketing and processing of milk and milk products

Interventions proposed to improve marketing and processing of milk and milk products in IFD sub-systems equally works for CSD sub systems also.

Assumptions and Targets

Commercial specialized dairy farmers adopting the cow dairy improvement interventions will have increased cost of feed and veterinary due to increased use of quality feed and veterinary service.

- The percent of feed purchased increases from **10%** to **17%** and **20%** in small and medium CSD sub-systems
- The veterinary cost also increases from **15,000** To **20,000** TZS per year/cattle

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

- Parturition rate increases from **0.70** to **0.75** in small and to **0.80** in medium CSD
- Mortality rate of juveniles decrease from **10%** to **6%** in both small and medium CSD
- Daily milk production increase from **8** to **10** liters in small and **9** to **12** liters in medium CSD

At national level, the dairy improvement intervention expected to result in increase of the number of crossbred dairy cattle and milk production in CSD sub-system

- The number of crossbreed dairy cattle in CSD sub-system increases from 250,800 to 660,000, a 163% increase in five years (Table 13).
- Milk production in CSD sub-system increases from 214,885 thousand liters in 2016/17 to 709,011thousand liters in 2021/22 (Table 3)
- Average annualized milk production of a cow in CSD sub-system is targeted to increases from the current 1,757 liters to 2,207 liters in 2021/22 (Table 4)

Investments

The investment listed for IFD, above, equally works for CSD and the investment will be shared among both IFD and CSD sub-systems

Impacts

Return on Investment (ROI)

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

Milk production

- Due to the dairy improvement interventions in CSD, the production of milk in the sub-system is expected to increase from 214,885 thousand liters to 709,011 thousand liters over five years (2016-2020), an increase in230% (Table, 3).

GDP

- Dairy improvement intervention in the CSD increases the GDP contribution of milk from CSD sub-system from the current 76,678million TZs to 276,130 million TZs, it is a 247% increase in five years (Table, 14)

Table 14: GDP contribution of cow milk production in the CSD sub-system

Livestock production	GDP contribution of milk in CSD sub-system (Million TZs)						% Change
	Base year (2016/17)	2017/18	2018/19	2019/20	2020/21	2021/22	
Commercial specialized	79,678	102,163	130,993	167,959	215,357	276,130	247%

Additional increase in income from dairy investments

- Dairy improvement intervention in CSD system resulted in 30% – 31% increase in income per animal when without and with additional investments are compared (Table 15)

Table 15: Change in income per animal due to dairy improvement interventions in IFD

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%

Activities time line and sequencing: Gantt chart

The Gantt chart presented in the IFD improvement section, above, equally work for both CSD and IFD sub-systems

Complementary intervention and success requirements

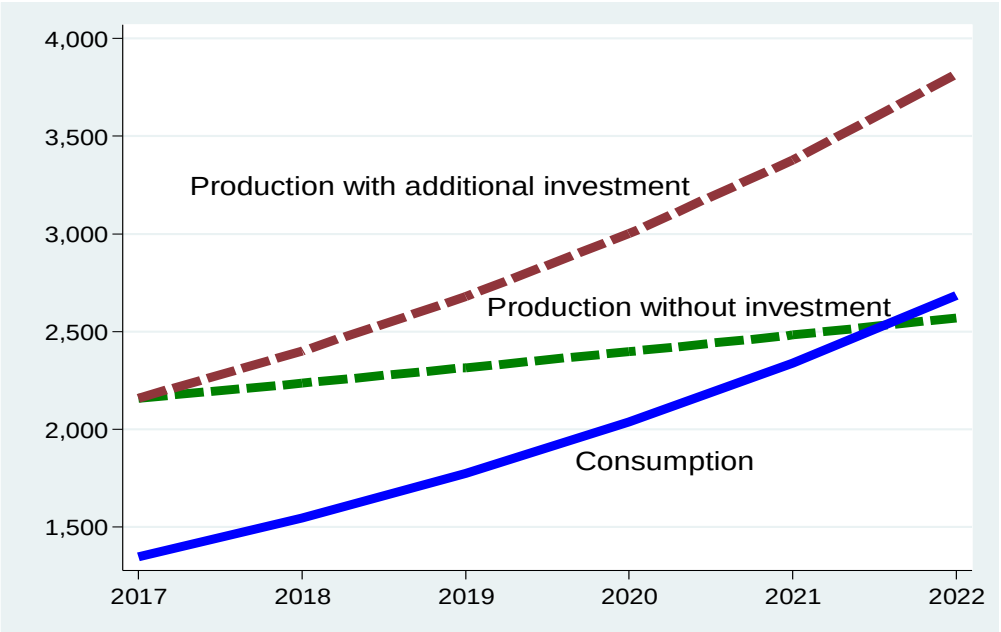
The following are crucial aspects of the dairy improvement interventions and success requirements for CSD sub-system

- Provide incentives to investors and ease the bureaucracy to establish commercial specialized dairy farms.
- Make land accessible for forage production for the commercial specialized dairy farms and forage producers
- Encourage establishment of heifer multiplication centers
- Enforce milk quality standards and support establishment/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 private health and AI service providers

Dairy production and consumption balance

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

Figure 5: Projected cow milk consumption and production with and without investment (in thousand tons), 2017-2022



Conclusions

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

- Raising and realizing the genetic potential of local breeds for significantly higher milk production through crossbreeding with exotic dairy breeds using AI with or without synchronizing hormone and bull, combined with better feed and health services.

Milk production and productivity of 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 represent huge potential to bridge the gap between the national milk consumption and production. The intervention –

mainly targeted in improving animal reproductive and weight gain performance – also affects milk production and productivity significantly in all (Hi, C&L and Cn) typology zones. These are achieved by:

- The improvement of natural grazing (pasture and range) land, coupled with health interventions to reduce mortality.

These combined interventions will result in:

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

This surplus could substitute for imported milk products and be used domestically for new or additional industrial purposes (e.g. in the baking industry) 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 (2017/18 – 2021/22)

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

Introduction

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

Vision

The projected 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 will be increased to generate foreign exchange earnings.

Overall targets

To reach production of 742,000 tonnes of red meat by 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 red meat output are expected to bring the following changes:

- An increase in the area of the grazing/pasture from 10% to 13%
- Promoting allocation and establishment of pasture/fodder productions area from almost 0%, at present, to 5%.
- Increase the parturition rate from 4% to 5%
- Mortality rate reduced to 25% to 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% to 16% for small scale; 10% to 14% in for Medium scale; and from 18-26% in ranches.
- Increase the herd size of ranches by range of 10 to 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 16: Annual increase in number of cattle

Production zone	***2016/17***	***2017/18***	***2018/19***	***2019/20***	***2020/21***	***2021/22***	***% change***
In Traditional cattle system							
Central	13,583,842	14,098,320	14,632,283	15,186,470	15,761,646	16,358,606	20%
Coast and Lake	11,985,328	12,301,694	12,626,411	12,959,700	13,301,786	13,652,901	14%
Highland	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%
In Ranching system							
Central	12,330	12,988	13,682	14,413	15,182	15,993	30%
Coast and Lake	19,297	19,525	19,755	19,988	20,224	20,463	6%
Highland	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[3] 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 total number of cattle in the three production zones shows an increase by 18% (29 to 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).

[3] The number includes culled cattle from the dairy subsector that are sent for fattening at the feedlot operations

Table 17: Annual increase in number of sheep and goats in the traditional system

Production zone	***2016/17***	***2017/18***	***2018/19***	***2019/20***	***2020/21***	***2021/2022***	**% change**
Sheep							
Central	1,976,019	2,050,120	2,127,000	2,206,762	2,289,516	2,375,373	20%
Coast and Lake	2,409,396	2,488,665	2,570,542	2,655,113	2,742,466	2,832,693	18%
Highland	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%
Coast and Lake	7,540,489	8,120,743	8,745,647	9,418,639	10,143,419	10,923,972	45%
Highland	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%

- The total sheep populations 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 in 2016/17 to 24 million in 2021/22)

Table 18: 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%
Coast and Lake	156,875	165,207	173,981	183,222	192,953	203,201	30%
Highland	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%

Table 19: 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%
Coast and Lake	425	505	600	713	847	1,006	136%
Highland	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%

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

Table 20: Percent 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	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	

Table 21: Contribution of Sheep and Goat 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%
Coast and Lake	11,059	11,670	12,314	12,993	13,710	14,467	31%
Highland	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%
Goats							
Central	25,096	27,246	29,579	32,113	34,863	37,849	51%
Coast and Lake	26,373	29,516	33,033	36,970	41,375	46,305	76%
Highland	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%

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

Table 22: Percent contribution of production systems to national red meat production

Production system	***2016/17***	***2017/18***	***2018/19***	***2019/20***	***2020/21***	***2021/2022***	**% change**
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 com. dairy	1.09%	1.24%	1.42%	1.61%	1.81%	2.02%	85.94%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	

Challenges and Strategies

Challenges	Strategies to address challenges
Feed	
▪ Lack of sufficient grazing areas to meet the feed needs of the animals ▪ Poor quality grazing land resources ▪ Inadequate knowledge on the use of crop residues and by-products ▪ Limited availability of concentrates and feed supplements, when needed.	▪ Rehabilitation of rangeland/grazing land; ▪ Acquiring substantial additional area for grazing land, and that of pasture/fodder production. ▪ Training and capacity building and skill development in an increase in the use of crop residues and by products ▪ Increased and better use of agro-industrial by-products from the processing of cereal/grains/oil seeds/sugar cane as concentrates for animal feeding. ▪ Promote appropriate storage and marketing of concentrates and feed supplements
Genetics	
▪ Low genetic improvement extension coverage and; ▪ Poor recording scheme	▪ The challenges of improving the genetic potential of local animals could be overcome through selection within the local breed; establishing community based breeding programs, which include developing a recording scheme; as well as promoting animal identification and traceability scheme.
Animal Health	
▪ Poor animal health extension advice; ▪ Inefficient animal health services; ▪ Inadequate supplies and qualities of vaccines and drugs; and ▪ Poor quality control of drugs and supplies.	▪ Strengthening animal health regulatory capacity under the coordination of the Livestock Sector Ministry
Marketing and processing	
▪ Poor market infrastructure; ▪ Poor technical knowledge of VC actors, especially processing	▪ Strategic capacity building spearheaded by the ASDPII ▪ Building infrastructure.

technicians; ▪ Inadequate market information; and ▪ Poor linkages between producers with processors and export abattoirs.	
Policy	
▪ Absence of breeding policy; ▪ Loss of land to alternative investments outside livestock; ▪ A lack of protective trade policy through appropriate measures.	▪ Developing clearly defined guidelines on land use and access rights, ▪ Implementing appropriate land policies. ▪ Gazetting the grazing land

Interventions to achieve targets[4]

Most of interventions for red meat production are expected to be done in Central, Coastal and Lake Production Zone; the interventions in these zones do not involve A.I; 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, over sowing 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; anti-parasitic control/treatment; and vaccinations;
- Breed improvement through better selection and management of male breeding animals;
- Much needed 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 Highland zone, the following interventions will be done:

- Breed improvement, involving AI with semen of exotic breed primarily for dairy development however, the culled dairy cattle will be channelled to beef production;
- Breed management improvement through the implementation of a herd/flock recording scheme;

[4] The detailed red meat interventions for all production are presented in the LSA report.

- 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);
- Over-sowing and rotational grazing.

