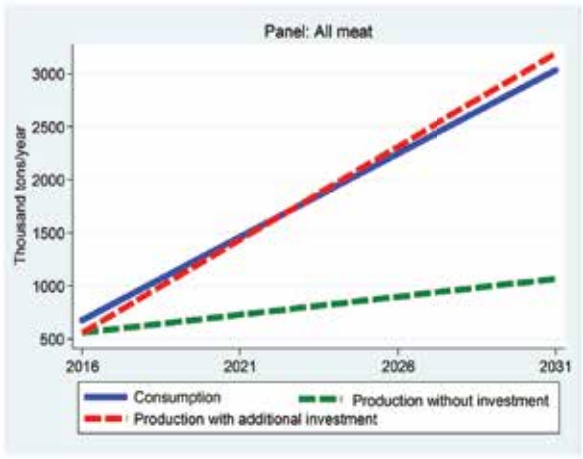
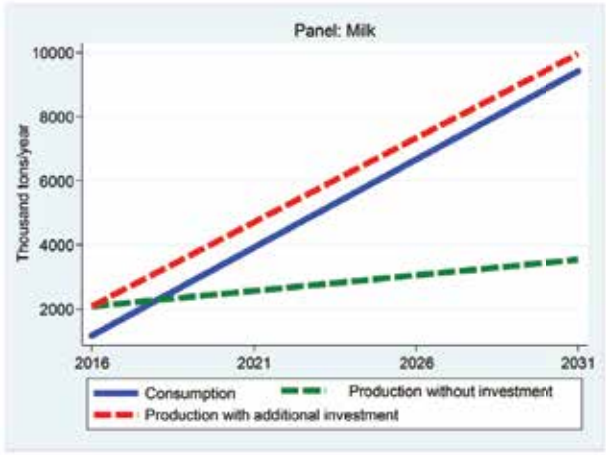
UNITED REPUBLIC OF TANZANIA
MINISTRY OF LIVESTOCK AND FISHERIES

# TANZANIA LIVESTOCK SECTOR ANALYSIS (2016/2017 - 2031/2032)

**December, 2017**



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## Acronyms and abbreviations

| | |
|---|---|
| ALive | African Partnership for Livestock Development |
| AI | Artificial insemination |
| AnGR | Animal genetic resources |
| ASDP II | Agricultural Sector Development Program II |
| ASDS II | Agricultural Sector Development Strategy II |
| ASF | African swine fever |
| ATA | Agricultural Transformation Agency |
| AU-IBAR | African Union-Inter-African Bureau for Animal Resources |
| BAU | Business as usual |
| BMGF | Bill & Melinda Gates Foundation |
| CBPP | Contagious bovine pleuropneumonia |
| CCPP | Contagious caprine pleuropneumonia |
| CIRAD | Agricultural Research Centre for International Development of France |
| Cn | Central zone |
| C&L | Coastal and Lake zone |
| CSO | Civil society organization |
| DM | Dry matter |
| DOC | Day-old chick |
| FAO | Food and Agriculture Organization of the United Nations |
| FMD | Foot-and-mouth disease |
| GDP | Gross domestic product |
| GM | Gross margins |
| GoT | Government of Tanzania |
| HACCP | Hazard analysis and critical control points |
| HESM | Herd and economic sector model |
| Hi | Highland zone |
| IFD | Improved family dairy |
| IFP | Improved family poultry |
| ILRI | International Livestock Research Institute |
| IRR | Internal rate of return |
| IFPS | Improved family pig system |
| ITFC | Improved traditional family chicken |
| Kg | Kilogram |

| | |
|---|---|
| Km | Kilometre |
| LGA | Local government authority |
| LMP | Livestock master plan |
| LMU | Livestock multiplication units |
| LSIPT | Livestock Sector Investment and Policy Toolkit |
| MALF | Ministry of Agriculture, Livestock and Fisheries |
| LSMS | Living Standards Measurement Study |
| Mm | Millimetre |
| MARIL | Managing Risk for Improved Livelihoods-Ethiopia |
| NAFORMA | Tanzania Forest Service Agency |
| NARCO | National Ranching Company |
| NGO | Non-governmental organization |
| ND | Newcastle disease |
| PPE | Personal protective equipment |
| PPP | Public-private partnership |
| PPR | Peste des petits ruminants (goat plague) |
| RVF | Rift Valley fever |
| SCC | Specialized commercial chicken |
| SUA | Sokoine University of Agriculture |
| SPA | Swine producers' association |
| T | Tonne |
| TAC | Technical advisory committee |
| TALIRI | Tanzania Livestock Research Institute |
| TB | Tuberculosis |
| TDV | Tanzania Development Vision |
| TFPS | Traditional family pig system |
| TIC | Traditional improved chicken |
| TLMI | Tanzania Livestock Modernization Initiative |
| TLSA | Tanzania livestock sector analysis |
| TVLA | Tanzania Veterinary Laboratory Agency |
| TZS | Tanzania shilling |
| USD | United States dollar |
| VA | Value added |
| YASM | Young and adult stock mortality |

## Acknowledgements

Tanzania accounts for about 1.4% of the global cattle population and 11% of African cattle population (FAO 2014). Tanzania has about 30.5 million cattle, 18.8 million goats and 5.3 million sheep. Other livestock include; 1.9 million pigs, 38.2 million local chickens and 36.6 million improved chickens. The livestock sector employs about 50% of her population, which is equivalent to 4.6 million households who their income depends on livestock.

The Livestock Sector plays an important role in building a strong national economy by increasing household food security, income, animal draught power, manure, foreign currency and employment opportunities while nurturing the livestock resources. This contributes to increased economic growth and Government revenue.

The Livestock Sector by its nature has high multiplying effects and net worth per capital invested. Livestock is used as security as it can be converted easily into monetary values (non-fixed assets/ liquidity) when need arises. This contributes to increased purchasing power to consumable and capital goods.

Despite the potential of livestock resources available in the country, the sector contribute only 6.9%, which is very little to economic growth. The sector is facing so many challenges including *low genetic potential, feed and water resources, diseases, land conflicts, lack of value addition of livestock priority commodities, increased postharvest losses, lack of quality processed products for local and international markets and illegal trade of livestock and livestock products.*

The emerging micro and macroeconomic policy changes, new challenges and opportunities have necessitated I and my Ministry with the technical support from the International Livestock Research Institute (ILRI) and the financial support from Bill and Melinda Gates Foundation (BMGF) to develop a livestock roadmap, the Tanzania Livestock Master Plan (TLMP) to address all challenges facing the sectors and hence achieve the Tanzania Development Vision (TDV) 2025. One of the TDV's goals is that "by year 2025 there should be a livestock sector, which to a large extent shall be commercially run, modern and sustainable, using improved and highly productive livestock to ensure food security, improved income for households and the nation while conserving the environment".

The TLMP sets out livestock-sector investment interventions on improved genetics, feed and water resources, health services, huge investment on industry and factory, promotes private sector investment and business environment and hence complementary policy support which could help meet the sector wide approach programme, the Agricultural Sector Development Programme (ASDP II) targets by improving productivity and total production in the key livestock value chains.

May I thank, the capable individuals, supportive institutions and agencies, which greatly contributed to the realization of the TLMP. May, I also acknowledge the commitment of the Permanent Secretary – Livestock Prof. Elisante Ole Gabriel, Director of Policy and Planning Mr. Amosy K. Zephania and TLMP Government team1 for their excellent and recommendable work.

Furthermore, this program found receptive ears and supportive partners from Dr. Jimmy Smith, Director General of ILRI, Rico Natali of the BMGF, Prof. Marcelina Chijoriga the BMGF focal person in Tanzania, and Dr. Amos Omore, ILRI's representative in Tanzania. Special thanks to the team of international experts from the International Livestock Research Institute (ILRI) who contributed to the making of the Livestock Master Plan; Dr. Barry I. Shapiro, the TLMP team leader from ILRI; Dr. Getachew Gebru, Solomon Desta, Asfaw Negassa, and Kidus Nigussie Brook.

I and my Ministry and other stakeholders we owe a huge debt to implement this Master Plan, which will be a resource weapon for conquer poverty and increase employment, economic growth, sustainable development and Government revenue.

In order to implement this, it may require formulation of new policy and strategies, amendments of laws and regulations, proper coordination of public and private sectors, education and awareness creation of which spirit of courage, commitment, determination and dedication is needed.

For effective and efficiently implementation of TLMP, I call upon every one of us to be focused, transparent, accountable and innovative in implementing the activities outlined in this document. I wish, therefore, to urge all Government staff from Central and Local Government, private sector and other stakeholders to fully commit themselves to the implementation of the Tanzania Livestock Master Plan for the benefit of the people of the United Republic of Tanzania, Africa and global.

Hon. Luhaga Joelson Mpina (MP)
**Minister for Livestock and Fisheries**
March, 2019

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# 1 Executive Summary

Using the most recent available and reliable secondary data and the LSIPT,[1] the Tanzania LMP team, made up of MALF senior experts and supported by the ILRI LSIPT experts, and supported by the BMGF, 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 (LSA). The results of this LSA guided in turn the preparation of the 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. It is also meant to help realize the various existing strategies and policies of Tanzania, namely the Tanzania Development Vision 2025, Five Year Development Plan (2016–17 to 2021–22), MKUKUTA II, National Livestock Policy 2006, Agricultural Sector Development Strategy II (ASDS II) and the Livestock Sector Development Strategy (2010).

The baseline analysis of the LSA shows that 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 chickens and **38.1** million improved chickens (as also reported in the MALF Budget Speech 2016–17). Tanzania accounts for about 1.4 % of the global and 11% of the African cattle population (FAO 2014). The national herd is dominated by indigenous cattle which are currently exhibiting low productivity but has much potential if improvements can be made in feed, health and breed. The country has many other outstanding natural resources to support livestock development which include extensive rangelands, diverse natural vegetation and diversely resilient low-production livestock breeds. Despite these resources, there is widespread agreement that the livestock sector is presently performing below its potential.

The LSA baseline analysis (depicting the current state of the sector) and projected impacts of the 'same level of investment—business as usual (BAU) in the future' showed that only 'with additional future investments' in technological change and changes in policy can the productivity and production potential of these animal resources be sufficiently improved to provide adequate levels of animal-source foods needed to feed the rapidly growing population, with its rapidly increasing income and growing demand, including for animal-source foods.
Presently, livestock activities contribute only 7.4% to the country's GDP and the annualized growth rate of the sector is low at 1.83%. 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 (Tanzania Livestock Modernization Initiative (TLMI) 2015).

Moreover, the LSA results show that under the BAU investment scenario there will be a large red meat supply deficit in 15 years (by 2031–32) estimated to be 1.7 million tonnes (t), driven by poor existing animal genetics, health and feed constraints. For milk, the scenario analysis with the current level of dairy investments shows there will be a production-consumption gap/deficit of 5.8 million litres in 15 years. These projected deficits will also be driven by high human population growth, as well as increased income and urbanization, and increased-income elasticities of demand, against projected high consumption of animal-source foods.

Despite these dismal but widely accepted baseline results for the sector, the LSA investment scenario analysis results shared below point to high returns from investment in livestock in

[1]This toolkit was developed by a group of international agencies under the aegis of ALive at AU-IBAR. CIRAD, FAO and the World Bank were the main contributors.

Tanzania—if there is additional investment in the sector at levels which are realistic and thus not difficult to achieve. The results show that a strategic increase in investments in the four main existing livestock production systems and value chains will not only improve productivity and incomes substantially for producers but enhance the sector's economic contributions at the national level, helping to meet the nation's development objectives.

In the analysis of investment scenarios carried out by the LMP team under the LSA on productivity-enhancing technology interventions, combined with better policies, the following current national development objectives of Tanzania were used as decision criteria for comparing the alternative investment interventions:

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

Using measurable economic and livelihood indicators for the above objectives, four key livestock value chains—live animals and red meat and milk (from indigenous cattle, sheep and goats), dairying with crossbred cows, chicken meat and eggs, and pigs/pork (both white meat) were identified in the LSA as having the most potential for productivity increase through new investments to achieve the national economic development objectives above and thus contribute most to the long-run development of the sector and the national economy. Moreover, the sector analysis shows there is at present particular underinvestment in the poultry subsector despite its high potential for productivity and income increase, as well as projected rapidly increasing demand. The rigorous ex-ante technical and financial analysis conducted on alternative intervention options (the investment scenarios) carried out by the LMP team thus provide a guide to the prioritization and choices for public and private investments with the highest payoffs for livestock sector transformation, improved livelihoods for livestock keepers and national economic development.

**Priority and complementary institutional and policy recommendations**

The review of existing policies, institutions, laws and regulations reveal a lack of enforcement capacity and the need to modify out-of-date policies. 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:

- Incentivizing private sector involvement in veterinary service provision in rural areas to include cost sharing for the prevention and control of diseases of economic importance.
- Establishing a reporting system for the collection of veterinary drug/vaccine performances at all levels.
- Strengthening dairy cooperatives to facilitate the provision of capital to smallholders, enforcing dairy food safety regulations through increased training of inspectors and more inspections, and promoting milk consumption through the establishment of school feeding programs.
- Strengthening cooperation between the government and private sector especially to invest in livestock processing plants (milk, meat and leather) and rehabilitation of abandoned industries
- 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 guidelines and bio- security and other relevant disease control guidelines.
- Provision of Veterinary services in a modified way through a policy of selective privatisation and support by public sector.
- 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).
- Promoting livestock, livestock product and by product for domestic and export trade by keeping fare business environment through control of cross border trade, strategic issuing and availability of livestock permits, license and supervision of primary, secondary and boarder markets in order to increase revenue accrued from trade.
- Promoting production and utilization of other livestock by-products for the provision of industrial inputs and income generation to livestock producers and traders.
- Introducing policies and enforcing laws for rangeland improvement: designate grazing areas in rangelands owned by livestock farmers, encourage environmentally friendly tsetse control, mandate dipping and vaccinations, and incentivize adoption of climate change adaptation and mitigation practices.
- Ensuring the implementation of the Draught Animal Breeding Act is accompanied by the provision of sufficient human resources and infrastructure and the establishment of livestock breeders' associations.
- To implement an extensive (or massive) artificial insemination, synchronisation, multiple ovulation and embryo transfer to increase the number of improved breeds and increase milk production
- 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 investments in facilities and 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 identification devices.
- Reducing social conflict between livestock farmers and other land users, and land degradation from overuse by strengthening livestock extension support services, legislating the demarcation of land for grazing, and encourage 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.

**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 crossbreeding 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 public-private partnerships (PPP) in order to decrease young and adult stock mortality (YASM).
- Increasing quantity and promote quality of hides and skins and increase the capability and scale up of the small-scale industry to provide secondary markets for large tannery and by supporting local entrepreneurs
- Improving marketing and information technology infrastructure to increase efficiencies along the value chains.
- 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**

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

**Red meat**

Cattle for beef production and milk greatly dominate the national herd numbers and show far more potential for productivity improvement and have the highest consumer demand so they are far more critical in any viable strategy to increase red meat production, rather than small ruminants—goats or sheep. Yet, because of the strong consumption preference for goat meat, goat production improvement also needs to be addressed to increase red meat output. Despite the ready know-how of practical and low-cost solutions and the technical ability of veterinary services to make good progress in addressing animal morbidity and mortality, very limited access to land for increased grazing and feed production, and limited ability to raise the genetic potential of local ruminant breeds in just 15 years mean the projected long-term red meat production deficit identified will not likely be closed in this time period.

Moreover, given the limited ability to increase red meat produced from ruminants, these red meat supplies will not help much to close the projected rapidly growing 'all-meat' consumption/demand gap expected due to increasing incomes, as well as rapid population growth and urbanization.

**Dairy (with cows)**

The future scenario analysis given the current level of dairy investments indicates that there will likely be a production-consumption gap/deficit of 5.8 million litres in 15 years, leading to increased imports, if additional investment is not started now. Meanwhile, the scenario analysis shows that with additional dairy investments the existing gap in projected milk consumption requirement can be closed and a surplus produced through artificial insemination (AI), synchronization, , multiple ovulation and embryo transfer combined with improved feed and health interventions, more investment in value addition and complementary policy changes. Thus, with additional investments there can be an excess supply of about one-half million litres of milk providing raw material for domestic industries and export, after meeting domestic consumption requirements.

**White meat**

Improving 'white meat' production and value chains provide the solution to meeting 'all meat' requirements over the next 15 years. Improving 'white meat' production will require increased focus upon controlling Newcastle disease (ND) and African swine fever (ASF) in chicken and pigs, respectively, to increase productivity and meat production to help close the projected all-meat consumption gap projected in 15 years, and to help achieve food and nutritional security and enable red meat exports. In the without additional investment scenario, by year 2031–32, a deficit of 234,000 t of white meat is projected, thus resulting in a total all-meat deficit of two million t. However, industrializing white meat (chicken and pork) production (in large commercial scale operations), along with increasing processing for product transformation, as well as investment in improved family operations, with improved genetics, feeding and health services can lead to significant increases in production and lower domestic meat and egg prices, while enabling an increase in exports and foreign exchange earnings by providing surplus red and white meat which will enable red meat exports.

**Leather**

Hides and skins are by-products from ruminants and there is potential to produce 3.6 hide and 12.8 skins. The tanning industry in the country has the total installed capacity equivalent to 104 million square feet per year, which can utilise 86 % hides and 61 % skins country production. The leather sector, however, remains weak and most of the exports are in the form of traditional products, such as raw and wet-blue hides. Owing to the inadequate quantities and quality of raw hides and skins, tanneries are operating well below installed capacity. However, the expanding domestic and international markets point to immense investment potential for this sector. Efforts need to be made to increase the domestic supply of raw materials by among others, increasing the capability and scale of the small-scale industry to provide secondary markets for large firms and by supporting local entrepreneurs.

**Main conclusions of the TLSA**

- The projected gap in milk demand can be closed and a surplus produced through AI and synchronization, more and better feed, and health interventions addressing YASM.
- Due to 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, red meat production cannot be increased much over time.

- Emphasis for increasing beef production needs to be put on increasing on-farm fattening and commercial feedlots.
- Red meat from small ruminants cannot help much to close the meat gap due to their low numbers, in addition to the limited feed resources and low genetic potential of indigenous breeds.
- The huge projected deficit in demand for red meat is driven by very high human population and income growth and overwhelms any known supply-increasing technologies and strategies to increase production.
- Increasing white meat production, especially from chickens, is the key to closing the projected looming all-meat deficit.
- Pigs are prone to ASF and demand for pork is limited, hence it cannot be the sole priority solution for closing the all-meat gap
- Investment in chicken has the most potential to contribute to closing the meat demand gap and can enable export of red meat. However, domestic consumer preferences for white meat need to be promoted.
- Livestock genetic improvement priorities are 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 offtake of meat and dairy.
- The policy priority is on creating a conducive environment for investment in commercial meat and milk production and processing.
- Land allocation and ownership policies also need to favour the investments required to increase feed for meat and milk production.

# 2 Introduction

## 2.1 TLSA and LMP

The TLSA was carried out by a joint team from the Tanzanian MALF and the international ILRI LMP team. ILRI provided training and technical support to livestock experts and planning staff of MALF to help them develop the LSA, a quantitative, evidenced-based a 15-year sector strategy. The LSA in turn informed the development of a five-years investment plan or LMP whose implementation is meant to contribute to the further modernization of the livestock sector and help achieve the government of Tanzania's (GoT) societal development goals like reducing poverty, improving food and nutritional security, increasing employment of women and youth, and increasing national income or GDP. The training and technical work of the ILRI LMP team was funded by the BMGF.

The development of the LSA and LMP was overseen by a TAC convened under the auspices and oversight of the MALF livestock permanent secretary, Dr Maria Mashingo, and chaired by Madame 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 (CSO) and development partner agencies (see the TAC member list in the Acknowledgement section).

The LSA is a sectorial analysis (for the period 2016–17 to 2031–32) leading to a 15-year strategy that informs the development of the LMP. The elaboration of the LSA entailed first creating a livestock herd and economic sector model (HESM) using a set of quantitative tools from the LSIPT. This toolkit was developed by a group of international agencies[2] under the aegis of ALive at AU-IBAR. The HESM was then used to carry out a productivity and investment returns analysis of the present technical and economic performance of the sector, given current investments in technologies and policies, and then an analysis of the future potential of the sector to produce positive economic impacts on households, value chains, the livestock subsector, the agricultural sector, and the national economy given the economic contribution of potential interventions and new and additional investments over the 15-year period.

The LSA and LMP are based on available data from the Living Standards Measurement Study (LSMS) field surveys (World Bank 2013) and published literature, as well as expert opinions, validated through consistency tests. The development of the LMP entailed regular and open consultations with relevant technical experts, partners and other stakeholders to help ensure ownership by all relevant livestock sector stakeholders.

Data collection and quantitative diagnostics were supported by the continual involvement of key national livestock experts and consultations with a wide range of key stakeholders. The quantitative sector analysis to produce the LSA was undertaken with HESM, built by using the LSIPT developed by a team from the World Bank, CIRAD of France, and FAO, working under the auspices of the AU-IBAR. The methodology for the LMP was developed by ILRI by modifying LSIPT and other tools to perform a five-year analysis for investment planning.

With technical 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), CSOs etc.) and private-sector actors.

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

# 3 Livestock production systems in Tanzania

This section will summarize the livestock production systems in Tanzania, including the production and reproduction performance, distribution and product contribution of each species in the different livestock production systems.

## 3.1 Livestock production systems and subsystems

Livestock production systems can be classified using a number of criteria. In this study, the Tanzania livestock production system is classified based on the Seré and Steinfeld (1996) approach, which uses a combination of criteria and concept of farming system. According to FAO (2002), a farming system is defined as a group of farms with a similar structure, such that individual farms are likely to share similar production functions. Classifying livestock production systems based on farming system gives opportunity to study, classify and group production systems into challenge and opportunity zones and simplify planning of development options/interventions.

Based on Seré and Steinfeld (1996) and FAO (2002), livestock production systems in sub-Saharan Africa can be divided into grassland based, mixed rainfed and landless systems. The grassland-based system is further divided into pastoral and agro-pastoral while the mixed rainfed system is divided into semi-arid, subhumid, humid and highlands. Using similar approaches, the Tanzania livestock production system is classified into three livestock production zones, namely, Central, Coastal and Lake, and Highland (Table 1, Figure 1). The Central livestock production zone represents agro-pastoral and semi-arid production systems while the Coastal and Lake zone represents mixed rainfed-subhumid and humid production systems, and the Highland zone represents a mixed rainfed-highland production system. In addition to the three production zones, there is a commercial/specialized livestock production system which can extend across the production zones. Under the commercial/specialized production system, the urban and peri-urban dairy, feedlot, commercial swine, layer and broiler production systems are included.

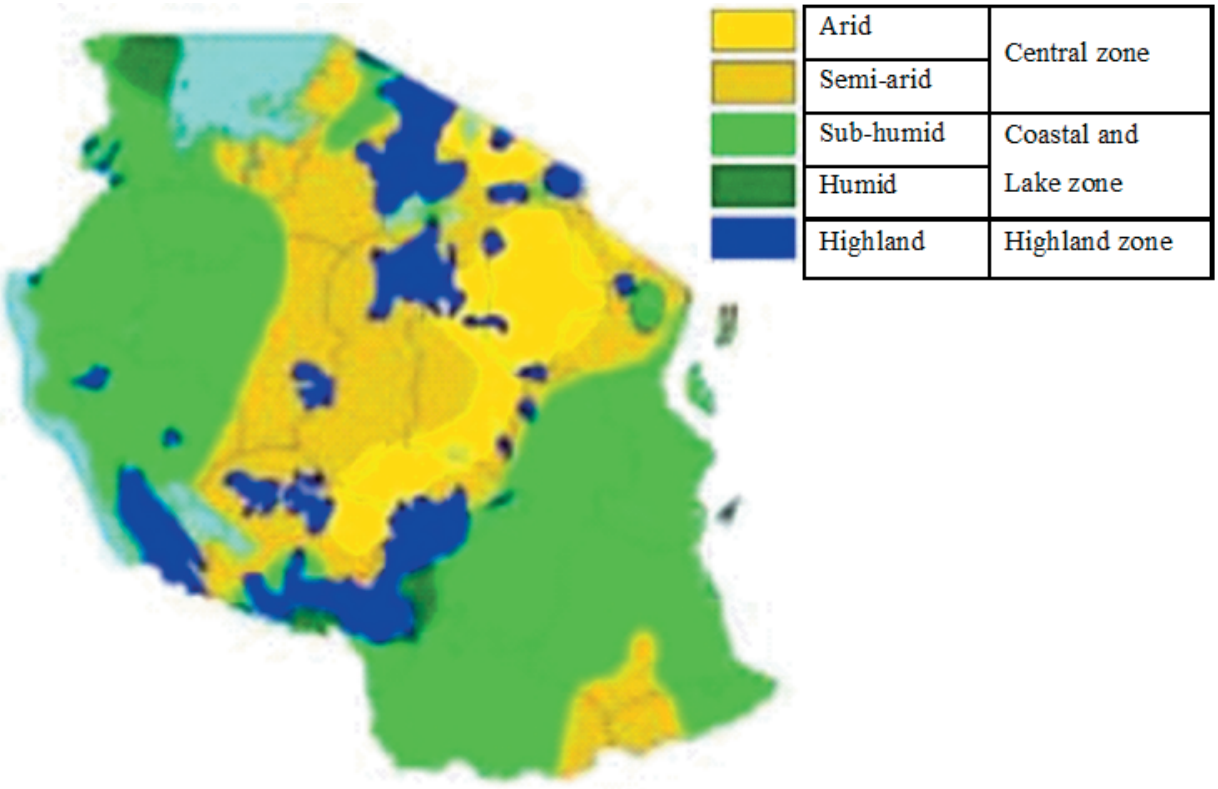
Table 1. Indicators for classification of traditional ruminant production systems in Tanzania

| Indicator | Central zone | Coastal and Lake zone | Highland |
|---|---|---|---|
| Length of growing period | 90–179 | 180–270 | 90–365 |
| Annual rainfall (mm) | 500–1,000 Uni-modal | 750–2,000 Bi-modal | 1,000–2,000 UM/BM |
| Altitude | 800–1,500 | 500–1,800 | >1,500 |
| Humidity | Low | High | Low |
| Species | Cattle, goats, sheep | Cattle, goats, sheep | Cattle, sheep, goats |
| Breeds[1] | Indigenous | Indigenous, exotic (+ to ++) | Indigenous, exotic (+++) |
| Major crops | Sorghum/millet/ cashew nut/cotton | Rice/sorghum/ sisal/cotton | Maize/coffee/tea/ wheat |
| Cultivation intensity | Low to moderate | Moderate to high | Very high |
| Tsetse challenge | Absent | Present | Absent |
| Livestock movement | Semi-sedentary | Sedentary | Sedentary |

Use of exotic (improved) breeds: +++ = very important, ++ = moderately important, + = some importance

Source: FAO 2002, FAO 2005, Arend Jan Nell et al. 2014, MALF production system classification.

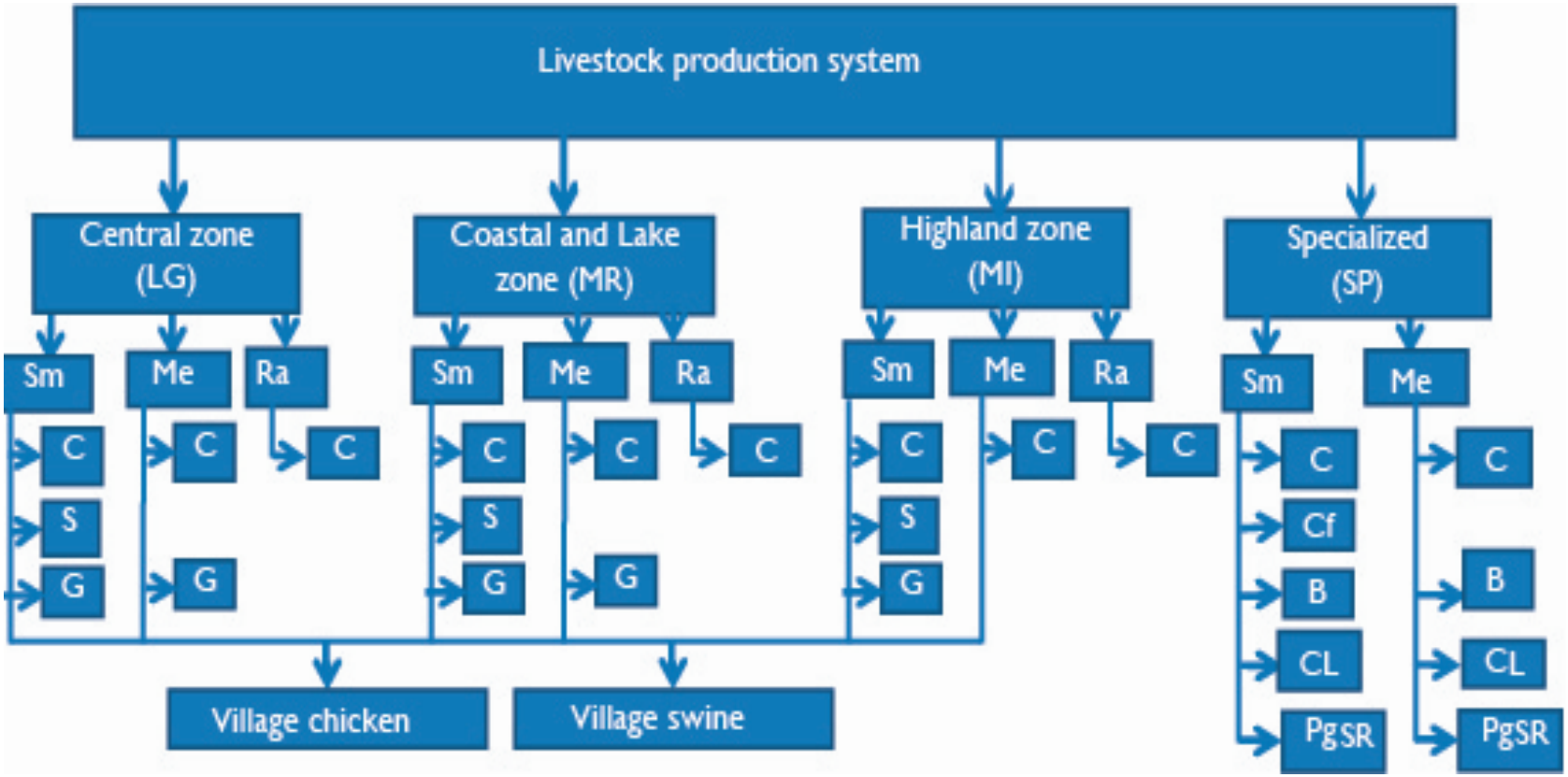
Figure 1 Tanzania livestock production zones.




Source: FAO 2005.

The three livestock production zones and the commercial production system are each subdivided into different species and flock/herd size groups (Figure 2). The species are cattle, sheep and goat while the flock/herd size categories are small and medium. For traditional/village chicken and swine, a uniform production system is assumed to persist throughout the country.

Figure 2. Livestock production system of Tanzania.




Key: B: broiler; C: cattle; Cd: Commercial dairy; Cf: cattle feedlot; CL: chicken layer; G: goat; Me: medium; Ra: ranch; S: sheep; Sm: small; PgS: commercial piggery

### 3.2 Distribution of livestock numbers over the different livestock production zones

The common livestock species in Tanzania are cattle, sheep, goat, swine, chicken and donkeys. Other species in the country include ducks, guinea pigs, turkeys, rabbits, camel and water buffalo which are considered less important to household income and food security as their numbers are fewer and held by fewer households.

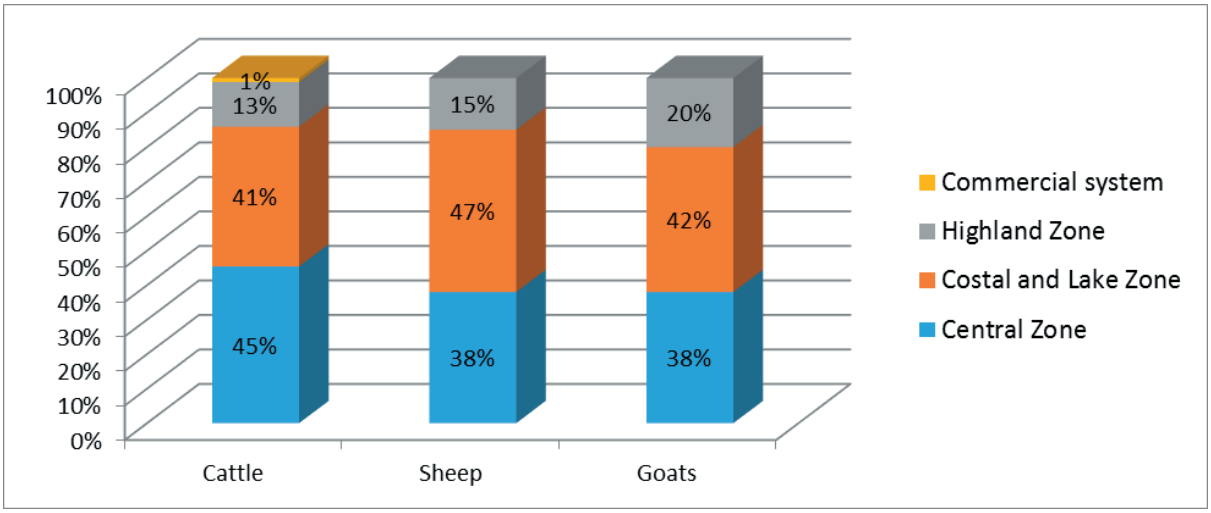
According to projections for 2016, based on two waves of surveys in 2010 and 2012, Tanzania has around 28.8 million cattle, 5 million sheep, 16.7 million goats, 71.4 million chickens, 1.99 million swine and 0.6 million donkeys (Table 2). Out of 28.8 million cattle, 45% are found in the Central zone while 42% and 13% are in the Coastal and Lake and the Highland zones, respectively. Sheep and goat, on the other hand, are more concentrated in the Coastal and Lake zone followed by the Central zone (Figure 3). The Highland zone has the lowest cattle, sheep and goat numbers, comprising 13%, 15% and 20% of the national livestock number, respectively.

Table 2. National livestock numbers and distribution over production zones/systems

| Numbers (heads) | National | Central zone | Coastal and Lake zone | Highland zone | Commercial system |
|---|---|---|---|---|---|
| Cattle | 28,829,230 | 13,092,480 | 11,677,318 | 3,736,557 | 322,875 |
| Sheep | 5,012,098 | 1,904,597 | 2,355,686 | 751,815 | NA |
| Goats | 16,672,786 | 6,335,659 | 7,002,570 | 3,334,557 | NA |
| Chickens | 71,418,048 | 33,274,048 | | | 38,144,000 |
| Swine | 1,988,826 | 1,586,970 | | | 401,856 |
| Donkeys | 572,357 | 572,357 | | | NA |
| Others | 4,539,665 | 4,539,665 | | | NA |

Source: Adapted from National Sample Census and expert opinion.

Figure 3. Cattle, sheep and goat per cent distribution over the different production zones.