Investments

- The time horizon for the project is 5 years.
- Total investment budget is estimated at 342,240 million Tanzania Shillings where by 56% of the budget source is public. Private and Private-Public-Partnership will provide 43% and 1% of the total budget respectively (Table 23) to be spent over the five years plan of the project.
- For all scenarios the annual discount rate assumed is 10%, which is the assumed current social opportunity cost of capital in Tanzania

Table 23**:** Total investment and recurrent costs red meat production

Investment category	**Responsible actor (000 000 TZS)**			**Total investment cost (000 000 TZS)**
	Public	**Private**	**ppp**	
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	5817	4300	57,530
Total investment	191,177	146,763	4300	342,240

Thirty six per cent of investment budget will cater for animal breeding and genetics; however 75% this budget will be sourced from the private sector (Table 24). Most of the public fund (60%) will be used in animal feeding and health interventions. The PPP will only suffice some budget for Market and value addition which generally has the big proportion of the public fund.

Table 24: The percent contribution of Public and private investments for red meat production

Key investment area	Proportion by responsible actor			Proportions by key investment area
	Public	Private	PPP	
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%

About 46% of the investment budget will be allocated to the central production zone. Coast and Lake Zone will use 42% of the investment budget the remaining portion will be used in the highland zone.

In the central zone

- The time horizon for the project is 5 years.
- The investment cost is estimated at 156 billion Tanzania Shillings (see table 25, 26 and 27 for the central, coast and lake production zone; and the highlands) to be spent over the five years plan of the project, covering the animal feeding, animal health, breeding, research, extension services, marketing and value addition.
- For all scenarios the annual discount rate assumed is 10%, which is the assumed current social opportunity cost of capital in Tanzania.

Table 25: Investment cost in the central production zone

Key intervention for investment	**Cost (in million TZS)**	**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%

Key intervention for investment	**Cost (in million TZS)**	**Proportion**
Marketing and value addition	26,590	17%
	156,409	100%

Coast and Lake Zone

Similar to the central zone, table 26 shows the investment in Coast and Lake Zone with a total of over 142 Billion Tanzania Shillings.

Table 26: Investment cost in Coast and Lake production zone

Key intervention for investment	Cost (in million TZS)	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%
	145,147	100%

Highland zone

There is very minimal investment for red meat in the highland production zone. Major intervention for the highland 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 27.

Table 27: Investment cost in Highland production zone

Key intervention for investment	**Cost (in million TZS)**	**Proportion**
Animal feeding	10,985	27%
Animal health	8,950	22%
Animal breeding and genetics	17,087	42%
Research	1,221	3%

Key intervention for investment	Cost (in million TZS)	Proportion
Extension services	1,627	4%
Marketing and value addition	814	2%
	40,683	100%

4.1.1 Impacts

4.1.5.1 Return on Investment (ROI)

Production Zone	Central zone (LG)	Highlands Zone (MI)	Coastal & Lake (MR)
Small Scale	16.9%	89.5%	-26.6%
Medium	-6.8%	540.8%	-31.1%
Ranch	-	102.5%	36.9%

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

4.1.5.2 Production

Table 28: Red meat production for baseline year (2016) and 2021 with red meat intervention (in tonnes)

Products	Total red meat in 2016/17 (tonnes) - baseline	Total red meat in 2020/22 (tonnes)- with red meat intervention	% change in production due to red meat intervention
Meat in Central			
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			
Cattle	157,301	204,206	30%
Sheep	11,059	14,467	31%
Goats	26,373	46,305	76%

Products	Total red meat in 2016/17 (tonnes) - baseline	Total red meat in 2020/22 (tonnes)- with red meat intervention	% change in production due to red meat intervention
Total	194,733	264,979	36%
Meat in Highlands			
Cattle	66,609	98,773	48%
Sheep	3,149	4,362	39%
Goats	13,424	19,527	45%
Total	83,182	122,662	47%
TOTAL	**481,061**	**662,931**	**38%**

Table 29**:** Total red meat by species - cattle, sheep and goats

Products	Total red meat in 2015 (tonnes) - baseline	Total red meat in 2020 (tonnes) - with red meat intervention	% change in production due to red meat intervention
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%**

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

4.1.5.3 GDP

Table 30: Livestock GDP for baseline year (2016/17) and 2021/22 with red meat intervention (in TZS 000,000)

Products	Total livestock GDP 2016/17 (in TZS 000,000) - baseline	Total livestock GDP 2021/22 (in TZS 000,000) - with red meat intervention	% change in national livestock GDP
Meat in Central			
Cattle	600,130	779,505	30%
Sheep	17,702	25,069	42%
Goats	81,851	114,929	40%
Meat in Coast and Lake			
Cattle	558,562	624,701	12%
Sheep	40,602	52,523	29%
Goats	83,479	134,674	61%
Meat in Highlands			
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%**

- The GDP contribution of red meat coming from the production zones has shown an overall increase by 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.

4.1.2 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
Anti- parasitic 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, goats, and camels										

4.1.3 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;
- Ensure sufficient vaccine production to meet demand; and
- Ensure adequate feed supplements are made available.

Specialized cattle feedlots and culled dairy cattle

Targets

Table 31: 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%

Table 32: Contribution of the cattle feedlot system to the national meat production (in tonnes)

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%

Table 33: Contribution of the dairy production system to national meat production (in tonnes)

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%**

4.1.1. Challenges and strategies

Challenges	Strategies to address challenges
Feed	
▪ **Limited access to land for production of forage seed and forage;** ▪ **Unable to meet the feed demand by commercial feedlots** ▪ **Poor access to quality concentrate feed; and inadequate concentrate available** ▪ **Lack of effective feed quality control: standards and mechanisms of enforcement missing**	▪ Making land available to forage production investors; ▪ Promoting and enforcing land contracts to produce forage for commercial feedlots; ▪ Promoting the establishment of flour mills and thus making more concentrates available; and ▪ 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 advice; ▪ Inefficient animal health services; ▪ Inadequate supplies of drugs; ▪ Poor quality control of drugs and supplies; ▪ Poor disease surveillance; ▪ A lack of traceability and identification; and ▪ Inadequate quality control in abattoirs.	Strengthening the animal health regulatory capacity under the coordination of the Livestock Sector Ministry is the main thrust.
Marketing and processing	
▪ Absence of quality based pricing; ▪ Lack of holding area and feedlot space; ▪ Lack of knowledge and skill on meat-cutting and –grading; and ▪ Poor links to export abattoirs.	▪ Building the capacity of meat technology training staff at the TMB; ▪ Increasing training of meat processing staff; ▪ Promoting forward contracting of feedlots and abattoirs; and ▪ 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, animal identification and traceability, etc.
Policy	
▪ A lack of meat quality standards control and enforcement, grading, and pricing policies; ▪ The policy on breeding not fully implemented ; ▪ 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 controlling; ▪ Need for further incentives to establish feedlots (including land access in appropriate locations conducive to feed production, linkages with export market, and infrastructure – road access, power and water supply);	▪ The introduction of trade policy to reduce the importation of cooking oil and grain flour; and ▪ The development and implementation of animal welfare policies.

▪ Lack of policy incentives to promote domestic production of oil seed thereby making availability of oil cakes, and also avoid importation of cooking oil	

4.1.2. Interventions to achieve targets

Increasing the number of animals 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 procedure, including cattle selection and feeding; and on improving the efficiency of the beef value chain, which targets quality beef marketing.

Table 34: Projected number of cattle fattened

	2016	2021	% change
Number of animals fattened/ unit/ year	90	112	24%
Number of fattening units	2,367	5000	53%
Total cattle fattened	213,030	512,000	58%

Increasing the availability of feed ingredients required by cattle feedlot

Table 35: Estimated amount of additional concentrate feed needed for additional cattle going to beef feedlot by the year 2020

	Number of animals		**Additional number of animals in 2021 relative to 2016**	**Additional concentrate/year (thousand tonnes)**
	2016	**2021**		
Fattening units	234,333	1,795,974	1,561,641	

- The additional concentrate needed per animal will be 0.01 tonnes per year.

4.1.3. Investments

Table 36: Investment in slaughter house establishment

Type of processing	Cost per unit (TZS 000,000)	Number of new slaughter houses	Capacity	Investment cost/ plant (TZS 000,000)	Area/ population covered
Big slaughter houses (with rendering system)	2,200	2	2,000 sheep and goats and 200 cattle per day	4,400	Towns and cities with 200,000 population
Modern abattoir (with all required facilities)	2,600	1	3,000 sheep and goats and 700 cattle per day	2,600	Towns and cities with 200,000 population

4.1.4. Impacts

4.1.5.4 Return on Investment (ROI)

The return on investment under cattle feedlots is big and attractive. The benefit/cost ratio is 19%.

4.1.5.5 Production

Table 37: Change in meat production from cattle feedlot (2016/17, to 2021/22) with feedlot intervention

Products	Total production 2016/17 baseline	Total production 2021/22 - with commercial feedlots intervention	% change in production
Beef in tonnes			
Cattle	7,433	64,565	769%

- Total red meat production increases by 769% in 2021/22, amounting to 7,433tones (in the base year), and to 64,565 tonnes (in 2021/22).

GDP

Table 38: Changes in Livestock GDP due to interventions on SP cattle feedlots

Product (meat)	Total livestock GDP 2016/17 (TZS 000,000) - baseline	Total livestock GDP 2021/22 (TZS 000,000) - with specialized feedlots interventions	% change in national livestock GDP
Cattle	3,535	48,394	1,269%

4.1.5. Activity timeline and sequencing: Gantt chart

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
Implementing the roadmap for the rationalization of public/private veterinary services										
Anti-parasitic treatment										
Adult stock vaccinations										
Disease surveillance										
Establishing quarantine facilities										
Establishing identification and traceability tools										
Quality control in Abattoirs										
Identifying potential locations for feedlot establishment										
Creating new feedlots										
Ensuring MALF support for establishment of feedlots in strategic locations										
Establishing slaughter houses										

Complementary interventions and success requirements

- Industry strategy developed by GoT 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 slaughter houses 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 cattle meat

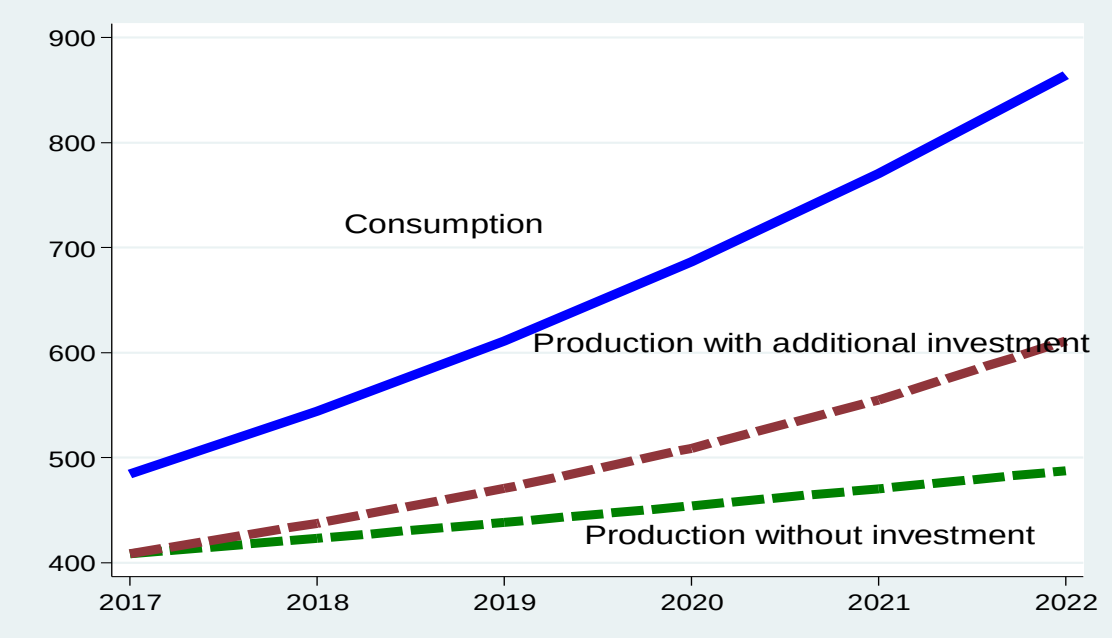


Figure 7: LMP targets for production, consumption, and production-consumption balance for sheep meat