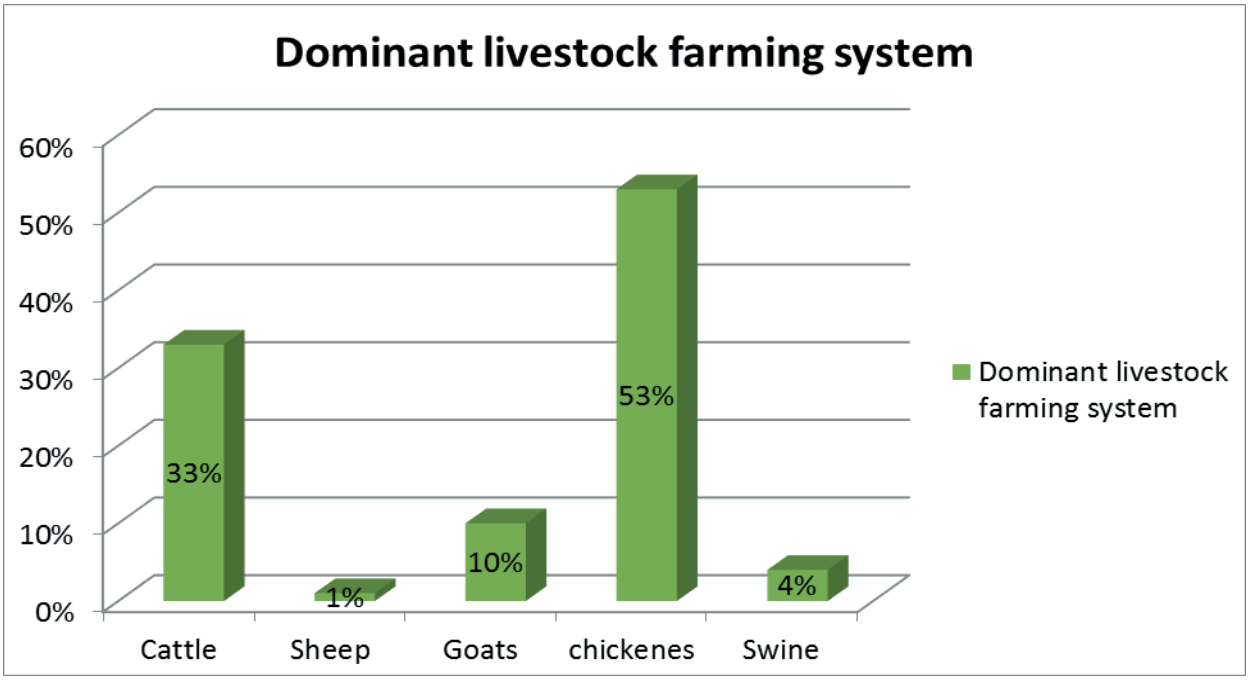

The total number of households that own livestock are around 4.5 million, 45.3% of the total households in the country. Most livestock-owning households obtain their highest income from chicken and cattle. The most dominant species in the household is chicken contributing the highest income in 53% of livestock-owning households. This could be due to the fact that many households their own chicken as a sole livestock. Around 33% and 10% of livestock-owning households obtain their highest income from cattle and goat, respectively. Sheep are the least important species and contribute the highest income in only 1% of livestock-owning households (Figure 4.).

Table 3. Number of households owning livestock and distribution over production zones/systems

| Dominant livestock farming system | National | Central zone | Coastal and Lake zone | Highland zone | Commercial |
|---|---|---|---|---|---|
| Cattle | 1,484,569 | 507,914 | 526,114 | 450,643 | 53625 |
| Sheep | 24,195 | 9,193 | 12,427 | 2,575 | NA |
| Goats | 440,363 | 75,842 | 269,257 | 95,264 | NA |
| Subtotal ruminants | 1,949,126 | 592,949 | 807,799 | 548,482 | 53,625 |
| Poultry | 2,400,034 | 2,365,534 | | | 34,500 |
| Swine | 189,473 | 188,037 | | | 1436 |
| **Total** | **4,538,633** | **986,889** | **2,298,007** | **1,217,904** | **89,561** |

Source: Adapted from National Sample Census and expert opinion.

Figure 4. Dominant livestock species in household income.




### 3.3 Livestock production parameters

The different livestock production and reproduction parameters are summarized for different species under each livestock production zone and system. The values of these parameters are obtained through review of the literature (research and national survey reports) and a panel of experts. Using the parameters listed in **Annex 1**, the baseline situation of the Tanzania livestock system is established.

***Cattle production parameters in the different production zones***

Production parameters of cattle in the different production zones are listed in Table 64, Table 65 and Table 66 in Annex 1. Parameters like parturition rate, mortality rate of juveniles and offtake rate of indigenous cattle in the three production zones range from 58–60%, 17–20% and 10– 13%, respectively. Daily milk production ranges between 1.5–2.0 litres with a lactation length of 180 days. The sub-Saharan and Kenyan average productivity parameters (Table A.1.2) indicate that the production system in Tanzania is more or less similar to the sub-Saharan region although the

parturition rate and offtake rate reported for Kenya (Onono et al. 2012 and IGAD 2012) looks higher than both the sub-Saharan (FAO 2002) and Tanzanian average values.

***Cattle production parameters in ranch and commercial dairy***

Cattle in ranch and commercial dairy production systems show better performance than cattle managed in the traditional production system. Parturition rate, mortality rate of juveniles and average offtake rate of cattle in ranches are 70%, 8% and 18%, respectively (Tables A1.3 and A1.4). Similarly, the commercial dairy production system shows very high performance in terms of production and reproduction parameters with parturition rate of 70%, juveniles mortality rate of 8–10% and offtake rate of 22%. The daily milk production in the commercial dairy ranges from 8–9 litres with a lactation length of 300 days (Table A1.4). This performance is more or less similar to many sub-Saharan African countries although smaller than countries like Uganda, Lesotho and Sudan (Gillah et al. 2012). Milk production cow/day in many sub-Saharan African countries ranges between 5–12 litres/day (Ndambi et al. 2007) and 5.7–17.1 litres/day (Gillah et al. 2012). The parturition rate of crossbred cattle in the commercial dairy system of Eastern African countries ranges between 65–90% (Gillah et al. 2012).

***Goats and sheep production parameters***

Similar to traditional cattle, production parameters of indigenous goats and sheep indicate the potential for further improvement of the system. Parturition rate, mortality rate of juveniles and offtake rate of indigenous goats in the traditional production system is 1.3%, 17–21% and 25–32%, respectively (Table A1.5). Similarly, parturition rate, mortality rate of juveniles and offtake rate of indigenous sheep is 1.3%, 28–30% and 26–33%, respectively (Table A1.6).

***Chicken productivity parameters***

The chicken production system is mainly divided into traditional (village chicken) and commercial productions. The commercial chicken production encompasses layer and broiler systems. The average number of eggs laid/hen/year in village chicken production is 50 with a laying period of 24 months. The average slaughter weight and dressing percentage of village chicken is around 1.1 kilogram (kg) and 68%, respectively.

Although village chickens produce very low total income per hen compared to total income per bird of commercial chickens, the net income per hen is not bad compared to the net income per bird of commercial systems (Table A1.7). Due to the brooding behaviour of hens, the flock size in village chickens is counted by using the number of hens. A hen in a village chicken system has around eight followers (chicks, cockerels, pullets and chooks). The high number of followers per hen and the very small input cost in village chickens produces unexpectedly high net income per hen. Layers and broilers, on the other hand, have high productivity but also high input cost. Layers produce 268 eggs per year and can start laying when they reach five months old. Broilers also have very high growth rate and can reach a slaughter weight of 1.9 kg by two-and-a-half months.

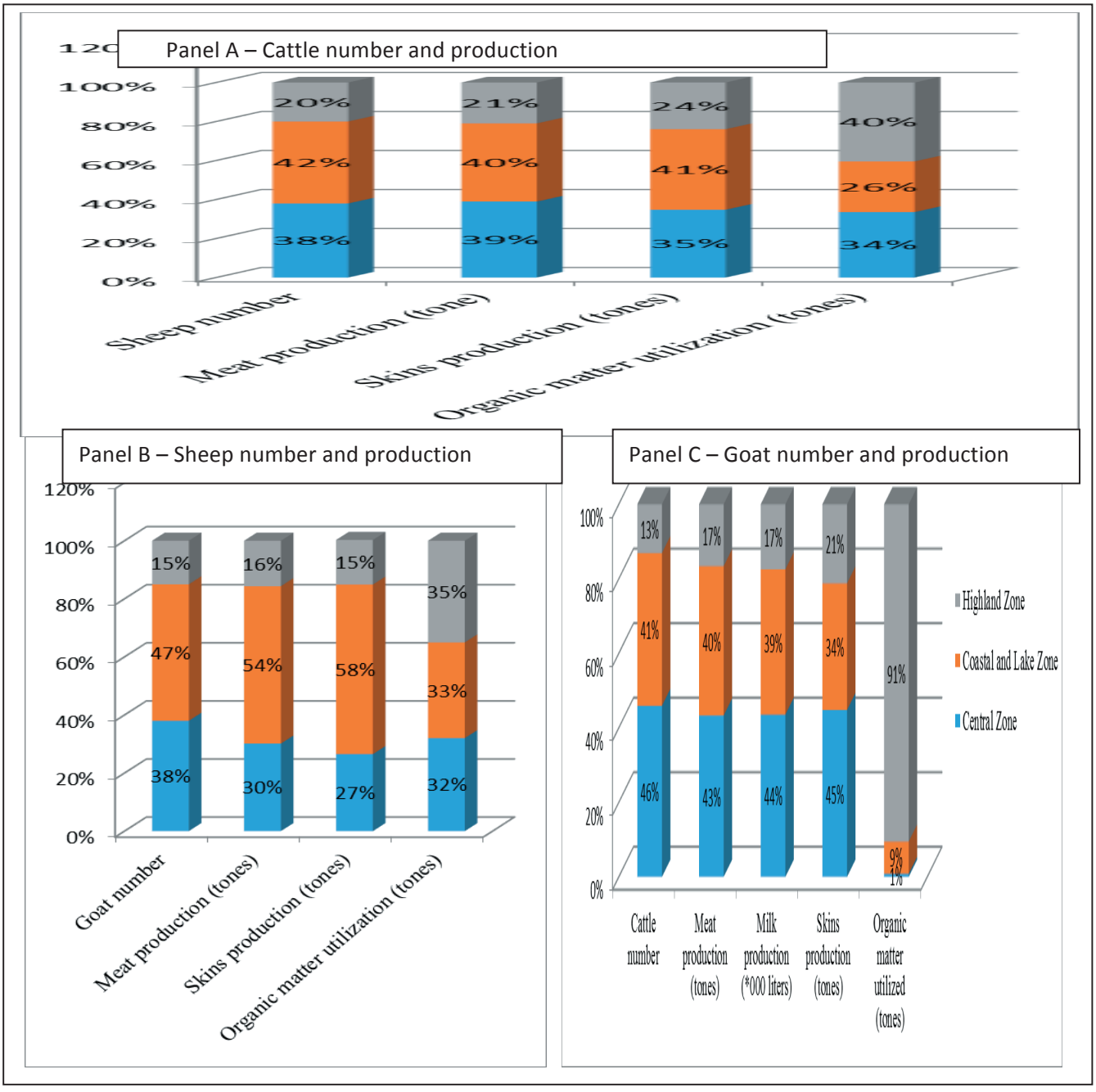
***Pig production parameters***

The two main pig production systems in Tanzania are village and commercial systems. The village piggery is divided further into two size categories, small- and medium-size village piggeries. Small-sized village has the lowest productivity performance. The litter size per sow in small village piggery is about 6 while litter size per sow is 10 for medium-size village and commercial piggeries. Mortality rate of young pigs is 20%, 12% and 11% for small village, medium village and commercial piggeries, respectively (Table A1.8).

### 3.4 Distribution of livestock products over the different livestock production zones

Distribution of livestock products like cow milk, beef, mutton and goat meat and distribution of livestock numbers over the different livestock production zones show a very similar pattern. Exceptionally, the amount of organic matter used in the household indicates a different pattern, being highest in the Highland, where the livestock number is the lowest (Figure 5). This could be due to much use of organic matter for cultivation in the Highland production zone.

Figure 5. Contribution of the livestock production zones to the national cattle, sheep and goat numbers and production.



The comparison of per head production of cow milk and beef of Tanzania with some African countries shows that Tanzania is among the lowest producers. Next to Ethiopia, Tanzania is the lowest in terms of per head production of cow milk and beef (Table 4).

Table 4. Comparison of per head production of cow milk and beef of Tanzania with some East African countries

| | Production | | Production/total cattle number | | Remark |
|---|---|---|---|---|---|
| | Cow milk | Beef | Cow milk | Beef | |
| Kenya | 3,750,000 | 425,000 | 206.74 | 23.43 | |
| Rwanda | 188,000 | 35,318 | 166.04 | 31.19 | |
| United Republic of Tanzania | 1,921,640 | 299,581 | 78.33 | 12.21 | |
| Uganda | 1,207,500 | 199,008 | 92.99 | 15.32 | |
| Ethiopia | 4,000,000 | 340,750 | 74.07 | 6.31 | |

Source: FAOSTAT September 2014.

# 4 Livelihoods and poverty within livestock-keeping households

## 4.1 Livestock in Tanzania

Tanzania is an agricultural country in which agricultural activities generate 70% of the total income for rural households. Tanzania has one of the largest livestock populations in Africa and according to the 2012–13 National Panel survey, 4.6 million households, 62% of which are rural and 23% urban, own livestock with ownership patterns dominated by chickens (86%), goats (48%), cattle (35%), pigs (9%) and other livestock (10%) (TLMI 2015, LSA 2016).

The GoT recognized the importance and potential of the livestock sector for poverty alleviation, food security enhancement, employment creation and environment conservation a decade ago and made a clear commitment for its improvement when it approved the National Livestock Policy. In 2006, the government ratified a National Livestock Policy based on the premise that 'the livestock industry has an important role to play in building a strong national economy and in the process, reducing inequalities among Tanzanians by increasing their incomes and employment opportunities' (URT 2006). The policy also recognizes that aside from contributing to gross domestic product (GDP), the livestock sector has a role to play in i) ensuring food security, ii) providing households with employment, income, and a store of value and investment opportunity, iii) providing draught power and manure for sustainable agriculture, and iv) fulfilling cultural roles.

The report in this section presents an analysis of livelihoods, poverty and food security among livestock-keeping households in mainland Tanzania using the LSIPT.

The main purpose of the analysis is to:

- Assess the wellbeing of the households directly involved in livestock production within the different livestock farming systems;
- Identify the situation with regard to income, poverty, food security and nutrition security that affect their living conditions, for each type of household;
- Assess the volume of jobs provided by the livestock sector at production level; and
- Estimate the per cent of poor livestock-keeping households by production zone and nationally.

Results from above could help decision makings in policy and technology to increase productivity of the sector, reduce poverty and improve the wellbeing of livestock-keeping households.

Data from the 2011–12 NBS-LSMS survey was used to analyse the household economy in the three livestock production zones, Central, Coastal and Lake and Highland using the LSIPT. Households with at least one animal (cattle, goat, sheep, pig or poultry) were selected and organized into three groups under the three production zones. The household and livelihood analysis included 432 households in Central, 1,110 in Coastal and Lake, and 471 in Highland.

It is believed moisture and temperature influence production and productivity of livestock across the three production zones. Individual livestock income was calculated based on the individual livestock assets (for each species) coming from the household survey multiplied by average production values generated from the LSIPT projections. Based on literature and expert opinion; estimates of average costs and revenues for each production system were generated to compute the net incomes.

For detail analysis and to capture variations among the different groups of livestock-keeping households, further household groupings were made using two main criteria based on the dependency level of households on livestock for income and for their main livelihood activities. Based

on these classifications the contribution of livestock production to the total household income, poverty reduction, employment generation and food and nutrition security in terms of calories and protein requirements in the household consumption, were measured and evaluated. This was done for each group of livestock-keeping households in the three livestock production zones. In summary, the following are analysed at the household level:

- Diversity of household sources of income from livestock production (species, products)
- Major livelihood activities practiced by livestock-keeping households
- Incidence and depth of poverty among livestock-keeping households
- Livestock production contribution to poverty reduction
- Livestock production contribution to the total household income
- Livestock production contributions to food and nutrition security
- Livestock production contribution in salaried and family employment

## 4.2 Main results

**Grouping of livestock-keeping households**

These are 4.5 million households in Tanzania who keep at least one or more livestock species that include cattle, sheep, goats, poultry and swine (LSA 2016). If holdings of other livestock species such as ducks, guinea fowls, donkeys and equines were considered, the number of livestock-keeping households in mainland Tanzania will be much higher than the estimated 4.5 million. In the LSIPT, similar to the classification of the national livestock population, livestock-keeping households are defined broadly according to the main livestock production zones Central (Cn), Coastal and Lake (C&L) and Highland (Hi). This helps to capture variability in household and livestock performances as a result of unique features in each zone, such as rainfall, temperature, marketing and other services.

Table 5. Livestock-keeping households by production zone

| Production zones | Number of livestock-keeping households |
|---|---|
| Cn | 985,946 |
| C&L | 2,294,927 |
| Hi | 1,212,755 |
| National total | 4,493,628 |

As shown in the table above, more than 50% of livestock-keeping households are found in the Coastal and Lake zone followed by Highland 27% and Central 22%. It is evident that livestock keeping is an important economic activity for many people in all production zones.