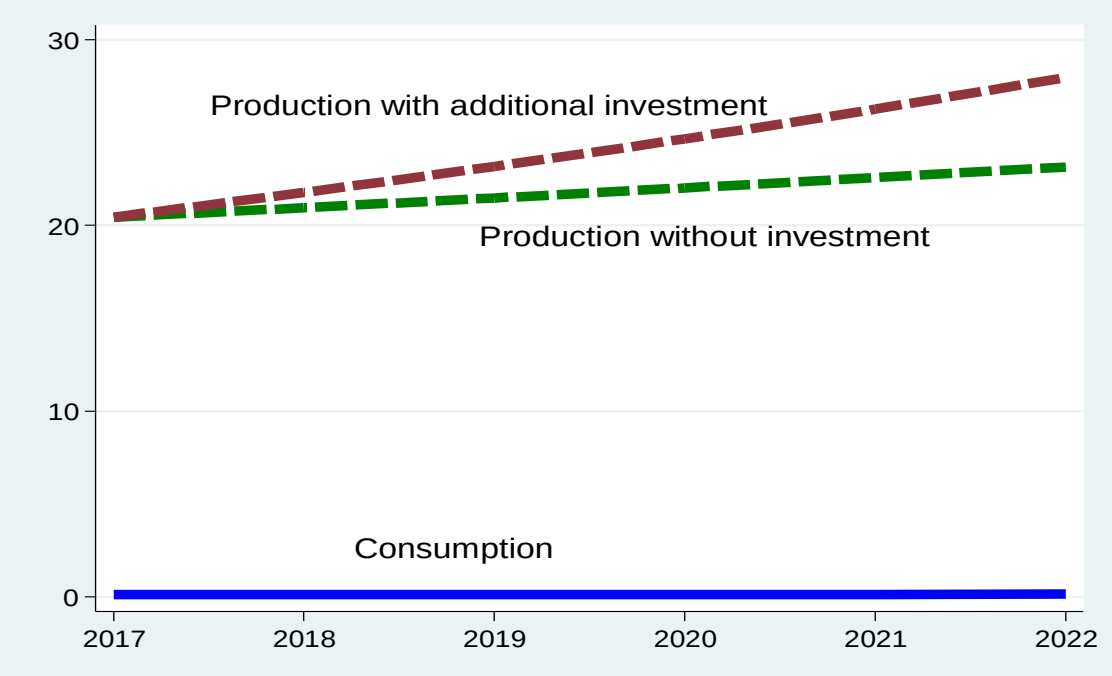


Figure 8: LMP targets for production, consumption, and production-consumption balance for goat meat

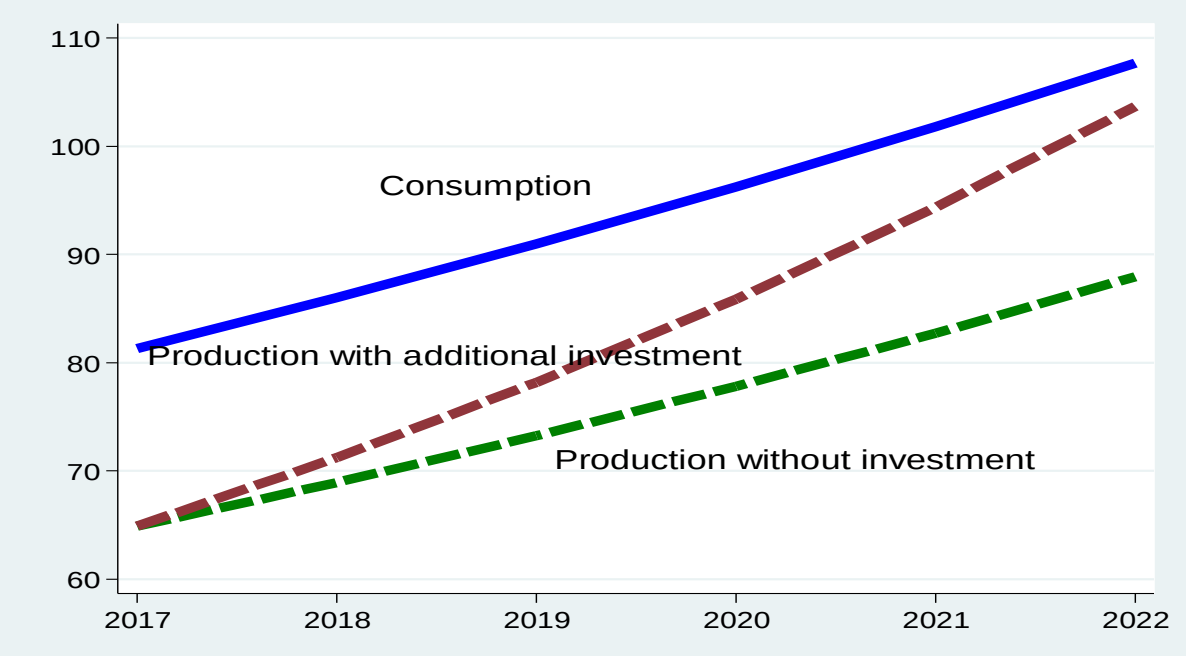
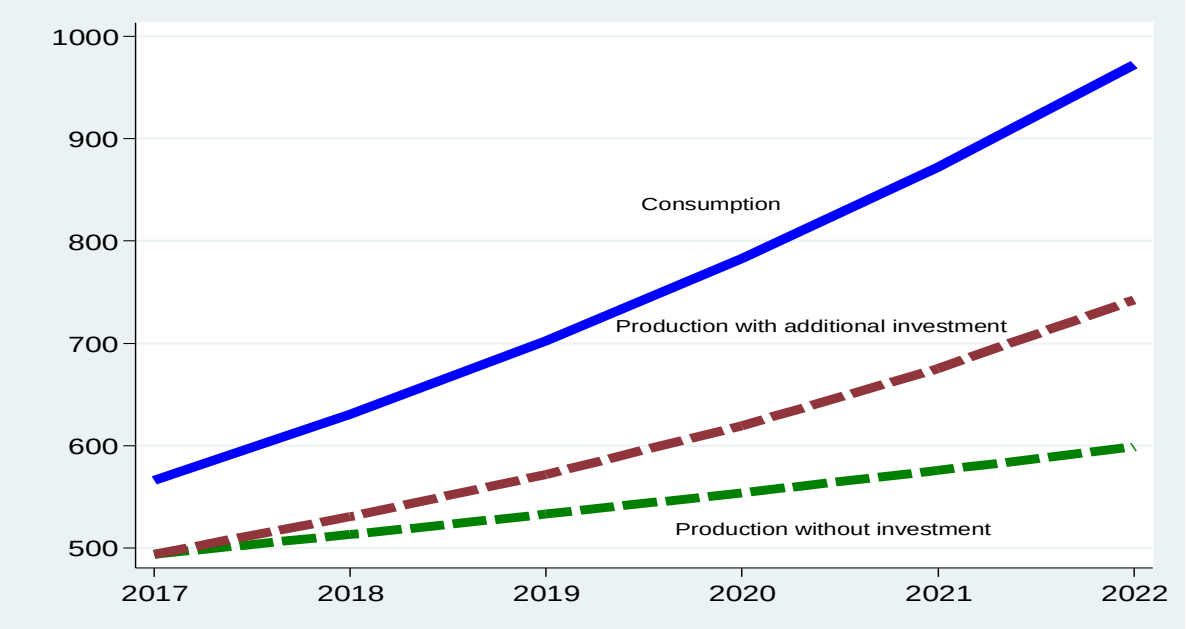


Figure 9: LMP targets for production, consumption, and production-consumption balance for red meat



Conclusions

- Given the production increases as, there is significant contribution by the production systems (the traditional, ranches, and feedlot) towards improving food security, meeting the red meat consumption and nutrition, and contributing towards economic growth. However, this can only be realized if:
  - Investments are implemented by the GoT and private investors in a timely manner; and are adequately funded.
  - Meeting the feed needs becomes a priority, and is followed by increasing pasture and fodder production, increasing the availability of roughages, such as crop residues and agro-industrial by-products. The bulk of additional concentrate feed needed, particularly in feedlot, is expected to come from investment by the private sector on 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 to attract and enable sustainable growth in feedlots is improved.
  - Linkages are established for a viable stocker 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 sugar cane 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 8 times from about **60,800** to **465,600 tonnes** and egg production from about **3.0** to **4.2 billion** by **2021/22** through Improved Traditional Family Chicken (ITFC), Tropical Improved Chicken (TIC) and expanded Specialized/Commercial Chicken (SCC) – with Layers and Broilers.

Improving Traditional Family Chicken (ITFC) and Promoting and expanding tropical improved Chicken (TIC) sub-systems (20167/17-2021/22)

Targets

Table 39: Number of hens and chicken meat and eggs production in ITFC and TIC 2016/17-2021/22

Chicken subsystem	**Unit**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**% change**
ITFC	in million	4.2	4.4	4.7	5.0	5.4	5.7	37%
TIC	in million	0.02	0.04	0.11	0.28	0.76	2.01	NA*
Total	**In million**	**4.22**	**4.44**	**4.81**	**5.28**	**6.16**	**7.71**	**NA***
ITFC eggs	in million	101.2	119.2	140.3	165.3	194.6	229.2	127%
TIC eggs	in million	0.79	2.2	6.1	16.8	46.5	129.1	NA*
Total egg	**In million**	**101.99**	**121.4**	**146.4**	**182.1**	**241.1**	**358.3**	**350%**
ITFC meat	In 000' tonnes	31.8	34.5	37.5	40.8	44.3	48.2	52%
TIC meat	In 000' tonnes	0.01	0.03	0.1	0.2	0.6	1.7	NA*
Total meat	**In 000' tonnes**	**31.81**	**34.5**	**37.6**	**41**	**44.9**	**49.9**	**57%**

- 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.
- 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 increased 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% increases.
- 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% increases.

*TIC is almost a newly introduced chicken system with few number of TIC in the base year. Hence comparing the number of TIC in the base year which is almost doesn't exist with the 5th year number does not make sense. TIC can be taken as a newly introduced system.

Key assumptions for the family chicken system

- Average number of hens/flock in ITFC grow from 2 to 4
- Average number of chicken/flock in TIC remains 25.
- Number of eggs laid per hen/year increases from 50 to 90
- Mortality in chicken before marketing will be reduced from 50% to 10%
- Average live weight of chickens (growers) sold will increase from 1.1kg to 1.4kg
- Number of eggs and chicken consumed on-farm/year increases from 10 to 20, a 100% increase
- The costs of Veterinary and medicines increases from TZS 50/chicken to TZS 100, a 100% increase

Table 40: Key challenges and strategies related to family system

Challenges	Strategies to address the challenges
Feeds	
Limited access to land to produce maize, soy beans for formulation of chicken feed	• Enforce Grazing Land and Animal Feed Resources Act, 2010 and its 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 the chicken feeds • Create awareness through sensitization on quality of chicken feeds • Build capacity for Animal feed processors Good processing practices • Regulating the export of oil crops and import of cooking oils; and • Strengthen the mechanism to control feed quality.
Low nutritive value and low quality of commercial chicken feeds in terms energy, protein, mineral and amino acid profile and high crude fibre;	
Availability of physical and chemical contaminants such as charcoal, sand, dust in chicken feed ingredients and feeds	
Low institutional capacity to control quality of chicken feed produced and processed	
Low incentive for the private sector to invest in feed processing plants	• Tax holiday and other incentives to encourage the participation of private sector in the feed processing industries.
Animal health	

High prevalence of disease particularly New Castle, Salmonellosis, Marek's disease to small scale chicken producers	• Strengthen enforcement of Animal Disease Act, 2003 and its regulations; • Formulate bio safety guidelines for disease control and other relevant guidelines; • Enforcing stricter disease controls on the importation of commercial replacement stock; • Production of ND vaccine with high efficacy and Mass mandatory vaccination against ND
Poor handling and quality drugs and vaccines associated with inadequate human resource for supervisory, monitoring and unreliable cold chain supply of chicken vaccines	
Poor housing and sanitation	• Awareness creation among small producers on sanitation and housing
Marketing and processing	
Chicken farmer's marketing organisation are not covering the entire country but mostly are concentrated in urban areas particularly in Dar-es-salaam;	• Promote establishment of Tanzania chicken traders associations;
The available farmers' organisations involve the small groups of farmers with a weak platform	
The organisations are disintegrated and not connected to form an apex.	
Lack of slaughtering facilities for chicken	• Construction of chicken slaughtering and processing facilities and promotion of chicken meat and eggs marketing.
Lack of chicken meat processing facilities	
Weak Biosafety and HACCP facilities	• Institutionalize mandatory biosafety and HACCP
Consumers poor preference for exotic chicken meat and eggs	• Intensifying the promotion and extension work to change the attitudes of consumers towards consuming eggs and meat from hybrid and exotic breeds
Policy	
Most of the hatcheries and breeder chicken farms are not registered; do not have registered veterinarians; operate within residential areas without standard operating procedures.	• Promote registration of hatcheries and breeder farms • Establish guidelines for operation of hatcheries and breeder farms. • Establish standard operating procedures of hatcheries and breeder farms. • Institutionalize Biosafety measures and HACCP facilities for chicken meat, eggs and feeds
There are a lot of complaints from farmers on high mortality of chicks from some hatcheries due to salmonellosis and emergence of Mark's disease in pullets (layers).	
Policy related to land acquisition for chicken feed production.	• Favorable policy for land acquisition for chicken feed production.

Interventions to achieve targets

The interventions to transform the family chicken system involve improvement in the indegenous chicken productivity through improved breed selection, importation of high yielding pure tropical scavenging brooding breeds and importation of semi scavenging tropical breeds. These go along with reduction of reproductive wastage through introduction of brooding and artificial incubattion facilities such as hay box brooder and small scale incubators, health, feed and mangement interventions. Adoption and coverage of the intervention 40% and 30% respectively let 12% of the total indigenous ITFC chicken be impacted over the 5 year period. TIC will grow from 15,000 chicken to 2,000,000 in 5 years, a huge developmnet.

The interventions in the ITFC (indigenous and imported pure breeds) aims at upgrading the flock size from 2 to 8 hens; eggs laid per year to increase from 50 to 90 and average weight of sold chicken to increase from 1.1 kg to 1.4 kg. Through the semi scavenging tropical crossbreeds (for e.g. Kuroilers), holding per family will remain 25 chicken and it is expected to get 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% to 10%. Average number of eggs consumed on-farm/year increases from 10 to 20 and chicken consumed from 5 to 10; a 100 percent increases.

Investments

See the investment details in table 45.

Impacts

Investment impacts

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

Production impacts

- Total meat from the family system (ITFC and TIC) increased 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 in the year 2016/17 to 358.3 million in the year 2021/22, a 350% increases.

GDP impacts

GDP contribution from the family chicken (ITFC and TIC) IFBC 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 41: GDP contribution 2031 with current and with additional investment scenario

Products	Chicken GDP 2016/17 (TZS millions)	Chicken GDP 2021/22 (TZS millions)	Change in %
Improved Traditional Family Chicken (ITFC) meat	153,843.49	276,115.6	79%
Cross breed Family Chicken meat	52.5	8,266.3	NA
Total Family chicken meat	**153,895.9**	**284,381.9**	**85%**
ITFC Family Chicken 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%**

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

Table 42: Intervention activity timeline and sequencing: Gantt chart

Investment interventions	**Investment cost (000,000 TZS)**				
	2017/18	**2018/19**	**2019/20**	**2020/21**	**2021/22**
Establish 3 chicken feed processing plants					
Improve the capacities of chicken feed quality control laboratories					
Land investment for feed (yellow-maize and soya) production (sorghum to complement maize)					
Upgrade and expand ND, FP, Gumboro vaccines production plant					
Establish 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 TALIRI and at farm level and developing appropriate business models					
Strengthen/upgrade 7 public chick multiplication centers					
Establish 8 new public and private crossbred semi-scavenging and commercial DOC multiplication centers and 30 mothering units and distribution centers for 4 weeks vaccinated chicks					

Establish 10 public and private hatchery facilities and 100 private distribution centers for selected 4 weeks vaccinated reproducing/brooding chicken						
Reduce reproductive wastage of brooding hens using artificial incubation (10,000 Incubators/year)						
Reduce reproductive wastage of brooding hens using chicken brooder box (10,000 hay brooding box/year)						
Support LITA and private institutions to implement a farmers skills and training programs on commercial livestock production						
Promotion of exotic chicken meat and eggs consumption						
Establishment of chicken slaughtering house, cold storage for eggs and chicken meat						
Building capacity of MALF, LGAs, WLEOs, VLEO and livestock keepers on record keeping, data management and dissemination[1]						

Specialized Commercial chicken production (2016/17-2021/22)

Targets

Table 43: Number of chicken and chicken meat production in SP chicken subsystems

Chicken subsystem	**Unit**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	% Change
SP layers	million	13.32	13.99	14.68	15.42	16.19	17.00	28%
SP broilers	million	3.29	5.64	9.64	16.49	28.20	48.23	1362%
Total SP chicken	million	15.61	19.63	24.32	31.91	44.39	65.23	318%
SP layer	Tonnes	9,988.3	10,591	11,231	11,909	12,629	13,391	34%
SP broiler	Tonnes	19,058.7	35,075	64,550	118,796	218,628	402,354	2011%
Total	**Tonnes**	**29,047**	**45,666**	**75,782**	**130,705**	**231,256**	**415,745**	**1331%**

- The number of chickens in the SP chicken layers subsystem grows from 13.3 million in 2016/17 to 17 million in 2021/22, a 28% increase. The SP chicken broilers subsystem grows from 3.3 million to 48.2 Million in the year 2021/22, a 1362% increase.

- Chicken meat production from SP chicken increases from 29,047 tonnes in 2016/17 to 415,745 tonnes in the year 2021/22, a 1331% increase.

Table 44: Egg production from specialized Layers

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

- 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 and family systems are facing the same challenges and strategies to address them to transform the industry. Refer to table 40 above for the details.

Interventions to achieve targets

The interventions for SP chicken improvement involve increasing the scale of operations and volume of production from the specialized chicken farms i.e., SP chicken layers and SP chicken broilers. The major intervention proposed for the SP chicken layers and SP 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 1020 per cycle and the average number of layers stayed the same 1300 layers.

Impacts

Investment impacts

Return on investment (ROI)

The internal rates of return of the investment in specialized broilers and layers are 57% and 36% which are way above the 10% discount rate. These justify the investment and implies the profitability of both layers and broiler. As shown in table 45 below, the total investment required during the first 5 years to develop the sector amounts to TZS 753 billion which is shared by the public and private sector.

Table 45: Five-year Chicken meat and egg production improvement investment costs (2017/18 – 2021/22)

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
1	**Animal feeding**							
	Establish 3 chicken feed		2,970		5,940		8,910	Private

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	processing plants							(100%)
	Improve the capacities of chicken feed quality control laboratories	1,320		1,320			2,640	Public[5] (100%)
	Land investment for feed (yellow-maize and soya) 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 ND, FP, 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**							
	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 TALIRI and at farm level and developing appropriate business models	2,200	3,520				5,720	Public (100%)
	Strengthen/upgrade 7 public chick multiplication centers	1,100		2,200		2,420	5,720	Public (100%)
	Establish 8 new public and private crossbred semi-scavenging and commercial DOC multiplication centers and 30 mothering units and distribution centers for 4 weeks vaccinated	3,163	3,163	6,325	6,325	6,325	25,300	Public (20%), Private (80%)

5 represents Government and NGO funds. NGO funds assumed to feed to the achievement of the national government/public goals

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	chicks							
	Establish 10 public and private hatchery facilities and 100 private distribution centers for selected 4 weeks vaccinated 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%)
	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 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%)
	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 slaughtering house, cold storage for eggs and chicken meat			6,325		6,600	12,925	Public (10%), Private (90%)
6	**Policy, planning and M&E**							
	Building capacity of MALF, LGAs, WLEOs, VLEO and livestock keepers on record keeping, data management and	1,210	1,320	1,430	1,540	1,786	7,286	Public (80%), Private (20%)

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	dissemination[6]							
	Total Investment	**121,644**	**134,404**	**162,206**	**163,031**	**172,187**	**753,361**	

Production impacts

- Chicken meat production from SP chicken increases from 29,047 tonnes in 2016/17 to 415,745 tonnes in the year 2021/22, a 1331% 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 55 billion 303 billion in 5 year time. Eggs from the specialized system contributed 61 billion during the same 5 year investment period.

Table 46: GDP contribution from commercial specialized chicken system with current and with additional investment scenario

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

The total GDP contribution of the specialized chicken system increases from 79 billion to 365 billion in five investment year time 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 5 year.

Table 47: Total chicken meat and eggs production with additional investment

Products	Unit	Chicken meat 2016/17 (in tonnes)	Chicken meat 2021/22 (in 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	In thousands	101,956	358,305

[6] This investment serves across all commodities

Total eggs from Sp	In thousands	2,864,947	3,824,162
Total eggs production	**In thousands**	**2,966,903**	**4,182,457**

Egg production
The total eggs production from the family and commercial specialized systems increased by 41% over 5 year.

Total GDP

Table 48: Family and commercial specialized chicken production systems GDP contribution with additional investment

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

Overall the GDP contribution of the total chicken meat and eggs production increased from the current TZS 256 billion to 723 billion in 5 year time, an increase of 184%.