Livestock-keeping households face different constraints and opportunities related to the main species they keep. Cattle keepers may be different from poultry farmers in terms of their production, marketing constraint and available opportunities for improvement. To capture variations that originate from holdings of specific species and to properly target and refine investment options, two methods which are based on the dominance concept (discussed below) were used in the LSIPT to group livestock-keeping households into different categories in each livestock production zone.

a) Dominance based on livestock income

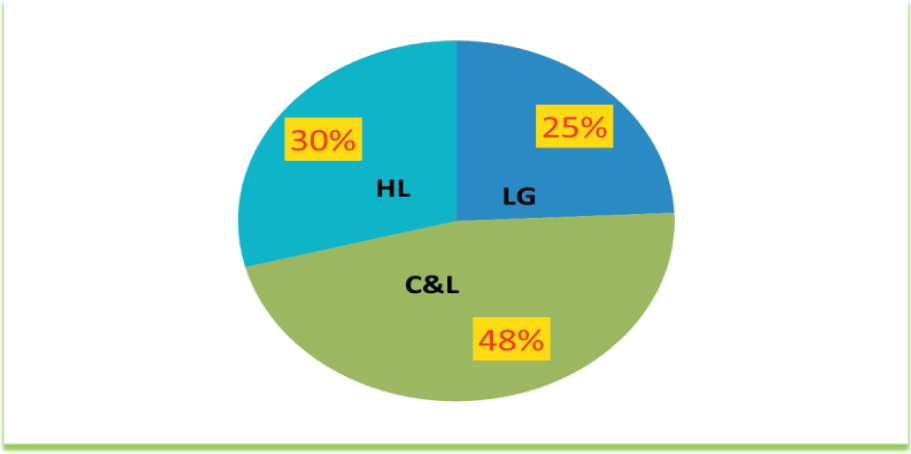
In rural areas, most households keep mixed herds comprising several species of animals to generate income and make a living. In the LSIPT, the income dominant livestock farming system is defined as ‘the species that contributes the highest share of the household livestock (cattle, sheep, goats, pigs and poultry) income’. The dominant species with its herd/flock size was used to determine the

household grouping. This will help to identify and determine the proportion of households at national level that have the same dominant livestock farming system and are likely to share the same constraints and options for improvements. This makes it easier for decision-makers to determine what, how and where to target and tailor livestock technology and policy investments to improve the living conditions of livestock keepers.

Nationally, it is cattle and poultry, which are the most important livestock income-generating activities for households. Cattle is the highest income generator for most households in the Central followed by the Highland and Coastal and Lake zones (Annex 3 Table 76).

Surprisingly, most livestock-keeping households (61%) in the Coastal and Lake zone obtain their highest livestock income from poultry. This is due to the fact that a large number of livestock-keeping households (48%) in C&L own only poultry, no other livestock species, hence the only and the highest household livestock income comes from poultry. Moreover, about 60% of poultry-dominant households are found in the Coastal and Lake zone.

Figure 6. Poultry-only keeping households (adapted from LSMS data).




As shown in the chart above, although poultry-only keeping households are found in the C&L, their number is quite significant in the other zones as well. This finding coincides with the huge (86%) dominance of poultry in livestock ownership pattern in mainland Tanzania (TLMI 2015). Sheep and swine are the smallest contributor to household income in all production zones. Less than one per cent of livestock-keeping households in all zones are obtaining their highest livestock income from sheep.

Based on livestock-income dominance, cattle and poultry are the high livestock-income generators for households in all production zones. These findings can contribute to determining policy and technology directions in setting priorities for livestock investment interventions.

b) Dominance based on livelihood activity

Livestock keepers earn their livings through diversified economic activities. It is noted that three-fifths of rural households earn income from livestock husbandry, while 97% cultivate crops and approximately one-fifth are employed as agricultural wage labourers (URT 2006). In the LSIPT, livelihood-based household grouping considers 'the livelihood activity that contributes over 50% of the total household income as dominant or main household livelihood activity'. Four livelihood activities were considered in the grouping.

i. Livestock producer: if the income from livestock production constitutes over 50% of the total household income
ii. Crop cultivator: if the income from crops represents over 50% of the total household income
iii. Off-farm: if the off-farm income constitutes over 50% of the total household income
iv. No dominant or mixed: if none of the activities (livestock, crops or off-farm) are producing more than 50% of the household total income.

Table 6. Livestock-keeping households by dominant livelihood activity

| Production zones | Households livelihood activity | | | |
|---|---|---|---|---|
| | Livestock producers | Crop cultivators | Off-farm | No dominant activity |
| Central | 64% | 12% | 19% | 5% |
| Coastal and Lake | 30% | 26% | 37% | 7% |
| Highland | 37% | 26% | 30% | 7% |

The 'no dominant' group is not significant. More than 90% of households in the three zones earn over 50% of their total income from one main activity.

As shown in Table 6, it was not a surprise to see that livestock is the major livelihood activity that generates more than half of the household income for most of the households in the Central zone. Given the aridity of the environment in the Central zone, the land is more suitable for livestock production than crop cultivation and it is rational for most residents to rely heavily on livestock for their livings. It is interesting, however, to see that off-farm activities are more important than cultivation in the Central zone. It is often argued and taken as a conventional truth that opportunities for off-farm activities are limited in pastoral areas in Africa, hence herders' involvement in non-livestock activities are constrained and force them to engage in widespread, unsustainable cultivation and harvesting and selling of fuel wood to complement their income from herding. The observations depict a different story in Tanzania. About a fifth of the livestock-keeping households in Tanzania are getting more than 50% of their household income from off- farm activities.

The nearly even distribution of the three major forms of livelihood activities in the Highland and Coastal and Lake zones is an indication of how much livestock-keeping households in these zones are diversified in their income-generating activities. Off-farm activity is as important as livestock production and cultivation in these zones. It is believed that such diversified livelihood activities strengthen risk management and climate change adaptation capacity of households. In general, the analysis revealed that in all the three production zones, a substantial number of households rely on off-farm activities to generate more than half of their total household income.

This has implications in targeting investment in these zones to enhance growth and food security. Such efforts require technology and policy investments that address all in an integrated manner. Investments that improve productivity and production of crop and livestock are necessary but not sufficient to bring change if investment is not equally targeted to skill and entrepreneurship development to help households' engagement in better paying and high return off-farm activities. In general, it is reasonable to conclude that when development or growth of livestock-keeping households is thought of in mainland Tanzania, one has to look beyond livestock. It should integrate crop and off-farm activities in its development planning.

**Livestock-generated income**

The EcoRum in the LSIPT imposes average values of yield using a 20-year period production projections and cost estimates to establish average net income per animal for the baseline years. From the LSIPT financial performance analysis of the livestock system, the average annual net income per animal for the various livestock systems and herd/flock sizes has been computed as shown in Table 7 below. These are the values which are used to compute household income from livestock. The same values are used to compute the contribution of livestock to the GDP.

Table 7. Average net annual income per animal

| Livestock farming system | Net income per animal (TZS) | | |
|---|---|---|---|
| | Central | Coastal | Highland |
| Cattle | | | |
| Small | 78,211 | 84,590 | 116,613 |
| Medium | 75,365 | 79,399 | 94,528 |
| Ranch | 113,439 | 120,340 | 129,157 |
| | | | |
| Sheep | | | |
| Small | 9,621 | 16,995 | 14,246 |
| | | | |
| Goats | | | |
| Small | 12,466 | 14,439 | 18,155 |
| Medium | 14,307 | 12,899 | |
| | | | |
| Poultry | | | |
| Small | 53,206 | 53,206 | 53,206 |
| | | | |
| Swine | | | |
| Small | 362,734 | 362,734 | 362,734 |
| Medium | 1,020,742 | 1,020,742 | 1,020,742 |
| | | | |
| Specialized dairy | | | |
| Small | 266,593 | | |
| Medium | 529,671 | | |
| | | | |
| Feedlot fattening | | | |
| Small (30 heads)/place | 252,840 | | |
| | | | |
| Specialized poultry | | | |
| Layers | 18,422 | | |
| Broilers/place | 10,046 | | |
| | | | |
| Specialized swine | | | |
| Fattening/reproductive female | 978,116 | | |

As shown in Table 7 above, for ruminant livestock in the extensive system, net income per animal is the highest in Highland followed by Coastal and Lake and last is Central.

Cattle on ranches in all three zones perform better than the household-owned traditional cattle. Relatively, there is better management and provision of improved animal health services in ranches than in traditional household cattle. With additional improvement in management and optimum use

of grazing resources on the ranches, performance of ranch cattle could increase substantially (LMP team background paper on ranches in Tanzania 2016).

The net income per cattle in the specialized fattening and dairy systems are three to seven times higher than the average net income per cattle in the extensive system, including ranches. This is a result of improved breed, feed and better animal health and marketing services in the specialized systems. The big difference in per cattle income among traditional, ranches and specialized may drive the future cattle industry in Tanzania to be predominantly ranching and specialized systems (dairy and feedlot).

According to the table above, the annual net income per hen with eight followers in the traditional system is three to six times higher than the net income per sheep and goats in all systems. This means that a hen with eight followers generates more income than three to six sheep or goats. Traditional poultry is less expensive to own than sheep or goats. The low initial capital needed to start traditional village poultry farms coupled with its high return makes it a more attractive business for smallholder farmers and women. That may be one of the reasons why livestock ownership in Tanzania is dominated by chicken in which 86% of livestock-keeping households own` chicken. Because of the payoff, poultry distribution is one of the preferred rehabilitation investment activities of NGOs following disasters and for poverty reduction in some cases, especially among women. However, health management, in particular ND vaccination, is critical for the success of poultry farms.

According to the results from the LSIPT analysis, income per swine with six followers generates good income which is much higher than ruminants and even poultry. Although it requires space and good animal health management, especially vaccination against swine fever, swine has a potential in Tanzania in general and in the Highland zone in particular for complementing and boosting households' income above the poverty threshold in a short period of time as swine reproduce quickly.

**Poverty among livestock-keeping households**

This section discusses the extent and depth of poverty among livestock-keeping households in mainland Tanzania across the three livestock production zones (Cn, C&L and Hi). Using the LSIPT poverty analysis tool and the household data from LSMS 2011–12, incidence and depth of poverty were measured and using the Gini coefficient inequalities in wealth distribution calculated for households grouped by their main livelihood activities and main (dominant) livestock farming system in each production zone. Incidence of poverty captures the proportion of the population whose income or consumption is below the poverty line. On the other hand, depth of poverty measures how far households are from the poverty line. Depth of poverty is an important indicator of resources and efforts needed to lift up poor households above the poverty line. 'Too deep' implies a prevalence of 'poverty trap'. The Gini index measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of zero represents perfect equality, while an index of one implies perfect inequality.

For this analysis the official national monetary poverty line of the GoT, which is TZS437,784/adult equivalent was used to compare against per capita income of the diverse group of livestock-keeping households.

### Poverty incidence and depth by main livelihood activities

This section discusses poverty as it appears among households grouped based upon their main livelihood activities to show which households with which main livelihood activities are the most hit by poverty.

Table 8. Incidence of poverty by main household livelihood activity

| | Central | | C&L | | Highland |
|---|---|---|---|---|---|
| | Incidence | Depth | Incidence | Depth | Incidence | Depth |
| Total | 88% | 0.57 | 84% | 0.19 | 83% | 0.48 |
| Households according to type of activity | | | | | | |
| No dominant | 86% | 0.54 | 91% | 0.09 | 96% | 0.58 |
| Livestock producer | 84% | 0.49 | 88% | 0.11 | 90% | 0.48 |
| Cultivator | 86% | 0.63 | 87% | 0.20 | 85% | 0.47 |
| Off-farm activities | 88% | 0.61 | 72% | 0.19 | 68% | 0.41 |
| Gini coefficient | 0.476 | | 0.599 | | 0.523 | |

As shown in the above table overall the poverty incidence among livestock-keeping households across all main livelihood activities is extremely high. The highest poverty incidence was observed in Highland (96%) among households with no dominant activity. The lowest is 68% in the same zone but among off-farm activity-dominant households. In the Central zone, the incidence across all four livelihood activities is in the 1980s. In the Coastal and Lake zone, the highest is 91% among the no dominant-activity households and the lowest is 72% among off-farm activities-dominant households. If all livestock-keeping households in the three zones with different livelihood activities were taken together, it can be concluded that at least 8 households out of 10 are below the national poverty line. The poverty level is also too deep across all livelihood activities in all zones.

The wealth distribution among households across all livelihood activities is skewed. The lowest Gini coefficient of 0.476 was observed among households in the Central and the highest 0.599 in the Coastal and Lake. Both values indicate skewedness in wealth distributions and inequalities in the income structure (a Gini coefficient closer to one means greater inequality in wealth distribution). This is an alarming finding that requires serious attention by GoT.

Poverty is widely spread and deep in all livestock farming systems across all the production zones. However, it is worst in the Central and in all non-cattle farming systems. The highest poverty incidence was observed (85–100%) in goat, sheep and poultry-dominant households (Annex 3, Table 77). This was not a surprising finding as it is the poor and the disadvantaged such as women and youth who heavily depend on poultry and small ruminants (as they are small capital investments) for their livelihoods. The poverty incidence and depth are lower among medium-size (75–112 heads/household) cattle-dominant households.

The overall poverty incidence among livestock keeping (83–88%) is way above the national average of 28%. It is obvious that policy and technology interventions to address poverty among livestock-keeping households in Tanzania require immediate action and it requires an integrated approach to

deal with incidence, depth of poverty and inequality in wealth distribution at the same time. This is a huge task.

**Other contributions of livestock**

One way of understanding the importance of livestock to the household economy is to estimate its financial/income contribution as a per cent of the total household income. The more its contribution, the higher will be its importance. The livestock income contribution is analysed using the two dominance groupings, i.e. by dominant livelihood activity and by main livestock farming system.

***Contributions of livestock income to total household income by main livelihood activities***

Households in all of the production zones which are grouped as 'livestock producers' derive 65–75% of their total household income from livestock production. It is only 25–35% of their total household income that comes from other livelihood activities including cropping and off-farm activities. This is why they are more vulnerable to shocks that affect livestock production than households in the other categories. A drought that kills livestock can easily destabilize their livelihood and make them succumb to food insecurity. The general picture depicts that all households in the Central, Coastal and Lake and Highland zones obtain 58%, 36% and 37% of their total household income from livestock production, respectively. This further demonstrates how critical livestock income is for households in all zones to make a secure livelihood.

***Contributions of livestock income to total household income by livestock farming systems***

In all production zones, livestock is a major contributor to the household income. In particular in medium-size cattle-dominant households, 76–96% of their total income comes from livestock. For medium-size swine-dominant households, 52–73% of household total income comes from livestock (Annex 3 Table 78). Livestock income is important to all livestock- keeping households, but it is critical to cattle-dominant and medium-size swine-dominant households.

Any fall in livestock income affects the livelihoods of the livestock-keeping households significantly. This has implications in planning livestock investment interventions both in normal seasons and before and after drought that often hits the Central zone.

***Contributions of livestock to poverty threshold***

Contributions of livestock towards meeting the household poverty threshold (TZS437,784) were also calculated. This was done based on the two groupings of dominance. This helps to understand the importance of livestock in household poverty reduction (Table 9).

Table 9. Contributions of livestock to poverty threshold by main livelihood activity

| | | Livestock income/poverty line | | |
|---|---|---|---|---|
| | | Cn | C&L | Hi |
| No dominant | | 13 | 19 | 13 |
| Livestock producers | | 30 | 28 | 27 |
| Cultivators | | 14 | 8 | 9 |
| Off-farm | | 6 | 5 | 9 |
| Total | | 24 | 12 | 16 |

Households in all zones grouped as 'livestock producers' generate a third of what is needed to meet the poverty threshold from livestock. These are high contributors compared to the other three groups. All livestock-keeping households of the different livelihood groups cannot generate enough income from livestock only to meet or cross the poverty threshold.

***Contributions of livestock to poverty threshold by main livestock farming system***

Small-size herd/flock-dominant households acquire too little income from livestock farming to meet the poverty threshold. It is as low as 3% in sheep dominant households. Medium-size cattle and swine-dominant households obtain little more than a third of the income needed to meet the poverty threshold from livestock (Annex 3, Table 79). On average, all livestock-keeping households do not meet the poverty threshold from income they generate from livestock only. This implies that those households who have attained the poverty threshold or above are getting additional income from elsewhere, off-farm or cultivation.

***Contributions of livestock to total employment by main livelihood activity***

Livestock provides employment for people. It is a source of employment for millions of family labourers and hired external labour in Tanzania (Table 10).

Table 10. Livestock-generated employment per household by livelihood activity (pers/month/year)

| Dominant livelihood activity | Central | | | | Coastal and Lake | | | Highland | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Internal | External | Total | | Internal | External | Total | Internal | External | Total |
| No. dominant | 1.87 | 0.50 | 2.37 | | 4.53 | 1.40 | 5.93 | 3.74 | 1.92 | 5.66 |
| Livestock producer | 14.66 | 1.54 | 16.20 | | 8.77 | 1.83 | 10.60 | 9.89 | 1.90 | 11.79 |
| Cultivator | 2.94 | 0.75 | 3.68 | | 1.04 | 0.43 | 1.47 | 2.23 | 0.54 | 2.77 |
| Off-farm activities | 1.25 | 0.28 | 1.53 | | 0.56 | 0.46 | 1.02 | 1.14 | 0.78 | 1.92 |
| Total average | 8.55 | 1.02 | 9.57 | | 2.30 | 0.72 | 3.02 | 4.01 | 1.0 | 5.01 |

As expected, households grouped as 'livestock producers' in all production zones generate the highest livestock-related labour. The Central zone 'livestock producer' households which generate 16.20 pers-month/household/year lead the rest, i.e. Highland is 11.79 and Coastal and Lake 10.60. In total and across all livelihood activities, average livestock-related labour contribution in Central produces 9.57 pers-month per year per household, 3.02 in Coastal and Lake and 5.01 in Highland. Central produces twice as much as Highland and three times that of Coastal and Lake. If one considers the total number of livestock-keeping households, Central absorbs 786,293 full-time workers for the whole year (Table 11).