Change in annual incremental income

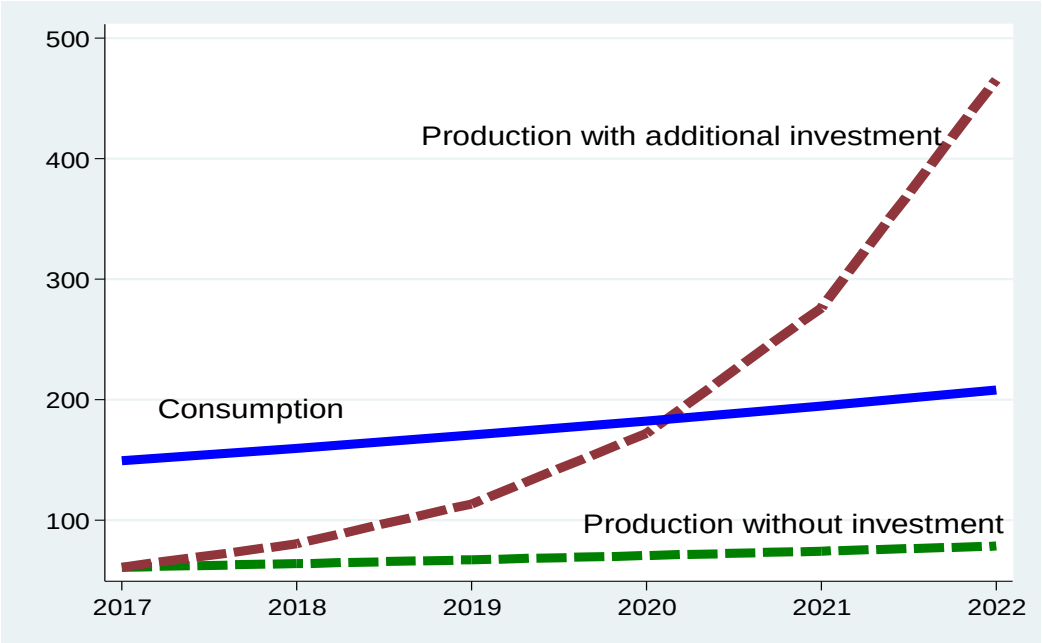
Table 49: Annual incremental income per place as a result of the intervention

Chicken sub system	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%

Production and consumption

The figure below shows that under business as usual or without additional investment, 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 (in thousand tons), 2017-2022



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

Activity timeline and sequencing: Gantt chart

Investment interventions	Investment cost (000,000 TZS)				
	2017/18	2018/19	2019/20	2020/21	2021/22
Animal feeding					
Establish 3 chicken feed processing plants					
Improve the capacities of chicken feed quality control laboratories					
Land investment for feed (yellow-maize and soya) production[6] (sorghum to complement maize)					
Animal health					
Upgrade and expand ND, FP, Gumboro vaccines production plant					
Establish and Monitor 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					
Strengthen/upgrade 7 public chick multiplication centers					
Establish 8 new public and private crossbred semi-scavenging and commercial DOC multiplication centers and 30 mothering units and distribution centers for 4 weeks vaccinated chicks					
Establish 10 public and private hatchery facilities and 100 private distribution centers for selected 4 weeks vaccinated reproducing/brooding chicken					
Extension					
Reduce reproductive wastage of brooding hens using artificial incubation (10,000					

Investment interventions	Investment cost (000,000 TZS)				
	2017/18	2018/19	2019/20	2020/21	2021/22
Incubators/year)					
Reduce reproductive wastage of brooding hens using chicken brooder box (10,000 hay brooding box/year)					
Support LITA and private institutions to implement a farmers skills and training programs on commercial livestock production					
Promotion 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 M&E					
Building capacity of MALF, LGAs, WLEOs, VLEO and livestock keepers on record keeping, data management and dissemination					

Complimentary intervention and success requirements for SP chicken

- Sustainability of the SP chicken on the effectiveness of the DOC production and distribution system. A well-functioning private DOC industry will be required for the efficient production and distribution of the DOCs to the SP chicken farms.
- Government encouragement of chicken agribusiness investors and a reduction of bureaucratic obstacles will be required.
- Government should give priority to SP chicken in land allocation to establish chicken farms and produce chicken feeds.
- 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. powdered eggs) 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 holidays and with low interest loans.
- Chicken feed is a critical factor to the success of the SP chicken operation. There is a need to set up mechanisms for low-cost feed production and formulation at all levels.
- SP 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 to ensure a regular supply of feed.

- PPP 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:
- Out growers (mother units) schemes for pullet production and distribution;
- Mini-hatcheries establishment; and
- Feed processing plants and slaughtering facilities.

Conclusions

The potential contribution of the chicken industry to improve food and nutrition security, household income, and its contribution to the national economic growth is huge. The challenges and strategies and the proposed policy and investment interventions along with indicative required investment funds are presented in this roadmap. The financial viabilities of various interventions and the impacts of interventions on chicken productivity, production and on national economy mainly in terms of gross domestic products (GDP) are presented. It is observed that the policy and investment interventions in the family chicken farm and specialized chicken production will substantially increase the chicken meat production which will contributes toward closing the gap in production-consumption for all meats. However, the above benefits can only be realized if:

- The feed problem is resolved;
- An effective extension system is put in place;
- Private investors in the sector (SP chicken, processing plants, feed producers) are provided adequate incentives in terms of tax holidays, 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 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 tons (2016/17) to 37,000 tons 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 50: Number of sow and tonnes of meat in traditional extensive and improved family (TFP&IFP) pig subsystems

Pig sub system	**Unit**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**% Change**
TFPS	Number	207,083	223,028	240,202	258,697	278,617	300,070	45%
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	000' Tones	12.77	13.71	14.72	15.81	16.98	18.23	43%
IFPS meat	000' Tones	5.96	6.38	6.84	7.33	7.85	8.42	41%
Total Pig meat Family system	**000' Tones**	**18.73**	**20.10**	**21.57**	**23.14**	**24.83**	**26.65**	**42%**

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

- Number of sows in traditional (extensive) family (TFPS) systems increases from 207,083 to 300,070 and pigs in improved semi-intensive family system increases from 77,778 to 112,703. In both cases the change in number over 5 year 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 (IFPS) sub system increases from 6 tonnes to 8.4 tonnes, a 41% change over 5 years period.

Targeted productivity changes;

- Number of sows in the TFPS subsystem increases from 2 to 4.
- Mortality of young pigs will decreaese from an average of 20% to 18% and 12% to 10% among TFPS and IFPS, respectively.
- Age at first calving decreases from average of 300 days to 270 days in TFPS.
- 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 average of 60 to 55 and 45 to 35 days among TFPS and IFPS respectively
- Age of piglets for marketing decreases from 120 to 112 days and from 60 to 40 days among TFPS and IFPS respectively.

Table 51: Key Challenges and Strategies related to the family pig system

Challenges	**Strategies to address the challenges**
Genetics	
Limited number of improved pig breeds Lack of specialized commercial pig breeding farms	• Establishing public and private sector specialized commercial pig breeding and multiplication farms • The LMP provide opportunities for designing 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. Inadequate supply of well-bred pig stocks from pig multiplication and breeding farms	• Importing new lines of improved high yielding pig breeds to avoid inbreeding and increase productivity • Extension and proper management and husbandry practices to lower the probability of inbreeding • Supporting TALIRI pig breeding and research activities
Animal Health	
A weak animal health delivery system Inadequate health extension staffs	• Strengthening surveillance, early detection/diagnosis • Strengthen national and LGAs capacity to recruit additional staff to respond to outbreaks and provide specialized pig extension services • MALF 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 ASF, FMD, erysipelas, Transmissible Gastro-	• Support immunization measures (FMD, brucellosis)

enteritis and brucellosis that cause heavy mortality	• Improving pig farm management practices to benefit producers. • Enforce the Animal Pounds Act, and Animal Welfare Act, 2008 • extensive pig farmers education, develop regulations to stop free roaming
Feeds challenges	
Unreliable supply of commercial feeds	• Establishment of private small-scale feed mills and PPP multi-level feed processing plants
Below standard quality of commercial feeds	• Strengthen surveillance system and the regulatory capacity of CVL with MALF involved in monitoring feed quality and safety.
High prices of commercial feeds, premixes such as amino-acids, minerals and vitamins that are necessary to adhere to standard pig nutritional diets increases cost of animal feeds.	• 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, 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 model 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
Unreliable supply of commercial feeds	• Massive production of cereals (yellow-corn, maize, sorghum etc.) and legumes (soya-beans, other oil seed cakes) to feed commercial pigs • Owners of commercial feeds processing plants, large-scale cereal and other alternative feed raw materials are supported to sit their 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 • Applying good-manufacturing practices (GMP) in production process, implement HACCP in animal feed manufacturing, pig slaughtering facilities and processing • Strengthening Swine Producer Associations (SPAs) to provide credit facilities, offer learning opportunities to farmers' and actors' in the value chain through skills training and r joint implementation of biosecurity measures to control
Higher pork price due to marketing inefficiency, high cost of transportation from producers to urban markets	
lack of pig slaughter facilities/abattoirs, absence of cooling systems (e.g. refrigerators), absence of standard weights and measures,	

Lack of access to formal credit sources for investment in pig production	devastating diseases like ASF; • 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 sells, 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, transporting policies	• Ensure Policy guidelines/regulations to re-organize pig marketing/trading system developed and • Ensure linkages to slaughter facilities/abattoirs, preservation 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 establishment of rural small-scale and urban large-scale slaughter facilities • develop policy guidelines, standard operating procedures (SoP) and awareness campaigns on slaughter facilities' hygiene and food safety
Policy for land allocation for pig production	• Ensure policy related to land acquisition or long-term leasing
Policy that incentive private sector to invest in pig production	• Develop and seek government approvals on due policy incentives to encourage foreign direct investments, organizations and individuals to invest in commercial pig production, processing and marketing; also building domestic pig auction markets, pig products and kiosks consumption outlets. • Infrastructures to feed sources is sufficient, and the production of feed raw materials (cereals, legumes, roots/tubers etc.) is adequate to supply large pig farms • Introduce protective trade policy to encourage domestic private investment in pig production.

Interventions to achieve targets in family pig sub systems

The proposed transformation of the traditional family pig production involves genetic, health and feeding interventions alongside with marketing and policy interventions. The genetic improvemnet

involves importation of adaptable toropical productive pig sows and boars for breeding and crossbredding and establishment of pig breeding and multiplication farms.

The animal health intervention involves strengthening disease control targeting the control and prevention of priority pig diseases (ASF, TGE, erysipelas, worms, and mange etc.) specifically strengthening biosecurity and allied facilities; surveillance through LGAs and zonalvet 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 intervention involves strengthening capacity of private small-scale pig feed mills/processors to compound and distribute pig feeds to rural small-holder farmers also strengthening capacity of family pig keeping households to compound and supplement their herd with quality feed/home rations from locally available and industrial feed materials to supplement their flocks

Impacts

Return on investment

The return on the pig investment from the family pig system is 86% and 17% for small size and medium size traditional pig systems respectively. Both have demonstrated a higher IRR greater than the 10% discount rate used in the analysis of the investment.

Production impacts

Pig meat production from the TFPS subsystem increases from 12.8 thousand tonnes to 18. 2 thousand tonnes and similarly pig meat from improved semi intensive (IFPS) sub system 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 5 years.

GDP impacts

As a result of the additional intervention, the GDP contribution of the TFPS increases from TZS 27. 5 billion in 2016/17 to TZS 39 billion. Similarly, the GDP that comes from IFPS increases from 11 billion to 15 billion during the same period. Due to the additional investment, the total GDP contribution of the family pig production subsystem increases from 38.6 billion to 54.4 billion a 41% growth.

Table 52: Family Pig GDP contribution with additional investment

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

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

Expanding Commercial/Specialized Pig production subsystem (CSP)

Targets

Table 53: Population growth of sows and meat production in CSP

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 (tons)	3,295	4,156	5,241	6,610	8,336	10,514	219%

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

- Number of sows in the commercial specialized pig subsystem increases from 57,580 to 161,218 sows. This is a 180% increase.
- 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 system increases from 3.3 thousand tons to 10.5 thousand tons over 5 year period that constitutes a 219% growth. This is happening as a result of the following changes:
  - Delay weaning-successful service from 15 days to 11 days
  - Proportion of industrial feed included in the ration from 70 to 79%
  - Age of pigglets for marketing from 40 to 36 months
  - Daily weight gain of pugglets from 0.7 kg to 0.8 kg

Key Challenges and Strategies related to the commercial specialized pig system

Genetics challenges and strategies to address the challenges

The same as the family sub system, refer to table 51.

Animal health challenges and strategies

Except the low level of biosafety measures which are a serious problem in CSP that can be addressed through implementation of a strict biosafety measures at farm level and HACCP at feed plants, the animal health problem and strategies to address the challenges is the same as the family sub system (refer to table 51).

Feeds challenges and strategies

The same as the family sub system (refer to table 51). However, to deal with the serious feed shortage for the specialized system, a suitable conditions for land allocation, land lease 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

The same as the family sub system (refer to table 51)

Policy challenges and strategies

The same as the family sub system

Intervention to achieve targets in commercial specialized family pig sub systems

The proposed expansion and upscaling of the commercfial specilized pig production involves genetic, health and feeding interventions alongside with marketing and policy interventions. The genetic improvemnet involves importation of 4000 adaptable toropical productive pig sows and 200 boars for breeding and crossbredding and establishment of 10 private and 10 public pig breeding and multiplication farms.

The animal health intervention involves strengthening disease surveillance and control targeting the control and prevention of priority pig diseases (ASF, TGE, erysipelas, worms, and mange etc.),Strengthen biosafety facilities, and building staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives. The feed intervention involves 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 54 below for the detail investment interventions.

Investment requirement to transform 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 15 years period. 37% of the investment which is TZS **73.202** billion or USD 33.145 Million for the first 5 years, followed by 35% in the second and the remaining 28% in the final 5 year. Much of investments are in the first year due to capital items and requirements for setting a leap in production and value addition activities.

In the first 5-Years, overall the major portion of the investment is on 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 sector is basically of private interest and the public will have major role in regulatory majors, development facilitation and providing incentives to attract and encourage the private investors.

Table 54: 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 ,000,000)	Budget Source
1.0	**Animal Feeding**		
1.1	Strengthen capacity of 150 private small-scale pig feed mills/processors to compound and distribute feeds to farmers	1450	Public 35% Private 65%
1.2	Strengthen capacity of public sector to regulate, and 30 private feed and meat processors to prepare own HACCP	154	Public 100%
2.0	**Animal Health**		
2.1	Strengthen disease surveillance at CVL, ZVC (procure capital lab equipment)	1200	Public 45% Private 55%
2.2	Train staff on novel lab technologies and methods to test blood/organ samples for early diagnosis of key pig diseases especially ASF	180	Public 30% Private 70%
2.3	Strengthen Vet Labs capacity: procure in-line and offline feed quality analyzer equipment to check hazards, nutrient level, and residues.	140	Public 100%
2.4	Procure equipment to check/validate feed intoxication and biological contamination	72	Public 100%
2.5	Build Lab staff capacity on residues validation testing procedures/methodology	460	Public 100%
2.6	Build capacity of Meat Inspectors in 100 LGAs for safe meat marketing	1,100	Public 40% Private 60%
2.7	Equip pig slaughter houses, abattoir and PPEs for Pig Meat Inspectors	1056	Public 35% Private 65%
2.8	Strengthen biosafety facilities and Plans of 300 pig farms to control pig diseases	5280	Public 35% PPP 65%
2.9	Build capacity of 100 LGA for cost-effective pig disease surveillance and control strategies	8250	Public 15% PPP 85&
2.10	Strengthen biosafety infrastructures in 300 pig farms in 100 LGAs and national biosafety services	660	Public 45% Private 55%
2.11	Facilitate pig identification, registration and traceability	2200	Public 5% PPP 95%
2.12	Build staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives	550	Public 35% Private 65%
3.0	**Animal Breeding**		
3.1	Import adaptable 4000 tropical productive pig sow breeds for breeding	4400	Public 50% Private 50%
3.2	Import adaptable tropical productive 230 pig boar breeds for breeding	660	Public 45% Private 55%
3.3	Facilitate to establish 10 private pig breeding and multiplication farms	232	Public 15% PPP 85%
3.4	Facilitate to establish 10 public pig breeding and multiplication farms	408	Public 100%
4.0	**Research Activities**		

	Type of investment	TOTAL (TZS ,000,000)	Budget Source
4.1	Identify risk factors for spread of ASF, including the role of wild pigs-argasid-tick interactions in high risk areas	60	Public 100%
4.2	Field test the efficacy of novel ASFV diagnostic tests (lateral flow device (LFD) for early detection of virus antigen and ELISA to detect IgM) for ASFV	30	Public 100%
4,3	Modelling cost-effective measures for prevention and control of ASF	22	Public 100%
4.4	Improve control and preparedness of pig farmers, Vets and public agencies for ASF	7920	Public 100%
4.5	Diagnostic study on SPAs managerial, financial and organizational needs and planning to achieve operational efficiency	33	Public 100%
	Build capacity of 300 Swine Producer Associations (SPAs).		
5.0	**Extension services**		
	Build capacity of 300 Swine Producer Associations (SPAs).		
5.1	Establish 300 Swine Producer Associations (SPAs) in potential areas	2280	Public 20% Private 80%
5.2	Build capacity for 300 SPAs to revitalize and innovate to address production, trade and development limitations	50	Public 10% Private 90%
5.3	Build SPAs capacity to manage pig meat value chain (processing, marketing)	100	Public 25% Private 75%
5,4	Leadership capacity to manage pig SACCOS, production and marketing	230	Public 30% Private 70%
5.5	Build hands-on-capacity to manage pig farm enterprise costs, manure processing and pig industry sustainability	275	Public 30% Private 70%
6.0	**Commercial production, Marketing and Value Addition**		
6.1	Expand and upgrade the capacity of 50 large-scale specialized investors' pig farms	2200	Public 5% Private 95%
6.2	Establish 50 new commercial specialized pig farms for commercial pig production	4400	Public 5% Private 95%
6.3	Improve capacity of government staff to backstop 30 meat and 30 feed processors implement their own HACCP	1100	Public 40% Private 60%
6.4	Construct pig marketing centers with slaughter facilities in 100 pilot LGAs	8,800	Public 10% Private 90%
6.5	Construct mechanized pig slaughters, processing plant, with cold-storage for marketing of chilled pig meat to domestic and exports markets	5280	Public 5% Private 995%
7.0	**Monitoring and evaluation**		
7.1	Institutionalize pig database and capacity for program and monitoring	9600	Public
7.2	Biannual evaluation of transformational development of the Pig Industry in TZ	720	Public
7.3	Support to program coordination and Asset Management	1,375	Public

	Type of investment	TOTAL (TZS ,000,000)	Budget Source
	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 IRR which is 22% ensures profitability.

Production impacts

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

GDP impacts

The GDP contribution of CSP increases from the current 5.3 billion to 26 billion in 5 year time. With the additional investment 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 increased by 69% over the 5 year period (2017 – 2022) likely attributed to god animal productivity and productions and increasing number of intensive smallholders, medium-to-large scale farmers.

Table 55: Total pig meat production with additional investment

Products	Pig meat 2016/17 (in tonnes)	Pig meat 2021/22 (in tonnes)	Change in %
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), MALF Tanzania

Total GDP

Overall the GDP contribution of the total pig meat production increased from the current TZS 44 billion to 80 billion in 5 year time, an increase of 83% from the base year.

Table 56: Family and Commercial/Specialized Pig GDP contribution with additional investment

Products	Pig meat GDP 2016/17 (TZS millions)	Pig meat GDP 2021/22 (TZS millions)	Change in %
Family Pig meat contribution	38,576.20	54,433.90	41%
CSP 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), MALF Tanzania

Income impacts

With the additional investment and increased in productivity, the net income per sow increased 3.1%, 10.2% and 57.1% among the TFPS, IFPS and CSP respectively. It is the specialized system that makes a significant incremental income benefit per animal followed by the semi intensive family system.

Table 57: Incremental income per sow

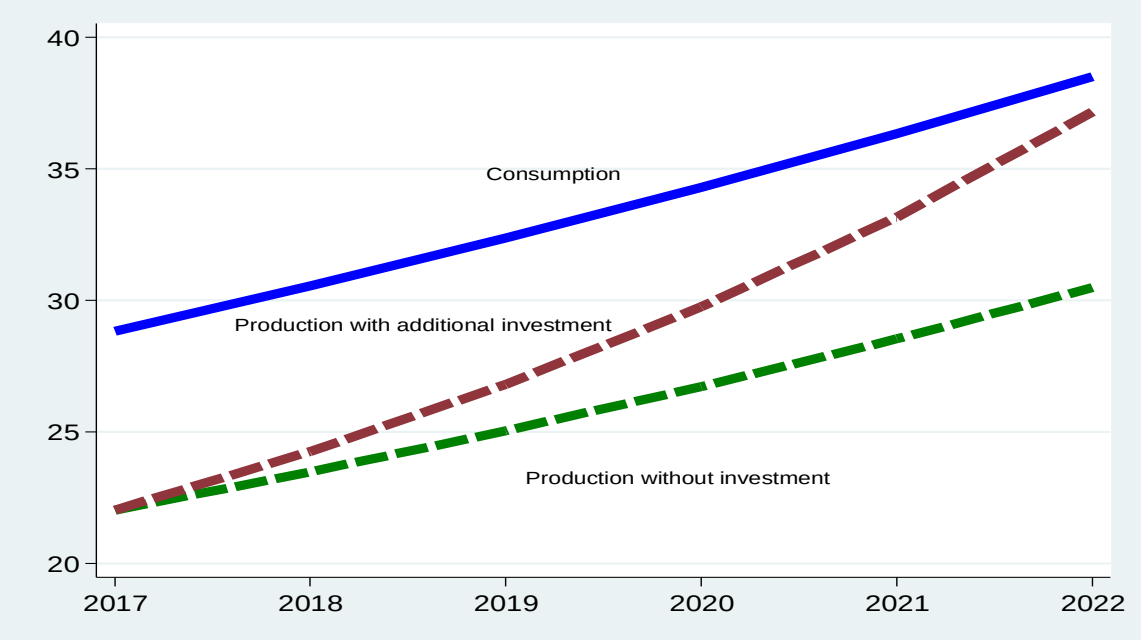
Pig sub system	Net income per sow	Net income per sow	Incremental income per sow	% increment
TFSP	803,714	829,113	25,399	3.1%
IFPS	1,029,362	1,134,622	105,260	10.2%
CSP	1,654,757	2,599,367	944,610	57.1%

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

Production-consumption balance impact

The figure below shows that under business as usual or without additional investment, 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 5 year investment period but it gets much more narrower compared with the without additional investment scenario.