Table 11. Total labour generated by livestock-keeping households at production stage

| Household type | Cn | C&L | Hi |
|---|---|---|---|
| Total number of livestock-keeping households | 985,946 | 2,294,927 | 1,212,755 |
| Total average labour (per-month/year)/household | 9.57 | 3.02 | 5.01 |
| Total full-time labour per year | 786,293 | 577,557 | 506,325 |

The entire sector generates 1,870,175 full family jobs and hired labour at the production stage. This does not include the jobs created across the livestock value chain. The hired labour constitutes 14% of the total. Forty-two per cent (42%) of the total labour is contributed by Cn. The highest labour contribution comes from the cattle-dominant farming system. Cattle-dominant households absorb one to six persons for 12 months. See details in Annex 3, Table 80.

As shown in Table 4, surprisingly, medium-size swine systems in the Coastal and Lake zone absorb five persons per month/household for the whole year. It is only 20% (one person/household) of the required labour that comes from the family. The remaining 80% is hired external labour. It is speculated that most of the owners of the medium-size swine are government civil servants, retired officers and other part timers who are reluctant to use family labour for the operation. There is a potential for this sector to grow.

***Food security***

LSIPT analyses livestock contributions to household food and nutrition security using protein and calories that come from the different livestock species as indicators to estimate the contributions.

Table 12. Livestock contribution to household food security in terms of calories and protein

| | Central | | | Coastal and Lake | | | Highland | |
|---|---|---|---|---|---|---|---|---|
| Livelihood activity | Calories | Proteins | | Calories | Proteins | | Calories | Proteins |
| Mixed | 9% | 6% | | 2% | 6% | | 1% | 2% |
| Livestock producer | 7% | 22% | | 5% | 16% | | 1% | 5% |
| Cultivator | 8% | 5% | | 1% | 1% | | 1% | 1% |
| Off-farm activities | 7% | 1% | | 2% | 1% | | 1% | 1% |

As shown in Table 12 in all livelihood situations and across all three production zones, the contribution of livestock towards the household calories and protein requirements is low. However, it is relatively higher among the groups classified as 'livestock producers'. This is true across the three zones. For example, in the Central zone, a quarter of households' protein requirements is obtained from livestock. Livestock contributions to household calories and protein requirements are the lowest in Highland where holdings/household and total livestock population are the lowest. Access to other sources of protein and calories is essential in all the zones but critically important in the Highland zone.

# 5 Value Chain Assessment

LSIPT was used to carry out an assessment of the livestock value chains in Tanzania, entailing mapping of the value chains and subchains and an analysis of the price structure or price changes and gross margins (GM) along the value chains. First, the value chains and important subchains were identified and mapped. Then, for the value chain descriptions, the production entering each subchain was derived from the EcoRum production assessment for each typology of livestock production zones minus the home consumption and direct sales to neighbours. This estimate of the total production entering each subchain was compared with information from other secondary sources to arrive at the estimate used in the analysis of price changes and value addition. Finally, the incentives along the subchains were analysed by assessing percentage price increases at each stage in the chains and the GM. The GM realized by each value-chain actor are the margins before costs are deducted for products sold at each stage in the chains. The main results of the value chain analysis are summarized here for selected value chains. The details of the assessment are provided in the text, tables and maps.

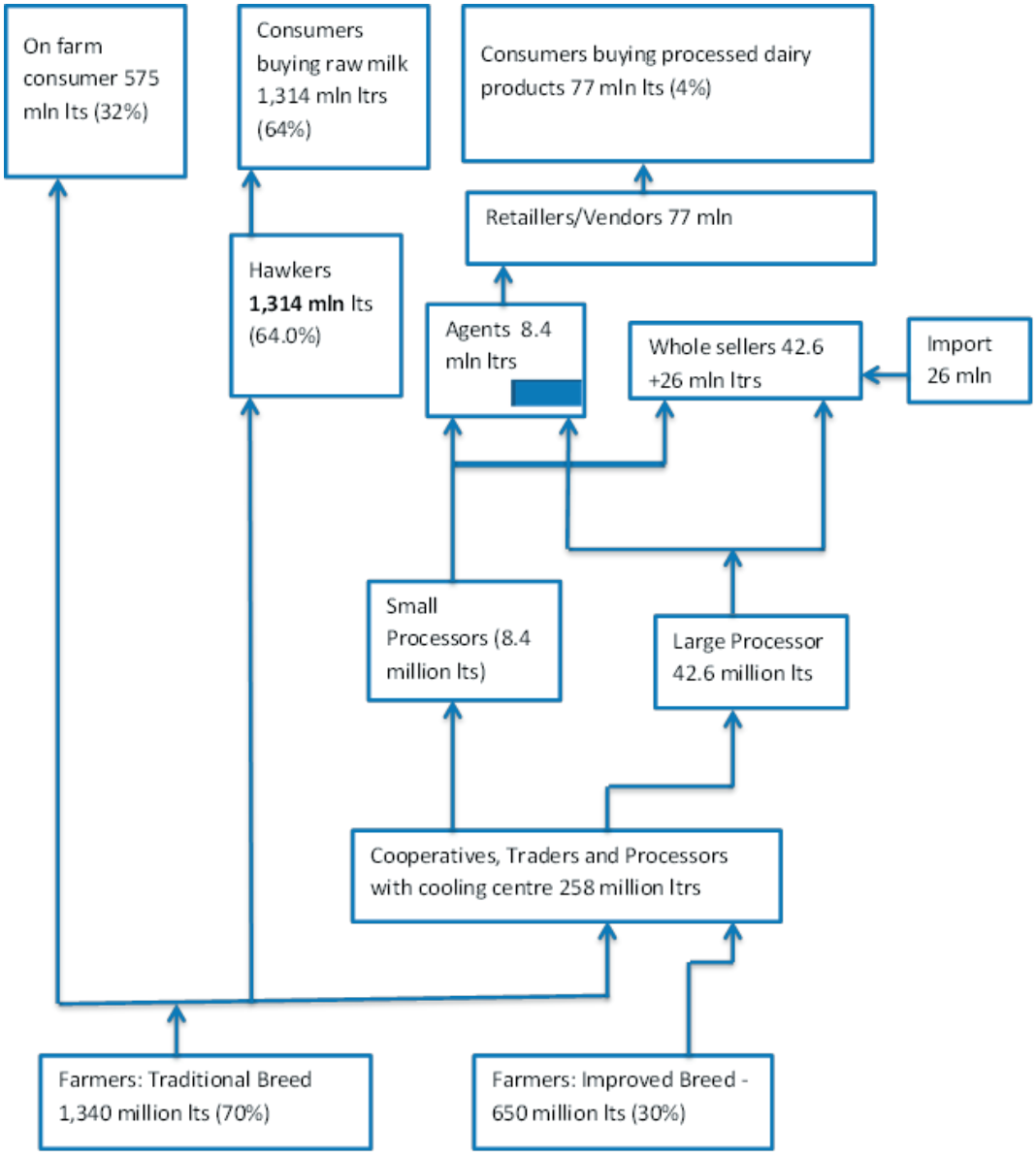
## 5.1 Dairy value chain and subchains (formal and informal)

The map of the major dairy subvalue chains for domestic and import markets in Tanzania are summarized in the value chain map (Figure 7). There are two major milk subchains: milk from indigenous breeds 70% and milk from improved breeds 30%. The market intermediaries who are involved in the milk value chains are: milk producers, milk collectors (vendors and hawkers), milk traders (wholesalers and retailers) and processors.

All of these value chains and subchains provide important opportunities for development activities and thus the LSA planning process, since farm-gate prices are high relative to world market prices, while dairy productivity is low relative to nearby countries with similarly conducive agro-ecological conditions for dairying. Thus, significant opportunities still exist for productivity increases at the primary production level and efficiency gains at all post-production levels in the value chains (especially in the supply and product distribution chains and in processing), with the potential to lead to increased benefits for all the actors in the chains.

In absolute terms, the dairy subchain selling prices for producers was TZS500/litre. The final consumer buying price was TZS2,170/litre. The total milk gross marketing margins (price spread) for the dairy subchain was TZS1,670/litre. The producer selling price for the traditional milk value chain was TZS400/litre, while the final selling price was TZS700/litre. The total gross marketing margin for the traditional milk subchain was TZS300/litre. It is important to note that the total gross marketing margin for dairy milk subchain was found to be larger (reflects more profit) than the total gross marketing margin for traditional milk. The total value added (VA) for dairy subchain for the milk collection centres, milk processors, wholesalers and retailers was TZS100, 620, 83 and 195/litre respectively, while the VA for traditional milk subchain for the milk vendors/hawkers was TZS200/litre. All the milk subvalue chains were found to be profitable as all the value chains generated positive VA.

Figure 7. Dairy value chain and subchains (formal and informal)




## 5.2. Formal and informal beef and live cattle export subchains

The live cattle and beef value chain map for domestic and export markets is presented as Figure 8. The live cattle for export and slaughter cattle for domestic beef markets are sourced informally and formally from all production zones: lowland grazing or Central (Cn), Coastal and Lake (C&L) and Highland (Hi) zones. There are domestic as well as export market channels for beef. The market actors who are involved in the live cattle and beef subvalue chains are: small traders, big traders/exporters, vertically integrated large-scale producers, processors, whole traders, rural and urban consumers. Bulking of live animal normally occurs in rural livestock markets organized about twice per week. Individual producers bring the livestock they want to sell to these markets where bulking traders assemble and normally buy through an auction market. The buyers will include bulking traders who assemble and normally buy through an auction. The buyers will include traders who then transport the livestock to a secondary market and resell either to large exporters, meat processors or small-scale butchers.

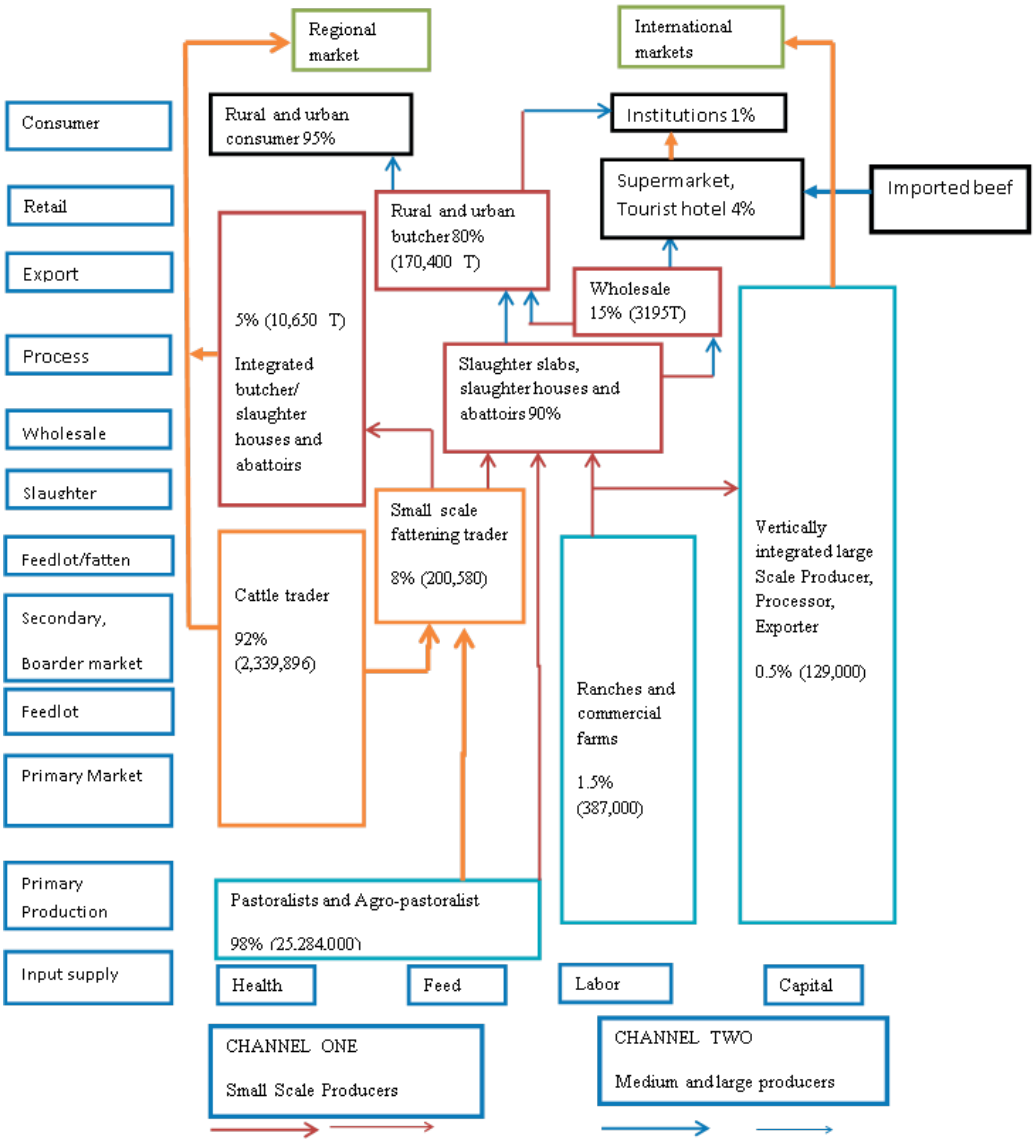
In absolute terms, the producers' beef selling prices for traditional live cattle, fattened cattle and traditional butcher beef subvalue chains were the same, about TZS3,750,423 per t. However, the beef

final selling prices were different: TZS5,449,333 per t for traditional live cattle, TZS6,676,057 per t for cattle fattening and TZS5,020,086 per t for traditional butchers' beef subvalue chains. This implies that the cattle fattening subchain fetches higher prices compared to traditional butchers.

The VA for small and big trader's subchains in traditional live cattle was 738,365 TZSand TZS495,394 per t, respectively. For the traditional butcher subchain, the small traders and butchers marketing actors accounted for TZS825,093 per t and TZS100,000 per t, respectively. The cattle fattening, small traders and integrated butchers subvalue chain was TZS669,296 per t and TZS659,395 per t of the VA, respectively.

The VA can be interpreted as a gross marketing profit for the value-chain actors. In this regard, it is important to determine the percentage of value addition to the gross marketing margin. This allows us to see the capacity of different value-chain actors in capturing the gross marketing margin available in relation to the marketing costs required. The highest percentage of VA to gross marketing margin was observed for small traders (traditional butcher subchain) while the lowest was observed for the butchers for traditional butcher subchain. Figure 8. Formal and informal beef and live cattle export subchains.

Figure 8. Formal and Informal Beef and live cattle export sub chains



### 5.3 Live sheep and mutton value chain

The sheep and mutton value chain map for both the domestic and export markets for Tanzania is given in Figure 9. There are away from home, home consumed and export subchains accounting for 60%, 30% and 10%, respectively. Most of the sheep in Tanzania come from pastoral and agro-pastoral in Central, Coastal and Lake livestock production zones. Sheep from ranches and commercial farms account for only 1% of total sheep in the country.

There are several market intermediaries and value-chain actors who are involved in the sheep value chains such as producers, small, butchers, hotels (away from home) and exporters. The sheep collectors are small-scale local sheep aggregators collecting sheep directly from livestock producers and supplying to small traders, butchers, hotels and exporters.

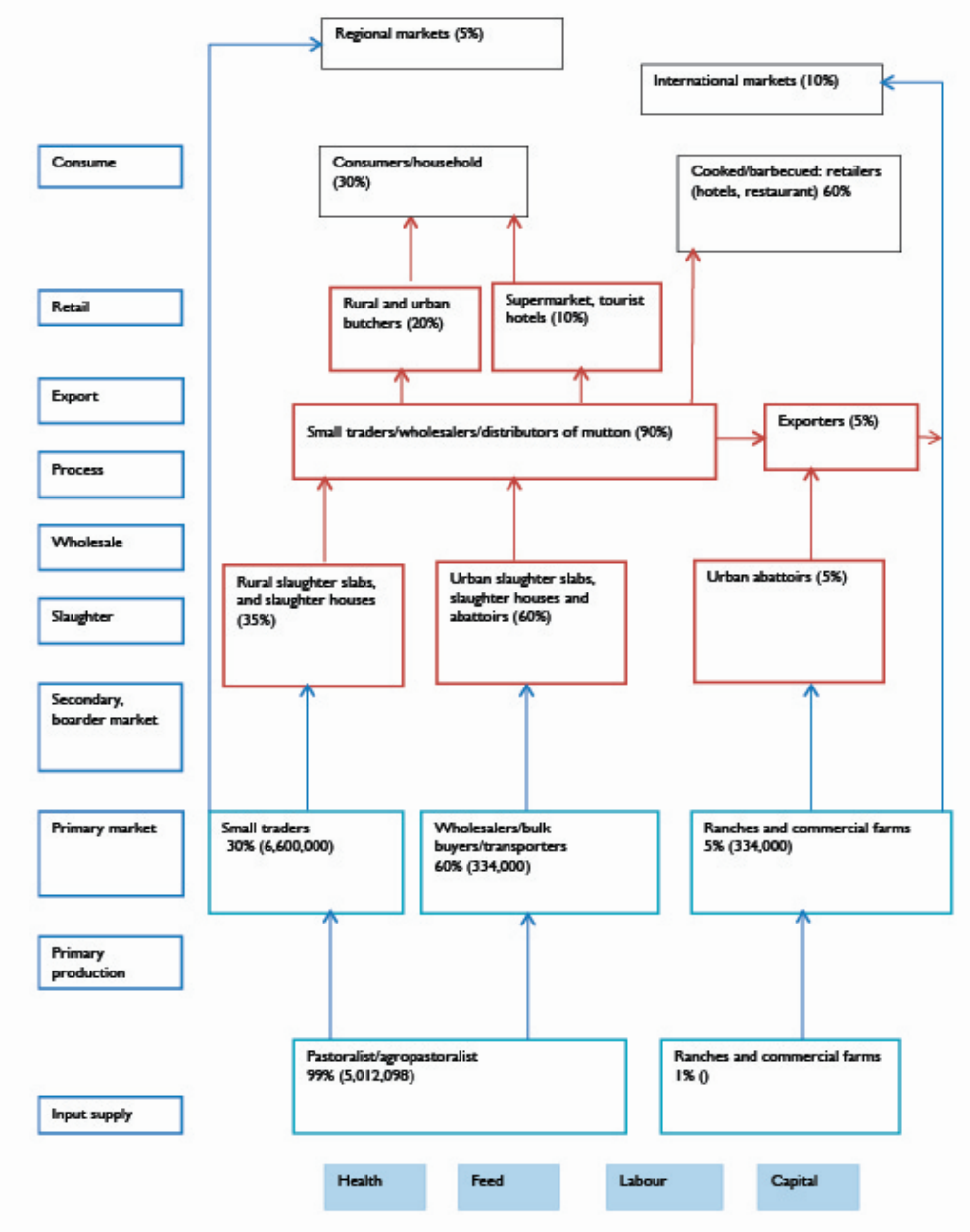
Home consumption subchain price for producers, small traders and butchers was TZS3,125,352, 4,922,430 and 6,000,000 per t, respectively. Prices for away from home subchain for producers, small traders and hotels were TZS3,084,229, 4,009,498 and 6,550,000, respectively. Export subchain for producers, small traders and exporters prices were TZS3,125,352, 4,009,498 and 6,024,486, respectively.