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



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

Table 58: Major Activities – Gantt chart (timing and sequence)

	Type of investment	2017	2018	2019	2020	2021
1.0	**Animal Feeding**					
1.1	Strengthen capacity of 150 private small-scale pig feed mills/processors to compound and distribute feeds to farmers					
1.2	Strengthen capacity of public sector to regulate, and 30 private feed and meat processors to prepare own HACCP	-			-	
2.0	**Animal Health**	**-**	**-**	**-**	**-**	**-**
2.1	Strengthen disease surveillance at CVL, ZVC (procure capital lab equipment)					
2.2	Train staff on novel lab technologies and methods to test blood/organ samples for early diagnosis of key pig diseases especially ASF					
2.3	Strengthen Vet Labs capacity: procure in-line and offline feed quality analyzer equipment to check hazards, nutrient level, and residues.					
2.4	Procure equipment to check/validate feed intoxication and biological contamination			-	-	-
2.5	Build Lab staff capacity on residues validation testing procedures/methodology	-				
2.6	Build capacity of Meat Inspectors in 100 LGAs for safe meat marketing		-		-	
2.7	Equip pig slaughter houses, abattoir and PPEs for Pig Meat Inspectors		-		-	
2.8	Strengthen biosafety facilities and Plans of 300 pig farms to control pig diseases					
2.9	Build capacity of 100 LGA for cost-effective pig disease surveillance and control strategies					
2.10	Strengthen biosafety infrastructures in 300 pig farms in 100 LGAs and national biosafety services					
2.11	Facilitate pig identification, registration and traceability					

2.12	Build staff capacity on national mandatory identification and traceability to achieve animal health and safe trade objectives				-	-
3.0	**Animal Breeding and Genetics**					
3.1	Import adaptable 4000 tropical productive pig sow breeds for breeding	-			-	-
3.2	Import adaptable tropical productive 230 pig boar breeds for breeding	-			-	-
3.3	Facilitate to establish 10 private pig breeding and multiplication farms					-
3.4	Facilitate to establish 10 public pig breeding and multiplication farms					-
	Research Activities					
4.0	**Develop capacity to control AFSV and transform the pig industry in the country**					
4.1	Identify risk factors for spread of ASF, including the role of wild pigs-argasid-tick interactions in high risk areas			-	-	-
4.2	Field test the efficacy of novel ASFV diagnostic tests (lateral flow device (LFD) for early detection of virus antigen and ELISA to detect IgM) for ASFV		-	-	-	-
4.3	Modelling cost-effective measures for prevention and control of ASF	-		-	-	-
4.4	Improve control and preparedness of pig farmers, Vets and public agencies for ASF					
4.5	Diagnostic study on SPAs managerial, financial and organizational needs and planning to achieve operational efficiency	-	-		-	-
5.0	**Extension Services**					
	Build capacity of 300 Swine Producer Associations (SPAs) .					
5.1	Establish 300 Swine Producer Associations (SPAs) in potential areas					

5.2	Build capacity for 300 SPAs to revitalize and innovate to address production, trade and development limitations					
5.3	Build SPAs capacity to manage pig meat value chain (processing, marketing)					
5.4	Leadership capacity to manage pig SACCOS, production and marketing					
5.5	Build hands-on-capacity to manage pig farm enterprise costs, manure processing and pig industry sustainability					
6.0	**Marketing and Value Additions**					
6.1	Expand and upgrade the capacity of 50 large-scale specialized investors' pig farms		-		-	-
6.2	Establish 50 new commercial specialized pig farms for commercial pig production	-			-	-
6.3	Improve capacity of government staff to backstop 30 meat and 30 feed processors implement their own HACCP		-		-	
6.4	Construct pig marketing centers with slaughter facilities in 100 pilot LGAs	-	-			
6.5	Construct mechanized pig slaughters, processing plant, with cold-storage for marketing of chilled pig meat to domestic and exports markets	-	-			
7.0	**Monitoring and Evaluation**					
7.1	Institutionalize pig database and capacity for program coordination and monitoring					
7.2	Biannual evaluation of transformational development of the Pig Industry in TZ	-		-		-

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 business as usual often without additional investment, there is and there will be a substantial shortage of pig meat production to even 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 first 3-4 years of the first 5-year investment phase, demand and supply gap for pork will get much more narrowed

with additional investment scenario. The transformation of the commercializing intensive pig industry will be driven by;

- Supplementary feeding of TFP 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; also continuing improvements in herd fertility for the breeding herds will also contribute.
- 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 invitation and support to foreign direct investments in pig farming as special target for those in large commercial pig production (e.g. CSP)
- Supporting private sector investment support - in animal health, 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 (slaughters, processing).
- Strengthen Swine Associations (producers, traders, processors) for;
    - training to equip them with right knowledge and skills
    - access to credits through SACCOS; collective marketing
    - as vehicles for commercialization of the pig industry

Livestock sectoral analysis–key findings on cross-cutting issues

Introduction

The key constraints and opportunities defining the productivity enhancing technology and better policy interventions with the most potential to contribute to achieving the present national development objectives of Tanzania include feed, animal health and genetic potential. These constraints/opportunities were analyzed with the diagnostic tools of LSIPT.

Feed

Crop and livestock production are the dominant economic sub-sectors providing livelihoods, incomes and employment to more 80% of the Tanzania's population, and the LSA 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 of 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 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 onset and cessation of rainfall and increased temperatures have drastically reduced availability of both roughages and concentrate feeds. Pasture and water shortages have led to overgrazing and resource conflicts between livestock keepers and other land users.

The LSIP toolkit 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. Analysis 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 should focus on improving pasture productivity in the grazing lands and fodder conservation, enabling reductions in 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, irrigated where possible. The intensification of feeding programs, where feasible, should 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. Their control and or prevention are 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 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 (RVF), foot-and-mouth disease (FMD), *peste des petits ruminants* (PPR), African swine fever (ASF), Marek's disease, Newcastle disease, Contagious bovine pleuropneumonia (CBPP), brucellosis, East Coast fever (ECF).

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 chain and intensification of production, develop a priority list of animal diseases, and characterize the status of veterinary infrastructures 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 priority diseases[7] hampering:

- household assets were CBPP (cattle); small ruminants (RVF); ASF (pigs); and ND (poultry);
- markets and value chains were FMD (cattle); Brucellosis (small ruminants); ASF (pigs); and salmonellosis (poultry); and
- livestock intensification were FMD (cattle); PPR (small ruminants); ASF (pigs); and Salmonellosis (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 empowering livestock communities to detect and report disease incidents to facilitate prompt responses to outbreaks.

Animal genetics

The absence of effective breeding and selection programs in Tanzania has hindered the supply of improved breeds to farming communities. Better coordination of the development

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

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 genetic improvement.

Employing the LSIPT tool, an inventory and characterization of AnGR in Tanzania were 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 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 MALF 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 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 centers;
- 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; and
- 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 to 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 2003 Animal Disease Act for poultry and the 2010 Grazing Land and Animal Feed Resources Act, building the capacity of animal feed and meat inspectors, and formulating and enforcing poultry feed inspection guidelines and bio security and other relevant disease control guidelines.
- Strengthening enforcement of the animal disease act for poultry and the 2010 grazing land and animal feed resources act, building the capacity of animal feed and meat inspectors, and formulating and enforcing poultry feed inspection, biosecurity and other relevant disease control guidelines.
- Taking measures to promote investment in processing facilities for hides and skins, and ensure 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 2010 grazing land and animal feed resources act, 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 private sector supply of ID 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 LMP conclusions

The ex-ante impacts of the LMP 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 the increase in exports and foreign exchange earnings.

For the specific VCs and interventions, the main conclusions and implications 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 synchronization, combined with improved feed and health interventions, value addition and complementary policy changes—during the ASDP II period (2017–2022) is 77% or a surplus of 1002 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%. 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 UHT to raise foreign exchange earnings. 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, powdered milk production and other value-added products like yogurt, ice cream, cheese, etc.;
- Introduction of quality-based standards and pricing to encourage quality milk supply;
- Strengthening of enforcement of milk and milk products quality standards;
- Formalization of milk trade through the training and licensing of milk traders;
- Upscaling of the on-going school milk feeding programs to promote consumption; and
- Building of the capacity of the dairy technology training institute(s).
- Introduction of protective trade policy including higher import tariffs or bans and/or subsidies for domestically-produced milk products;
- Reduction in bureaucracy and promotion of investment in the dairy industry;
- Introduction of the effective measure for the control and enforcement of milk-quality standards, as well as comprehensive grading and pricing policies;
- 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); and
- 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 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 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 meeting the following conditions:

- 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 Ministry of Agriculture, Livestock and Fisheries;
- Development of strategic capacities spearheaded by staff working in Agricultural Sector Development Program II; and
- 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;
- 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; and
- Refraining from uncritically gazetting grazing land, to make land currently held for conservation purposes for accessible pastoral production.

Poultry development

Successful poultry interventions would allow the sub-sector to move to improved family poultry with semi-scavenging crossbreds 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, as well as increasing the contribution of poultry to GDP by 182%, from TZS 256 billion to 723 billion and substantial contributing 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 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. With assistance of policies encouraging large 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 be exported to generate foreign exchange earnings.

Perhaps most importantly, the growth of the poultry sub-sector would enable Tanzania to close the total national meat production-consumption gap (see Figure 3). It would also contribute to the reduction of GHG emission 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 GoT 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:

- Establishment of an efficiently functioning private day-old-chicks industry, as well as effective distribution systems for the specialized poultry farms.
- Facilitation by government of the establishment of investment in poultry chicken agribusiness sector through the reduction of bureaucratic obstacles;
- Facilitation by government, of the allocation of land for the establishment of poultry farms and production of feed;
- Promotion of large-scale private investment in poultry processing plants—needed to produce value added products for industrial uses (e.g. powdered eggs) 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, when the private sector will not invest itself; and

- Encouragement of farmer groups and cooperatives to establish out grower 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 significant 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 to 80 billion between 2017 and 2022. This would bring the production-consumption deficit for pork meat from 8000 tonnes to a 1350 tonne surplus between 2017 and 2022.

Improving pork meat requires a focus on upon controlling African swine fever pigs, 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 pork 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, 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 herds and in the production and supply of quality commercial feeds.
- An intensification of livestock 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 (slaughters, processing).
- Strengthening of Swine Associations (producers, traders, processors) to become the vehicles for commercialization of the pig industry, ensuring they have the right knowledge and skills, and access to credit through savings and credit cooperatives and collective marketing opportunities.

Total investment in the LMP

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 59: Total investment cost required to carry out the LMP roadmap

Investment interventions	Total investment cost in million TZS			Total Cost in million USD
	Public	Private	Total	
Cow dairy[8]	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

Finally, the results for all the targeted VCs thus show that investing in the LMP could help transform family farms from traditional to improved market-oriented systems. This includes all the traditional family systems. The specialized commercial production systems (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.

[8] Investments to improve pasture productivity and reduce YASM are included in the investment of red meat/milk and feedlot system.

Annex:

Five year dairy production improvement investment costs (2017/18 – 2021/22)

S/No	Investment Intervention	Investment cost (000,000) TZS						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
1	**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 2 plants (500,000 USD 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) – improving the existing (1st five years)	-	440	-	-	-	**440**	Public – 100%
v	Strengthen the existing pasture/forage seed quality control laboratories	880	-	-	-	-	**880**	Public – 100%
2	**Animal Health**	-	-	-	-	-	**-**	
i	ECF vaccination Program – vaccination of 300,000 dairy cattle per year	-	-	-	-	-	**-**	Cost mentioned in red meat improvement scenario
ii	Implement programs for eradication of CBPP, FMD, RVF (capacity for surveillance, diagnosis and vaccination campaign)	-	-	-	-	-	**-**	
iii	Rehabilitate 100 Veterinary centers	-	-	-	-	-	**-**	
3	**Animal Breeding and Genetics Investments**							
i	Strengthen existing National and establish a new	2,200		11,000			**13,200**	Public – 100%

S/No	Investment Intervention	Investment cost (000,000) TZS						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	semen production center.		-		-	-		
ii	Strengthens existing and acquire 2 new liquid nitrogen plants	-	1,100	-	1,100	-	**2,200**	Public
ii	Training 6,650 and capacity building for AI technicians	554	554	554	554	554	**2,772**	Public – 10% Private – 90%
iii	Establishment of bull centers – purchase of 20 proven bulls	198	198	198	198	198	**990**	Private – 50% Public – 50%
iv	Purchase and distribution of crossbred heifers for under resources 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 crossbred heifers multiplication farms – 4 farms	2,750	-	2,750	2,750	2,750	**11,000**	PPP 50%/50%
vii	Sensitize formation of breed societies	440	-	-	-	-	**440**	Public 50% Private 50%
4	**Extension**	-	-	-	-	-	-	Cost mentioned in red meat improvement scenario
	Strengthening Extension services for dissemination of appropriate livestock technologies	-	-	-	-	-	-	
5	**Marketing and Value Addition**	-	-	-	-	-	-	
i	Construction of 1 UHT in Coastal and Lake and 1 powder milk processing plant in Highlands	-	11,000	17,600	-	-	**28,600**	PPP 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 milk collection/ chilling centers (cold chain) – Establish 150 centers	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 areas –To be	550	-	-	-	-	**550**	Public – 100%