Small traders in subchain I (home consumption) share 62.5% of the gross marketing margin while the butcher operators' share is 37.5%. The subchain II (away from home subchain) depicts that away from home actors such as barbecue meat centres, hotels and restaurants share 73% of total gross market while small traders account for 27%. Subchain III (export subchain), small traders and exporters account for 68.9% and 31.1%, respectively.

The total costs were TZS754,103, 706,085 and 954,103 per t for subchain I, II and III, respectively. This shows that subchain III has higher costs than other subchains.

All of the sheep value chains were found to be profitable based on the positive value addition. Among the value-chain actors, the export small traders accounted for the highest share of the gross marketing margin and VA. There was no proportionate share of gross marketing margin and cost of production.

Figure 9. Live sheep and mutton value chain.




## 5.4 Live goat and goat meat value chain

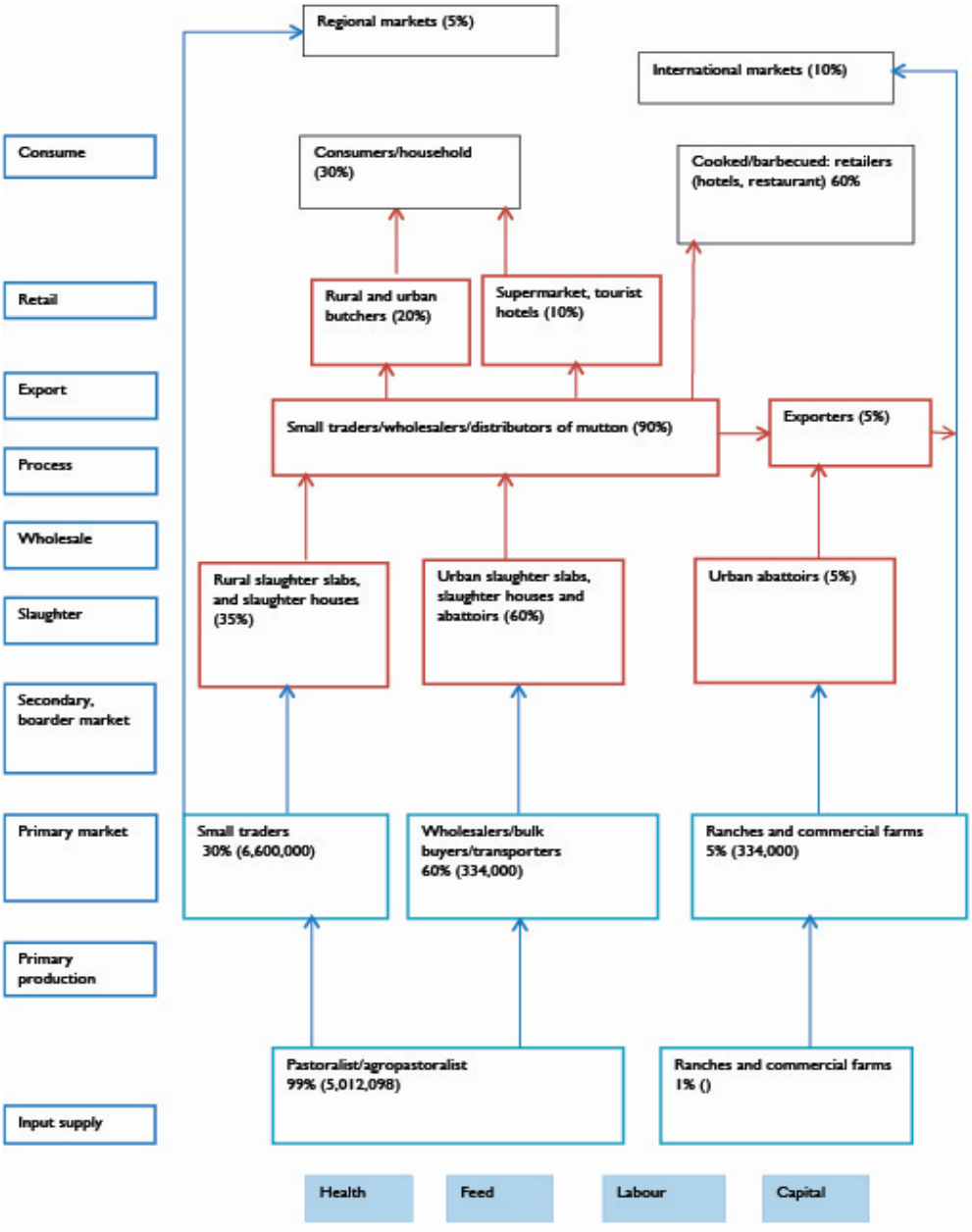
The live goat and goat meat trade for domestic and export market is sourced from all three livestock production zones (Central, Coastal and Lake and Highland). The live goat and goat meat value-chain map for Tanzania is given in Figure 10. There are several market intermediaries and value-chain actors who are involved in the live and goat meat value chains: goat producers, goat collectors, and small and big goat traders/exporters.

The goat collectors are small traders who purchase about 4–10 goats at a time directly from livestock producers and supply them to urban wholesalers and retailers. Wholesalers/exporters normally buy from small traders and sometime from big livestock producers. The wholesalers/exporters handle more than 200 goats at a time. The live and goat meat exporters account for 10% of the goat market in Tanzania, where the main destination is United Arab Emirates.

The figure below summarizes three goat subchains identified, where subchain I (away from home) is the main chain that accounts for more than 50% of the goat meat marketed in the country. Producers sell TZS3,125,352 per t, butcher operators buy TZS3,125,352 per t and sell TZS4,922,430 per t. Final consumers pay an average of TZS5,100 per kg or TZS5,100,000 per t. The prices for subchain II (butcher home) does not vary much with the prices of subchain I (away from home)

In the value chain analysed above, away from home (restaurants, barbeque) and exporters marketing actors realize the most benefit, 87.8% and 72.3% of value addition, while butchers incurred high cost (72%) compared to other marketing actors.

Figure 10. Live goat and goat meat value chain.



## 5.5 Hides and skins value chains and subchains

Tanzania tanneries industry has a total annual capacity to process 3.6 million hides and 12.8 million skins. The total installed capacity in the country is equivalent to 104 million square feet per year, with actual capacity utilization at around 86 % for hides and 61 % for skins of total annual processing capacity. The Tanzanian tanning industry produces mainly wet-blue leather. Crust and finished leather account for a smaller share of production. There are no tanneries producing high-fashion finished leather. The sector is estimated to employ about 1,000 people directly. It is estimated that, only five small firms produce leather footwear in the country and less than 200 workers are employed in the leather footwear sector (excluding micro / small enterprises employing less than 10 people).

There are around 40 micro, small and medium-size enterprises; and two large enterprises, which are involved in the manufacture of leather products and footwear. These account for the entire Tanzanian exports of finished leather. Some of these firms are also vertically integrated in the tanning sub-sector. Domestic and international markets for leather and leather products are growing. A stable demand for leather from large importing markets (United States, China, etc.) has been a key driver for expansion of the sector in the country. The expanding middle class in emerging countries (Brazil, the Russian Federation, India, China and South Africa - BRICS) add to this demand on Tanzanian leather products which in turn will prompt further expansion of the leather industry.

The leather sector, however, remains weak and most of the exports are in the form of traditional products, such as raw and wet-blue hides. A low degree of product diversification over the last decade reflects weak technology adoption, limited access to finance and a number of supply-side constraints. Challenges facing tanneries are also associated with unproductive investments where investments are made in equipment without a concomitant increased level of production, owing to the inadequate quantities and quality of raw hides and skins (H&S). Tanneries are therefore operating well below installed capacity.

Other challenges include growing requirements in terms of environmental compliance and standards, chemical controls (including the Registration, Evaluation, Authorization and Restriction of Chemicals Regulation) and weak customer service when dealing with the delivery requirements of buyers (e.g. grades, timing, etc.). However, the expanding domestic and international markets point to immense investment potential for this sector. Efforts need to be made to increase the domestic supply of raw materials by among others, increasing the capability and scale up of the small-scale industry to provide secondary markets for large firms and by supporting local entrepreneurs.

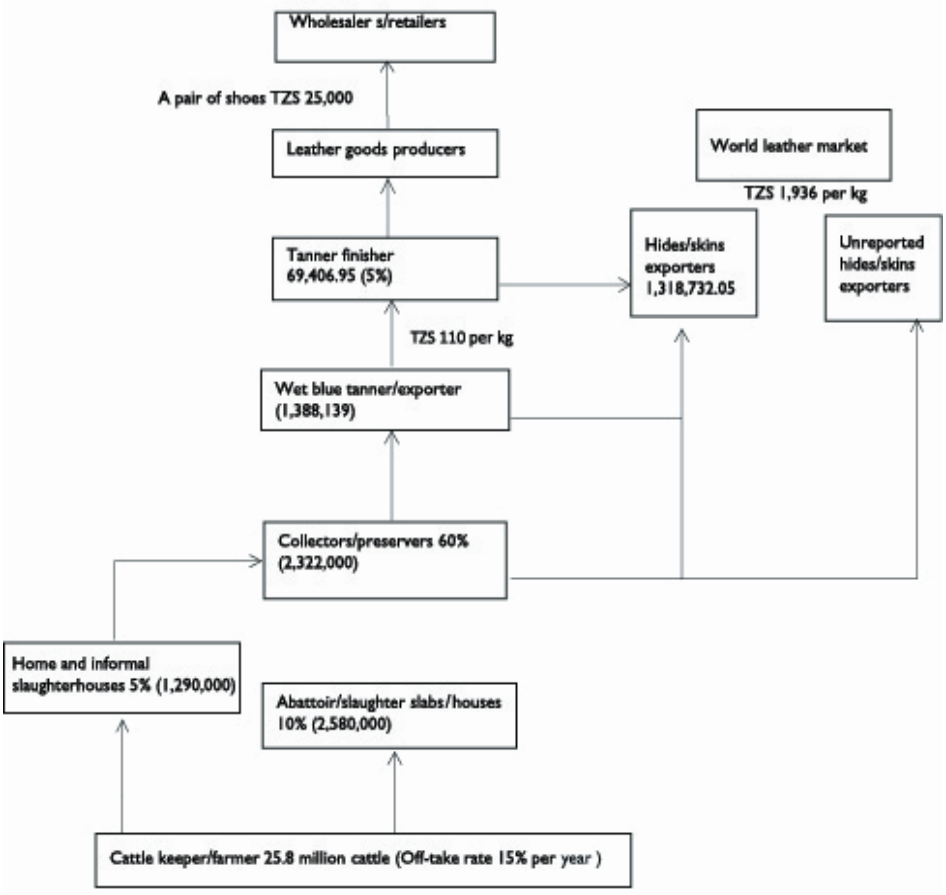
Similar to the other live animal and livestock product value chains, there are several market intermediaries and value-chain actors who are involved in the hides and skin value chains: producers, hides and skin collectors, wet blue tanners, tanner finishers, local consumers and exporters. The collectors are small scale local aggregators collecting hides and skins directly from abattoirs/slaughter slabs and home and supplying to processors and exporters.

The hides and skins value chain map for the domestic and foreign markets in Tanzania is given in Figure 11. Production of hides and skins in Tanzania starts at abattoirs/slaughter slabs and home slaughter. Hides and skins that enter the value chain are only 60% out of the 3.9 and 4.4 million cattle and goats slaughtered annually. Produced hides and skins follow two main subchains, local consumption and export which takes a large proportion. The main subchain is export which accounts for more than 50% of the hides and skin that enter the value chain. In all four subchains, collectors in

subchain II have the lowest price spread of 7.69%, while illegal exporters in subchain IV have the highest price spread at 88.89%.

In subchain I (local consumption) and III (hides export subvalue chains), the total intermediate cost is TZS678,006 per t for each, where wet blue tanners share is 64.2% and collectors share is 35.8%. The subchain II total costs of intermediate goods and services incurred by actors are TZS966,906 per t, in which wet blue tanners account for 52% of total costs. From the comparison of the share of gross marketing margins and costs of marketing, the wet blue tanners take a large share in gross market and costs.

Figure 11. Hides and skins value chains and subchains.




## 5.6 Chicken meat value chains and subchains

Poultry species in the country include chickens, ducks, turkeys, guinea fowls and pigeons. Chicken is the major species. The chicken population is estimated to be 42 million for traditional chickens and 34.5 million commercial chickens. The chicken meat value-chain map for the domestic market is given in Figure 12. There are two commercial chicken meat value chains while there are four chicken meat value chains from the backyard production systems. There are several market intermediaries who are involved in the chicken-meat value chain: poultry producers, village collectors, poultry traders, processors and supermarket traders.

In absolute terms, the producers' chicken meat selling prices for traditional chicken meat value chains varied from TZS4,688,029 per t to TZS12,529,092 per t. For the commercial broiler value chains, the producers chicken meat prices varied from TZS6,429,297 to TZS10,715,494 per t. In all three subchains, subchain II (away from home local chicken) fetches the highest price.

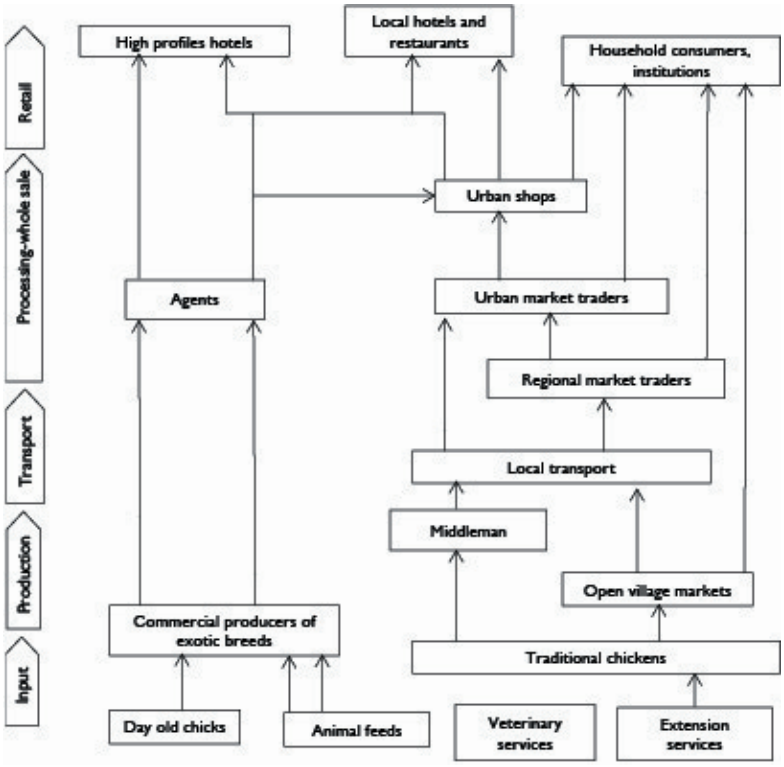
The chicken meat gross marketing margins (price spread) for the traditional and commercial broilers value chain varied from TZS267,887 to TZS547,0260 per t and TZS2,277,043 to TZS2,009,155 per t, respectively. The gross marketing margin for the traditional chicken value chain is found to be greater than the commercial broiler value chain. This demonstrates the importance of the traditional poultry system in terms of the economic opportunity it provides for value-chain actors.

The total chain-level costs of intermediate goods and services incurred in the traditional chicken meat value chain varied from TZS27,191 to TZS1,204,823 per t. In the commercial broilers value chain, the costs of intermediate goods and services varied from TZS283,157 to TZS287,845 per t.

The total VA along the traditional chicken meat value chain varied from TZS240,697 to TZS4,265,436 per tone, while the VA along the commercial broilers value chain varied from TZS1,721,310 to TZS1,993,886 per t. This demonstrates more gross profit for traditional chicken meat compared to commercial.

All of the chicken meat value chains were found to be profitable as all the value chains generated positive VA.

Figure 12. Chicken meat value chains and subchains.




## 5.7 Chicken eggs value chains and subchains

The chicken egg value chain map for the domestic market is given in Figure 13. Similar to the live chickens for slaughter value chain, the chicken egg is also sourced from the commercial and traditional poultry production systems. Traditional poultry encompass about 70% of producers while commercial takes about 30%. However, 60% of egg consumers consume eggs away from home (restaurants, hotels etc.) while 40% consume at home. There are several market actors who are involved in the chicken egg value chain: poultry producers, village egg collectors, small and big traders, restaurants, hotels etc.