S/No	Investment Intervention	Investment cost (000,000) TZS						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	established in four milk sheds (Office and laboratory)							
v	Strengthen the capacity of milk quality and safety control laboratory -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**	PPP 50/50
	TOTAL INVESTMENT	**26,998**	**37,888**	**59,998**	**37,998**	**40,198**	**203,082**	

Five years red meat production improvement investment costs

S/No	Investment Intervention	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
1.	**Animal feeding**							
i	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%)
ii	Rangeland (communal grazing land) improvement – Bush clearing and/or over-sowing	20,000	10,338	10,000	5,000	4,000	49,338	Public (60%) Private (40%)
v	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**							
i	Public good vaccination - ECF, CBPP, FMD, RVF, PPR, CCPP	2,552	2,552	2,552	2,552	2,552	12,760	Public (80%) Private (20%)

S/No	Investment Intervention	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	and Brucellosis diseases							
ii	Construction and rehabilitation of dip tanks	1,043	1,043	1,043	1,043	1,043	5,215	Public (60%) Private (40%)
iii	Improve the capacity of vaccine production centers, veterinary centers 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**							
i	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 (blanded) goat	70	100	80			250	Public (30%) Private (70%)
4.	**Research**							
i	Grazing land resource (feed/fodder/water) assessment- Research – grazing land resource assessment		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**							

S/No	Investment Intervention	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
i	Strengthening the capacity of existing Livestock training institutes • Provide extension officers with the necessary equipment (toolkit) • Establish and/or strengthen Ward livestock resource centers	5,500		5,500			11,000	Public (90%) Private (10%)
6.	**Marketing and Value addition**							
i	Establish and Rehabilitation of secondary livestock markets		1,500	1,000			2,500	Public (100%)
ii	To renovate and equip Kwala and Tarime and Murusagamba Livestock quarantine station (Export)		10,000	10,000		20,000	40,000	Public (100%)
iii	Renovation and/or constructions of modern slaughter houses/abattoir ; • Two (2) Big slaughter houses with a capacity to slaughter 2,000 sheep and goats and 200 cattle per day • One (1) Modern abattoir with a capacity to slaughter 3,000 sheep and goats and 700 cattle per day		3,500	3,500			7,000	Public (50%) Private (20%) PPP (30%)
iv	Renovation of existing and/or constructions of new two (2) semi-processing and finished leather products processing plants	2,400	2,000				4,400	Private (100%)
v	Strengthening Meat Board to		200	130			330	Public (95%)

S/No	Investment Intervention	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	regulate, promote, monitor and coordinate stakeholder activities for improving the meat value chain (traders and producers associations)							Private (5%)
vi	Strengthen the capacity of meat quality and safety control laboratory –TVLA		550	550			1,100	Public (100%)
vii	Enhancing livestock identification and traceability system – purchase of equipment (computer, networking and identification kits)		1,200	1,000			2,200	PPP (100%)
	Total	**72,083**	**115,251**	**99,623**	**26,688**	**28,595**	**57,530**	

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

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
1.	**Animal feeding**							
iv.	Establish 3 chicken feed processing plants		2,970		5,940		8,910	Private (100%)
v.	Improve the capacities of chicken feed quality control laboratories	1,320		1,320			2,640	Public[9] (100%)
vi.	Land investment for feed (yellow-maize and soya) production (sorghum to complement maize)	36,300	36,300	46,200	60,500	62,700	242,000	Private (100%)

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

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
2.	**Animal health**							
iii.	Upgrade and expand ND, FP, Gumboro vaccines production plant	13,200	19,360	13,200			45,760	Public (100%)
iv.	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**							
vii	Identifying suitable tropical pure reproducing/brooding chicken breeds	3,960	2,200				6,160	Public (100%)
vii	Identifying suitable tropical semi scavenging crossbred chicken breeds	2,200	1,760				3,960	Public (100%)
ix.	Testing breeds at TALIRI and at farm level and developing appropriate business models	2,200	3,520				5,720	Public (100%)
x.	Strengthen/upgrade 7 public chick multiplication centers	1,100		2,200		2,420	5,720	Public (100%)
xi.	Establish 8 new public and private crossbred semi-scavenging and commercial DOC multiplication centers and 30 mothering units and distribution centers for 4 weeks vaccinated chicks	3,163	3,163	6,325	6,325	6,325	25,300	Public (20%), Private (80%)
xii	Establish 10 public and private hatchery facilities and 100 private distribution centers for selected 4 weeks vaccinated reproducing/brooding chicken	7,508	7,508	15,015	15,015	15,015	60,060	Public (20%), Private (80%)
4.	**Extension**							
v.	Reduce reproductive wastage of brooding hens using arteficial incubation (10,000 Incubators/year)	22,000	26,400	33,000	35,200	37,400	154,000	Public (30%), Private (70%)
vi.	Reduce reproductive wastage of brooding hens	8,800	9,900	11,000	12,100	13,200	55,000	Public (20%),

	Investment interventions	Investment cost (000,000 TZS)						Budget source
		2017/18	2018/19	2019/20	2020/21	2021/22	Total	
	using chicken brooder box (10,000 hay brooding box/year)							Private (80%)
vii	Support 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%)
vii	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 slaughtering house, cold storage for eggs and chicken meat			6,325		6,600	12,925	Public (10%), Private (90%)
6.	**Policy, planning and M&E**							
	Building capacity of MALF, LGAs, WLEOs, VLEO and livestock keepers on record keeping, data management and dissemination[10]	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**	

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

	Type of investment	Investment cost (TZS, 000,000)					TOTAL (TZS ,000,000)	Budget Source
		2017	2018	2019	2020	2021		
1.0	**Animal Feeding**							
1.1	Strengthen capacity of 150 private small-scale pig feed mills/processors to compound and distribute feeds to farmers	290	290	290	290	290	**1450**	Public 35% Private 65%

[10] This investment serves across all commodities

	Type of investment	Investment cost (TZS, 000,000)					TOTAL (TZS ,000,000)	Budget Source
		2017	2018	2019	2020	2021		
1.2	Strengthen capacity of public sector to regulate, and 30 private feed and meat processors to prepare own HACCP	-	54	52	-	48	**154**	Public 100%
2.1	Strengthen disease surveillance at CVL, ZVC (procure capital lab equipment)	280	270	250	220	180	**1200**	Public 45% Private 55%
2.2	Train staff on novel lab technologies and methods to test blood/organ samples for early diagnosis of key pig diseases especially ASF	36	36	36	36	36	**180**	Public 30% Private 70%
2.3	Strengthen Vet Labs capacity: procure in-line and offline feed quality analyzer equipment to check hazards, nutrient level, and residues.	28	28	28	28	28	**140**	Public 100%
2.4	Procure equipment to check/validate feed intoxication and biological contamination	42	30	-	-	-	**72**	Public 100%
2.5	Build Lab staff capacity on residues validation testing procedures/methodology	-	115	115	115	115	**460**	Public 100%
2.6	Build capacity of Meat Inspectors in 100 LGAs for safe meat marketing	380	-	370	-	350	**1,100**	Public 40% Private 60%
2.7	Equip pig slaughter houses, abattoir and PPEs for Pig Meat Inspectors	352	-	352	-	352	**1056**	Public 35% Private 65%
2.8	Strengthen biosafety facilities and Plans of 300 pig farms to control pig diseases	960	1,200	1,200	1,080	840	**5280**	Public 35% PPP 65%

	Type of investment	Investment cost (TZS, 000,000)					TOTAL (TZS ,000,000)	Budget Source
		2017	2018	2019	2020	2021		
2.9	Build capacity of 100 LGA for cost-effective pig disease surveillance and control strategies	1,650	1,650	1,650	1,650	1,650	**8250**	Public 15% PPP 85&
2.10	Strengthen biosafety infrastructures in 300 pig farms in 100 LGAs and national biosafety services	132	132	132	132	132	**660**	Public 45% Private 55%
2.11	Facilitate pig identification, registration and traceability	560	480	440	400	320	**2200**	Public 5% PPP 95%
2.12	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%
3.1	Import adaptable 4000 tropical productive pig sow breeds for breeding	-	2,420	1,980	-	-	**4400**	Public 50% Private 50%
3.2	Import adaptable tropical productive 230 pig boar breeds for breeding	-	330	330	-	-	**660**	Public 45% Private 55%
3.3	Facilitate to establish 10 private pig breeding and multiplication farms	58	58	58	58	-	**232**	Public 15% PPP 85%
3.4	Facilitate to establish 10 public pig breeding and multiplication farms	102	102	102	102	-	**408**	Public 100%
4.1	Identify risk factors for spread of ASF, including the role of wild pigs-argasid-tick interactions in high risk areas	30	30	-	-	-	**60**	Public 100%
4.2	Field test the efficacy of novel ASFV diagnostic tests (lateral flow device (LFD) for early detection of virus antigen and ELISA to detect IgM) for ASFV	30	-	-	-	-	**30**	Public 100%

	Type of investment	Investment cost (TZS, 000,000)					TOTAL (TZS ,000,000)	Budget Source
		2017	2018	2019	2020	2021		
4.3	Modelling cost-effective measures for prevention and control of ASF	-	22	-	-	-	**22**	Public 100%
4.4	Improve control and preparedness of pig farmers, Vets and public agencies for ASF	1,800	1,760	1,540	1,500	1,320	**7920**	Public 100%
4.5	Diagnostic study on SPAs managerial, financial and organizational needs and planning to achieve operational efficiency	-	-	33	-	-	**33**	Public 100%
	Build capacity of 300 Swine Producer Associations (SPAs) .							
5.1	Establish 300 Swine Producer Associations (SPAs) in potential areas	456	456	456	456	456	**2280**	Public 20% Private 80%
5.2	Build capacity for 300 SPAs to revitalise and innovate to address production, trade and development limitations	10	10	10	10	10	**50**	Public 10% Private 90%
5.3	Build SPAs capacity to manage pig meat value chain (processing, marketing)	20	20	20	20	20	**100**	Public 25% Private 75%
5.4	Leadership capacity to manage pig SACCOS, production and marketing	54	37	48	37	54	**230**	Public 30% Private 70%
5.5	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%
6.1	Expand and upgrade the capacity of 50 large-scale specialized investors' pig farms	1,200	-	1,000	-	-	**2200**	Public 5% Private 95%
6.2	Establish 50 new commercial specialized pig farms for commercial pig production	-	2,100	2,300	-	-	**4400**	Public 5% Private 95%

	Type of investment	Investment cost (TZS, 000,000)					TOTAL (TZS ,000,000)	Budget Source
		2017	2018	2019	2020	2021		
6.3	Improve capacity of government staff to backstop 30 meat and 30 feed processors implement their own HACCP	380	-	370	-	350	**1100**	Public 40% Private 60%
6.4	Construct pig marketing centers with slaughter facilities in 100 pilot LGAs	-	-	3,200	2,880	2,720	**8,800**	Public 10% Private 90%
6.5	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%
	TOTAL	**9,125**	**11,865**	**18,679**	**11,181**	**10,382**	**61232**	**Public 20% Private 80%**

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