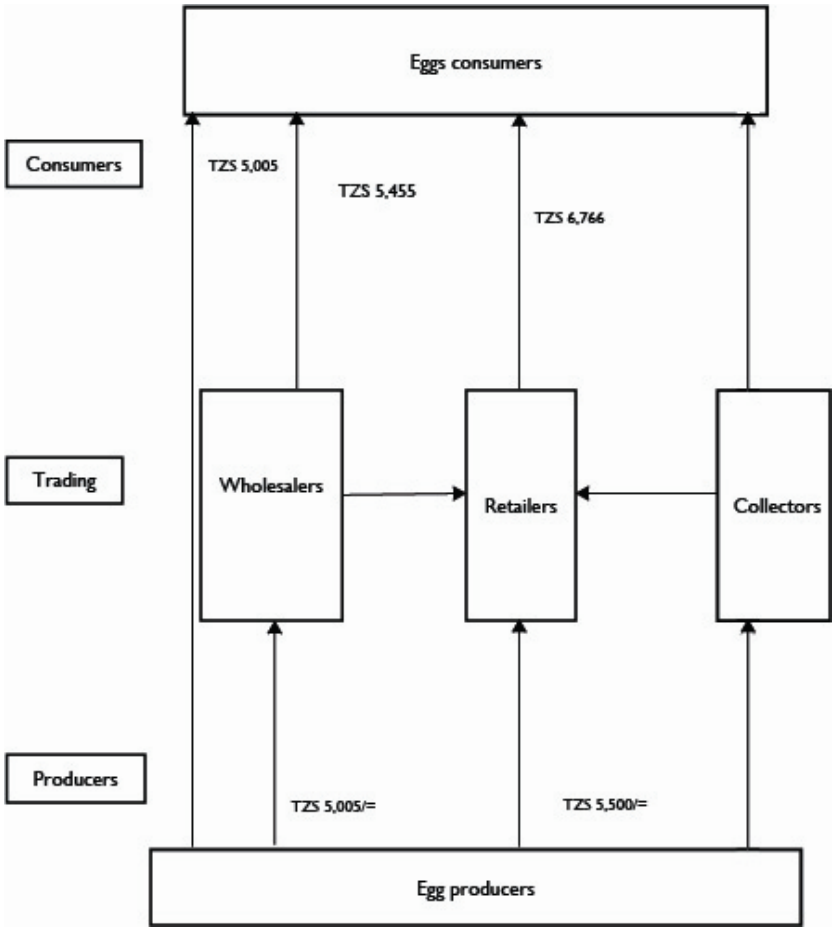
In absolute terms, the producers' chicken egg selling prices for commercial egg value chains varied from TZS5,345,998 per t. On the other hand, traditional value chains varied from TZS1,2336,918 per t.

The chicken eggs gross marketing margins (price spread) for the commercial and traditional value chain varied from TZS1,233,692 per t and TZS5,757,228 per t of eggs, respectively. In general, the gross marketing margin for the commercial chicken value chain was found to be greater than the gross marketing margin for traditional chicken egg value chain. This demonstrates the importance of commercial chicken egg in terms of the economic opportunity it provides for egg value-chain actors.

The total VA along the commercial chicken egg value chain varied from TZS1,224,034 to TZS5,717,099 per t while the VA along the traditional chicken egg value chain was TZS1,224,034 per t. In the case of the commercial chicken egg value chain, restaurants and hotels accounted for 81% of the GM while in the traditional value chain the VA accounted for 100% of the GM.

All of the chicken egg value chains were found to be profitable based on the positive value addition. However, similar to other value chains, this value chain analysis lacks detailed information on the transaction size and frequencies of business in order to compute the annual turnover volume which is important to assess whether the value-chain actors in the chicken egg value chain generate adequate and sustainable income over a given period of time. In the future, it is important to gather detailed information on the transaction size and frequencies of business in order to compute the annual turnover volume for the different commodities value- chain actors. This requires structured cross-sectional surveys of different value-chain actors complemented with time-series prices analysis.

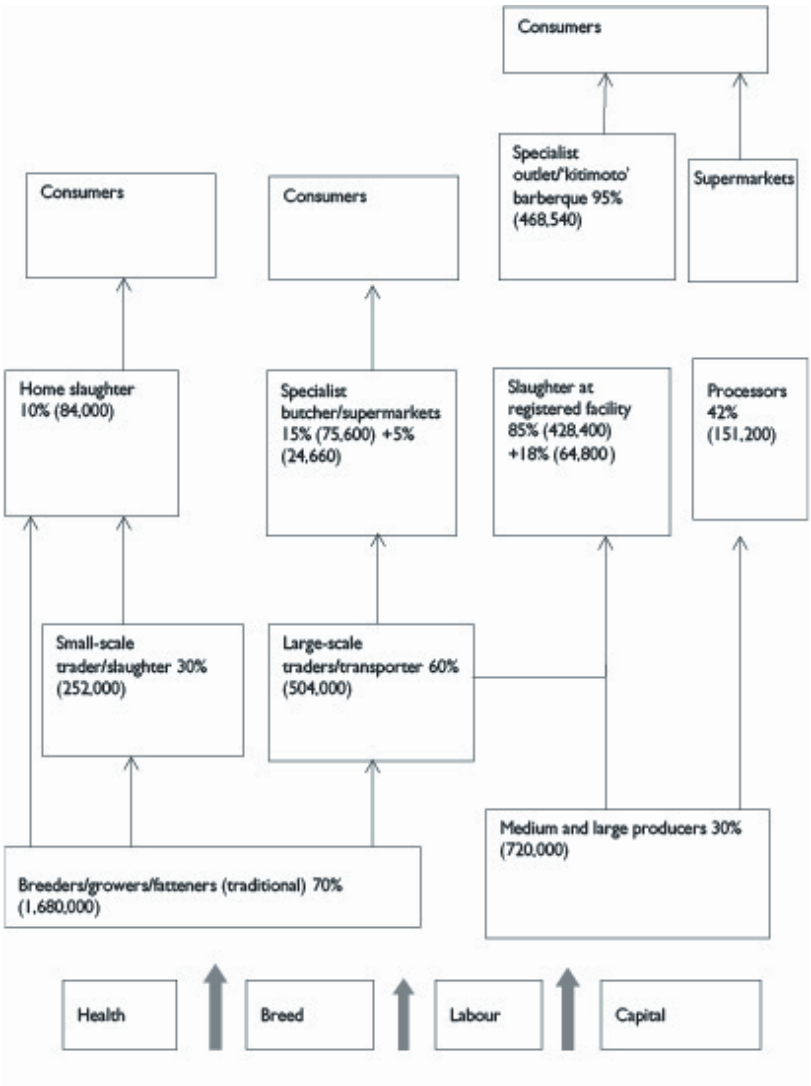
Figure 13. Chicken eggs value chains and subchains.



## 5.7. Pigs value chain

The pig and pork value chain map is given in Figure 14 below. The map indicates two subchains where the main chain accounts for 70% of pork and the second subchain share is 30%. The amount of pork that goes through the value chain is 19,047 metric t. The main production zone for swine is the Highland zone where about 58% of pig producers are found, followed by Central 22% and Coastal and Lake 20%. The pig value chain in Tanzania has various marketing actors such as producers, small traders, big traders, retailers (butcher and supermarkets) and-consumer 'kitimoto' barbeques. Small traders and wholesalers are primary buyers and secondary buyer-agents operate throughout the zones. Trading usually takes place at the point of production. Some long-distance trade towards the Dar es Salaam market by road transport is undertaken but most trade is local.

Figure 14. Pig and pork value chain mapping, links, volume and percentage.



# 6 Livestock trends

## 6.1 Key livestock trends

The trends in livestock population in Tanzania over the last 30 plus years since 1980–2013 is given in Figure 15 (FAOSTAT). Steady population growth has been observed for all livestock species except sheep. The sheep population had been stabilized at less than four million for most of the period studied; but started growing towards the end of the period. In terms of productivity per animal, there has only been a noticeable improvement in dairy cattle milk production and poultry meat, while beef per animal (kg) from cattle has begun an upward trend in recent years, while meat from sheep, goats and pig has remained stagnant (Figure 16).

The recent trends in annual per capita production and consumption of livestock products in Tanzania is presented in Figure 17. There is a steady upward trend in the per capita production and consumption of chicken meat and cow milk. It is also interesting to note that there has been a reverse in the per capita production of beef, sheep and goat meats. There has been a continuous decline in per capita egg production and consumption while the per capita production and consumption of pork has fluctuated.

Figure 15. Trends in livestock population in Tanzania (thousand heads) 1980–2013.

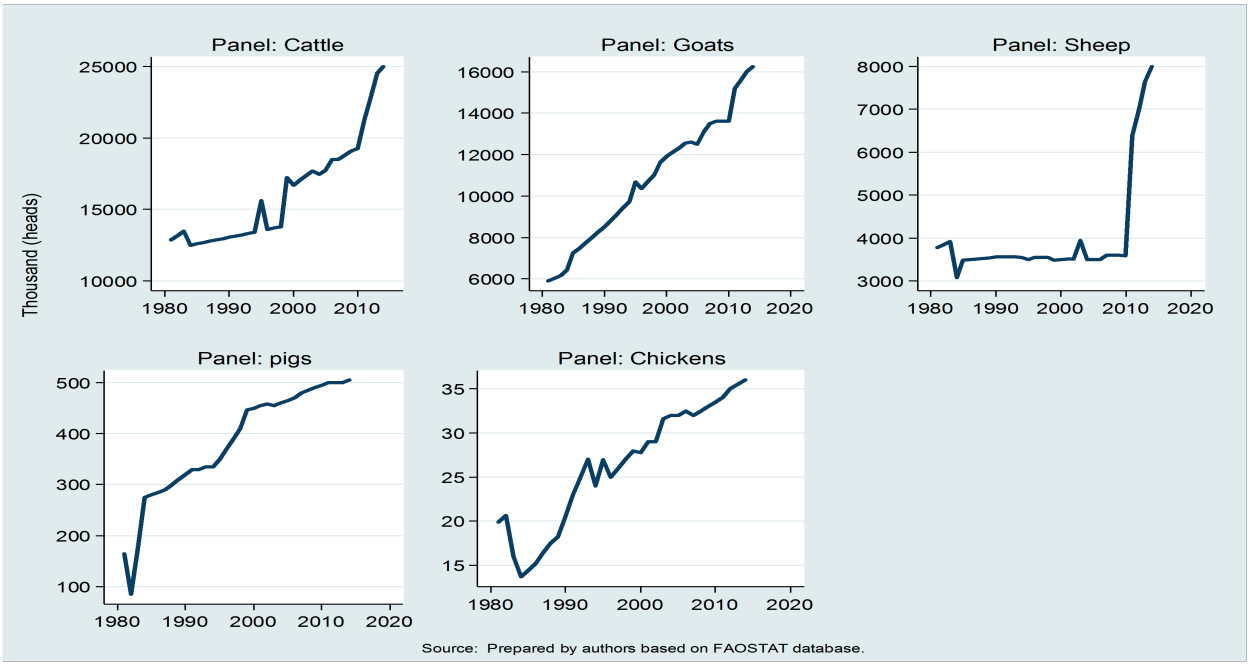


Figure 16. Trends in livestock productivity in Tanzania 1980–2013.

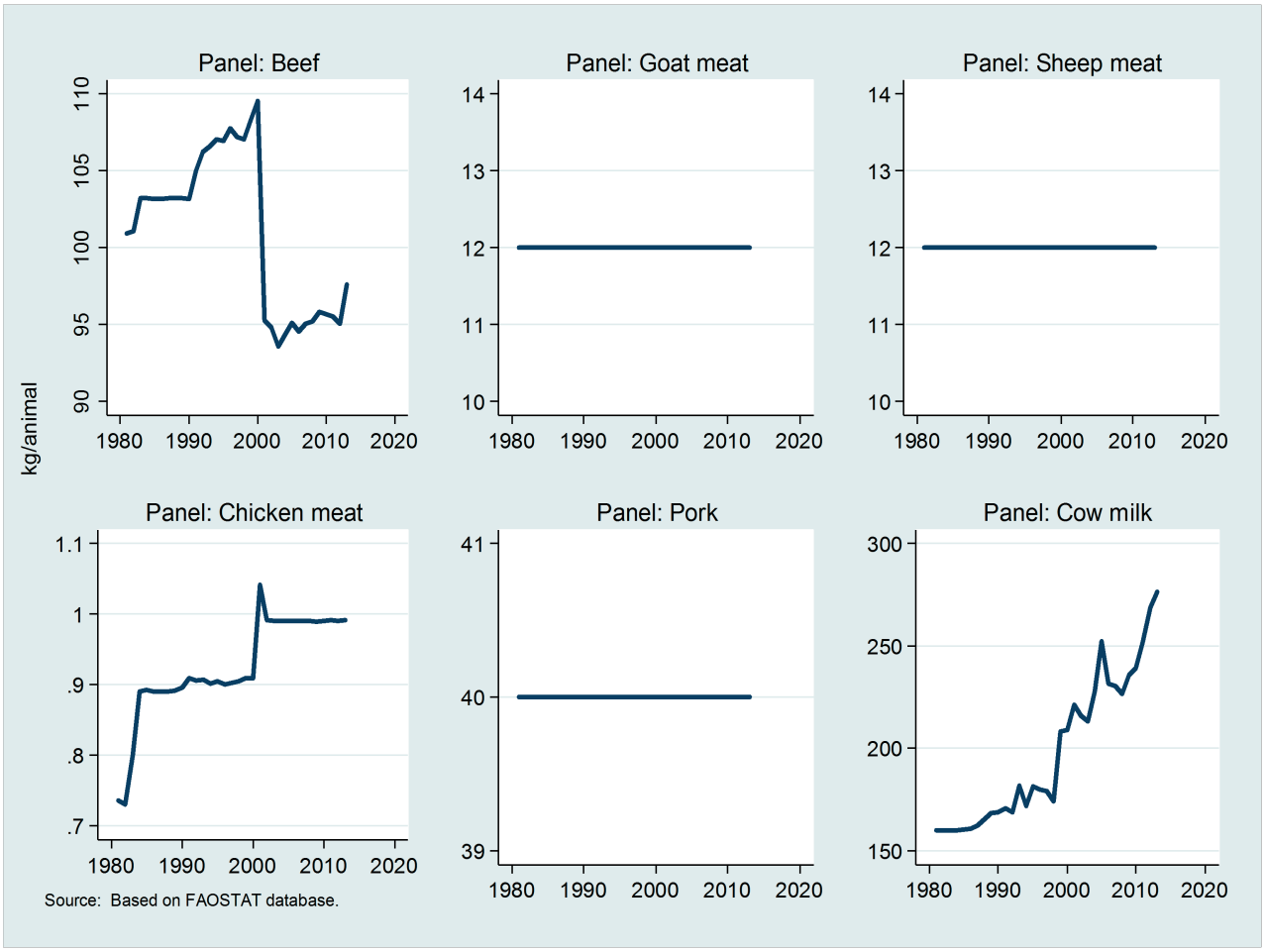
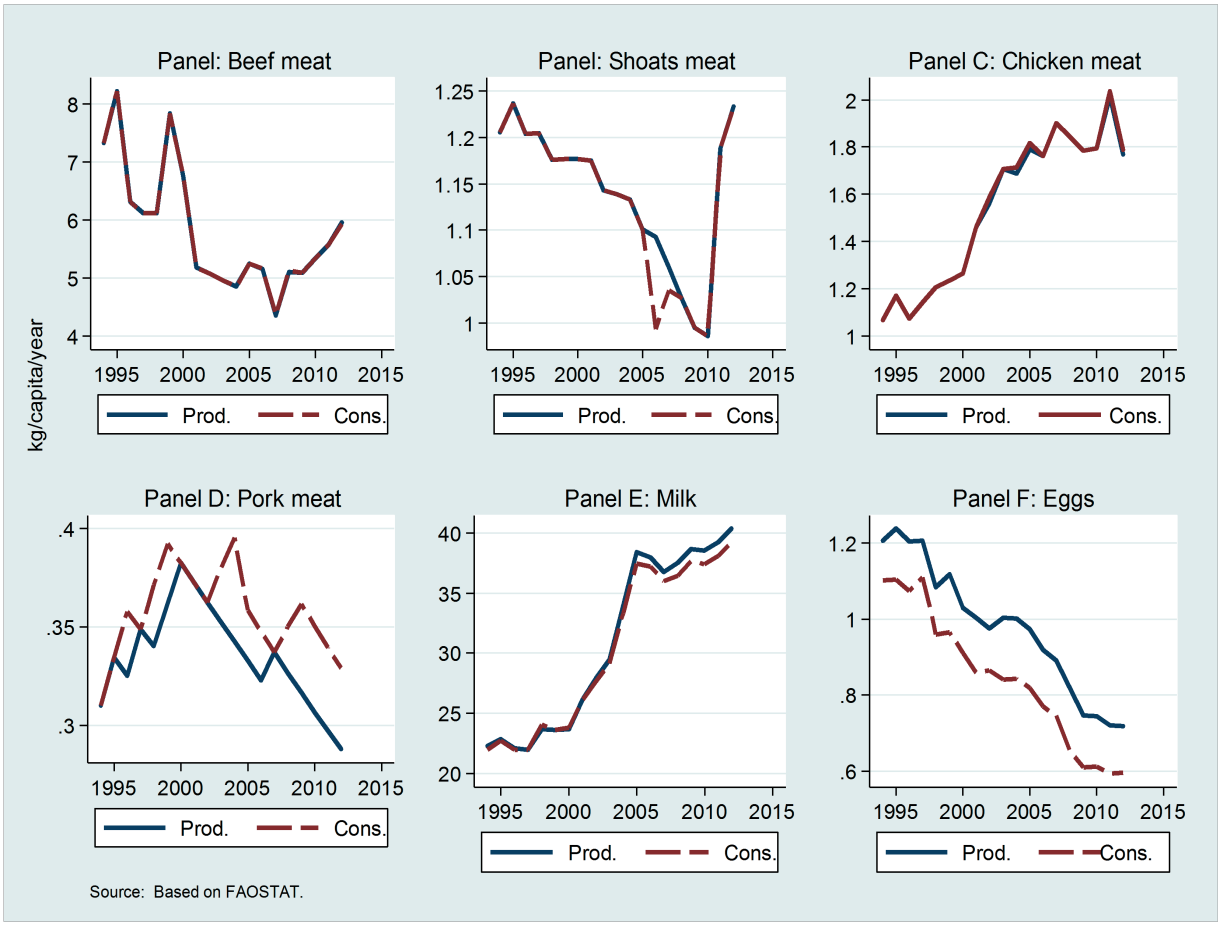


Figure 17. Trends in annual per capital production and consumption of livestock products in Tanzania 1995–2013.




## 6.2 Livestock sector GDP

Policy decisions on resource allocation to a particular sector are often based on the relative importance of that sector in the national economy. One of the most common indicators of this relative importance is the share of a sector to the national GDP.

The contribution of livestock to the Tanzanian GDP is expressed as the total added value (AV) using the total production (Q) of all animal products (meat, milk, eggs, hides and skins, manure and traction) generated by each livestock production system (S), the average price of each product (p) and the percentage of intermediate costs (%CI). The AV is represented in the following formula:

$$Total\ AV = \sum_{S,A} Q * p * (1 - \%CI)$$

Then using estimates of the relative share of products that have been self-consumed, bartered or sold, several indicators of GDP can be distinguished:

- The **direct monetary** GDP consists of all the monetary transactions for animal products, including goods for final consumption (meat, milk, eggs etc.) or intermediate goods destined for another sector of the economy in the downstream sectors (traction, manure). This is the indicator which is normally reported.

- The **direct non-monetary** GDP consists of the non-commercial exchanges (barter) of final consumer goods. For example, the exchanges of milk for cereals is still a common practice in some parts of the world and home consumption of animal products (valued at market price).
- The **indirect GDP** consists in the contribution of livestock production to agriculture in terms of manure and draught power (as intermediate products) to the own farm.

Finally, the addition to the GDP generated at the production stage was also defined for the downstream value chains, aggregating the value VA from various subchains. This is represented schematically in Table 13 below.

Table 13. GDP contributions in the downstream value chains

| | | | |
|---|---|---|---|
| **Final consumer or intermediate goods in livestock related industry** | -Meat<br>-Milk<br>-Wool<br>-Skins<br>-Organic matter (fuel)<br>- | **Exchanges**<br>-Cash<br>-In-kind*<br><br>-Home consumption use on farm | **Type**<br>Direct/monetary<br>Direct/nonmonetary<br><br>Indirect |
| **Intermediate goods for agriculture and nonlivestock industries** | -Organic matter<br>-Traction | **Exchanges**<br>-Cash<br>-In-kind<br>-Home consumption use on farm | **Type**<br>Direct/monetary<br>Direct/nonmonetary<br><br>Indirect |

Note: *Milk versus cereals/manure contracts (manure versus crop residues)

**GDP estimate of livestock value addition at the production stage**

The summary of the composition of the subsector direct added value at the farm/herd level is provided in Table 14. The total VA from direct livestock sector production in 2016 amounts to TZS2,815,063 million or about USD1.29 billion.[3] It is observed that the largest VA is generated by beef production which accounted for about 49% followed by milk which accounted for 28%, and poultry (meat and eggs) 10%, demonstrating the importance of cattle production systems in Tanzania.

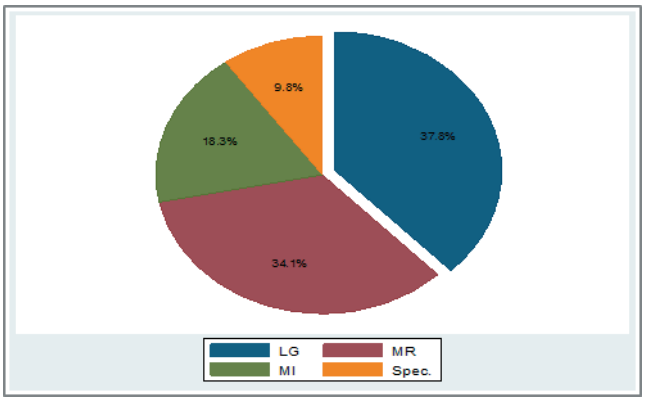
Table 14. Summary of the composition of the subsector direct added value at the farm/herd level 2016

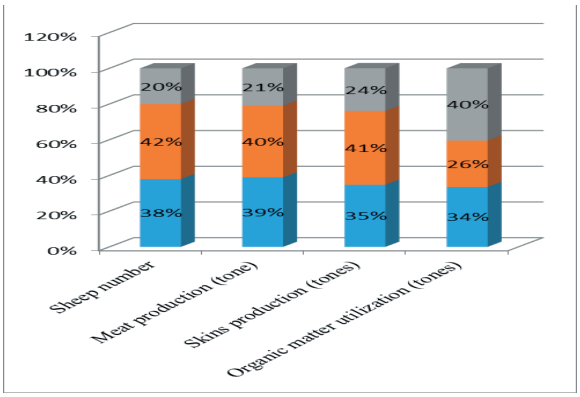
| Commodity | Value (millions of TZS) | Share |
|---|---|---|
| Beef | 1,368,991.6 | 48.6% |
| Small ruminants meat | 280,791.7 | 10.0% |
| Pork meat | 53,460.1 | 1.9% |
| Poultry meat | 248,563.8 | 8.8% |
| Milk | 781,386.2 | 27.7% |
| Eggs | 35,158 | 1.2% |
| Hides and skins | 418.5 | 0.01% |
| Organic matter | 6,585.4 | 0.23% |
| Draught | 39,707.7 | 1.4% |
| TOTAL | 2,815,063 | 100% |

The distribution of the total VA (monetary and non-monetary values) of the different commodities over the three main agro-ecological zones and specialized sector is provided (in figures 18 and 19).

[3] In 2016, USD1 is equivalent to about TZS2,180.

Figure 18. Contribution of milk to GDP 2016.  Figure 19. Contribution of red meat to GDP 2016.




The two diagrams show the approximately equal contribution of the three major agro-ecological zones and the still incipient contribution of the specialized dairy production system. Despite being responsible for an equal contribution as the C&L and Hi, the Cn, specifically pastoral areas, is often neglected. This study highlights the importance of these pastoral areas and accordingly provides due emphasis in terms of policy and investment interventions.

**Value-added creation through processing and marketing of animal products and services**

In addition to the substantial macro-economic input at the production systems level, the formal value chain also makes a significant contribution to the national economy through VA processing and marketing (Table 15). LSIPT figures estimate the value-added contribution at TZS1,524,137. The table below provides an overview of contribution of the different chains as provided by the LSIPT model data runs. The total contribution to the national economy of livestock production and processing plus monetary and non-monetary values amounts to about TZS4,339,200.

According to the LSIPT data and based on expert opinion, the share of VA through processing and marketing is only 35% of the total VA of the livestock sector. This is quite low in comparison with Organisation for Economic Co-operation and Development countries where VA often amounts to more than 100%. Consumer preferences are the main driver for more value addition. With Tanzania's rising incomes, major investments in the sector value addition will be an important opportunity for the sector. The total VA contributions of the different sectors are summarized in millions of TZS in the table below.

Table 15. The contribution of the livestock processing and marketing chain to the national economy in in millions of TZS 2016.

| Commodity chain | Total VA added in the chain | Percentage | Commodity chain | Total VA added in the chain | Percentage |
|---|---|---|---|---|---|
| Cattle | **296,216** | **19.4%** | Milk | **343,630** | **23.0%** |
| Sheep | **29,370** | **1.9%** | Eggs | **381,556** | **25.0%** |
| Goats | **37,625** | **2.5%** | Hides and skins | **96,721** | **6.1%** |
| Swine | **80,625** | **5.3%** | | | |
| Poultry | **258,394** | **17.0%** | | | |
| | | | Total | **1,524,137** | **100%** |

## 6.3 Regional comparison of livestock production

In general, the Tanzanian livestock sector has a lower productivity than those of its neighbouring countries, as shown in the table below by the production of meat and milk per standing head[4] of cattle.

Table 16. Comparative production of cattle in East African Countries5

| Country | Cattle population | Beef production (mT) | Milk production (mT) | Beef production/ standing head (kg) | Milk production/ standing head (kg) |
|---|---|---|---|---|---|
| Tanzania (LSIPT) | | | | | |
| Tanzania (FAOSTAT) | 21.1 | 0.3 | 1.8 | 13.7 | 85.3 |
| Ethiopia (LSIPT) | **53** | **0.6** | **4.7** | **12.1** | **88.7** |
| Ethiopia (FAOSTAT) | 53 | 0.3 | 3.8 | 6.4 | 71.0 |
| Kenya | 19 | 0.4 | 3.7 | 21.6 | 194.7 |
| Uganda | 12.8 | 0.2 | 1.2 | 14.8 | 93.7 |

Note: mT= metric tonne

This approximate indicator shows that Tanzania has the lowest production per standing head in beef and milk if FAOSTAT figures (2012) are taken, and only surpasses Uganda and Tanzania, if the LSIPT projections are adopted. There is therefore ample room for improvement.

## 6.4 Projected future production and consumption

Projections of future production and consumption for the major livestock products (meat and milk) without any additional policy or technology interventions (the 'business as usual' scenario) were made to assess the size of the future supply and demand gap. This projection is critical to anticipate the magnitude of required future investment in livestock research and development interventions (policies and technologies), which will be required to close the production-consumption gap.

The estimation of the current and projected future livestock productions were made using an Excel-based deterministic herd/flock growth model built in the LSIPT (Alry et al. 2014). The main data required in the herd/flock model are the size of livestock population for the reference (base) year and the herd/flock survival rates which are derived based on technical parameters relating to births, deaths and offtake rates. In turn, the baseline technical parameters for different production systems by herd/flock size classes are based on the review of grey literature and expert opinions.

The reference year selected for the projection of livestock population was 2016. However, for 2016, the livestock population data was not available. The most recently available national livestock population data was from the population census for 2012 and National Panel Survey (NPS) data, both conducted by the Tanzanian National Bureau of Statistics (NBS) (Table 17). Therefore, in order to arrive at the livestock population data for 2016, the livestock population figures for 2012 were projected using the annually compounded livestock population growth rates.

[4]The production per standing head is calculated by dividing the total population of a species by the total annual production from that species.
[5]Based on LSIPT results for Tanzania, and on FAOSTAT data for the other countries. The use of FAOSTAT data for Tanzania would have also resulted in its lowest rank for milk production.

Table 17. The evolution of livestock population for mainland Tanzania (heads of animals) 2008–16

| Livestock Species | Population census in 2012 in million of TZS | Livestock population estimates based for traditional production system using National Panel Survey (NPS) data in million | | | | Reference population in 2012 in millions | Projected total population in 2016 in millions |
|---|---|---|---|---|---|---|---|
| | | 2008 | 2010 | 2012 | Annual growth Rate (%) | | |
| Cattle | 23.9 | 14.5 | 17.5 | 19.2 | 4.7 | 23.9 | 28.8 |
| Goats | 14.979 | 13.4 | 15.7 | 16.6 | 2.8 | 14,979 | 16.7 |
| Sheep | 4.4 | 3.98 | 5.25 | 5.63 | 3.5 | 4.4 | 5.08 |
| Pig | -- | 1.05 | 1.59 | 1.44 | 7.7* | 1.4 | 1.9 |
| Poultry | 36.5 | 46.1 | 53.6 | 54.3 | 0.7 | 36.5 | 71.9 |
| Donkey | -- | 0,447 | 2.5 | 0.51 | 3.2* | 0,51 | 0.6 |
| Other | -- | 4.6 | 3.7 | 3.9 | 4.3 | 3.9 | 4.5 |

Source: Own calculation based on the population census for 2012 and growth rates from the National Panel Survey data from three waves (2008, 2010 and 2012).

Note: *The annual growth rates were computed for cattle, goats, sheep, poultry and other animals using the 2010 and 2012 NPS data while for pigs and donkeys the annual growth rate was computed using 2008 and 2012 NPS data. Similarly, in order to project the baseline livestock population in 2016, the reference livestock population for cattle, sheep, goats and poultry in 2012 was taken from 2012 population census while for pig, donkey and other animals the NPS data for 2012 was used. The projected livestock population for 2016 includes the livestock population both from the traditional and commercial sector. For example, the final projected cattle population for 2016 is 28,829, 230 which is composed of 28, 435, 825, 322,875 and 70,530 heads of cattle from traditional, commercial and ranches, respectively. Thus, the traditional sector accounts for about 98.6% of the total cattle population in 2016. The projected pig population for 2016 is 1,851,317 and 57,429 heads from traditional and commercial production systems, respectively. In the case of poultry, the projected total population is 71,928,444 heads of chicken and the traditional sector accounted for 52% of the total population.

The annually compounded livestock population growth rates used were determined using sample livestock population estimates obtained from the three recent waves of NPS conducted in 2008, 2010 and 2012.[6] For example, given the cattle population estimates for 2010 ($Q_{2010}$) and 2012 ($Q_{2012}$), the annually compounded cattle population growth rate ($r$) between the two waves of NPS was given as:

$$r = \left( \left( \frac{Q_{2012}}{Q_{2010}} \right)^{\frac{1}{2}} - 1 \right) * 100 \quad (1)$$

Accordingly, the computed annually compounded growth rate between 2010 and 2012 for the different livestock species varied from 0.7% for poultry to 7.7% for pigs (Table 17). Among the ruminants, the highest annual growth rate of 4.7% was observed for cattle followed by 3.5% and 2.8% for sheep and goats, respectively. Finally, the 2016 population for individual livestock species was estimated by applying the obtained annually compounded livestock population growth rate to the

[6]For details, see footnotes to Table 1.

respective reference livestock population estimates (based on either the 2012 NPS sample population estimate or the livestock population census for 2012, given in the 7th column of Table 17) as:

$$Pop_{2016} = Pop_{2012} * (1 + r)^4 \quad (2)$$

The major assumption made in using such an annual growth rate was that the pattern of livestock population growth over the 2012 to 2016 period would also follow the growth trends for the 2010 to 2012 period. Accordingly, the projected livestock populations for 2016 are given in the 8th column of Table 18. For example, the cattle population for the traditional production system in 2016 was estimated at 28.4 million heads which accounted for 98.6% of the total cattle population.

The projection is made at the herd/flock level and then aggregated by production systems and at the national level. The 15-year projected livestock population figures for different livestock species are given in Table 18. For example, the total cattle population is projected to grow from 28.8 million heads of cattle in 2016 to 47.5 million heads of cattle in 2031, implying an annually compounded growth rate of about 3%. Among the livestock species, the highest growth rate was projected for poultry (layer subsystem) which registered an annual growth rate of 11%.

Table 18. Baseline current and projected populations for major livestock species in Tanzania 2016–2031

| | *Livestock population (heads)* | | |
|---|---|---|---|
| Livestock species | *2016* | *2031* | *Annually compounded growth rate (%)[1] 2016–2031* |
| Cattle | *28,829,230* | *47,516,427* | 3.39 |
| Goats | *16,672,786* | *42,546,949* | 6.44 |
| Sheep | *5,012,098* | *7,450,462* | 2.68 |
| Pigs | *321,903* | *864,781* | 6.81 |
| Chickens | | | |
| Traditional | *32,274,048* | *36,944,320* | 0.70 |
| Layers subsystem | *12,000,000* | *57,415,074* | 11.00 |
| Broilers subsystem | *27,144,000* | *10,335,218* | 8.50 |
| Total chickens | *71,418,048* | *104,694,612* | 5.29 |

Source: Based on LSA simulation results.[1] The annual compound growth rate between 2016 and 2031 was computed using the formula given in equation (1).

In order to estimate the quantities of current and projected future production of livestock products, the baseline livestock productivity (yield) parameters are applied to the projected livestock population. The main livestock products considered in this study are meat, milk and eggs and other bi-products like skin and hides, draught-power and manure are also estimated and valued to estimate their contribution to the national and household economies. The results of projections are presented in Table 19. For example, under the baseline scenario, the projected beef production is expected to grow from 395 thousand t in 2016 to 666 thousand t in 2031, implying an annual growth rate of about 3.5%. For all livestock products, a minimum annual growth rate of 2.5% is projected and the highest growth rate of about 11% is projected for egg production.

Table 19. Baseline projected livestock production in Tanzania 2016–2031

| | Production (t) | | |
|---|---|---|---|
| Livestock product | 2016 | 2031 | Annual growth rate (%)[1], 2016–2031 |
| All red meat | 479,048 | 855,308 | 3.94 |
| Beef | 395,116 | 666,199 | 3.54 |
| Mutton | 19,955 | 29,101 | 2.55 |
| Goat | 63,977 | 160,008 | 6.30 |
| Chicken meat | 63,518 | 152,935 | 6.03 |
| Pork meat | 25,145 | 70,524 | 7.12 |
| All meat | 567,712 | 1,078,766 | 4.37 |
| Milk | 2,037,765 | 3,384,970 | 3.44 |
| Eggs | | | |
| Traditional chickens[2] | 3,802.76 | 4,222.2 | 0.70 |
| Specialized layers | 162,356.1 | 776,807.2 | 11.00 |
| Total eggs | 166,158.9 | 781,029.4 | 10.87 |

Source: Based on LSA simulation results. Note that an egg from the traditional chicken subsystem weighs around 40 grams while an egg from a specialized layer weighs around 58 grams. The annual compound growth rate between 2016 and 2031 was computed using the formula given in equation (1).

The estimation of current and projected consumption requirements of livestock products is made using the base-year information on quantities of livestock products consumed by households, income elasticity of demand for different livestock products, the growth rates of real per capita GDP and human population. The following sections provide brief discussion of the steps used in the derivation of important variables used in estimating the current and the projected future consumption of livestock products in Tanzania.

First, the baseline per capita annual consumption data for livestock products in Tanzania was computed by taking the average values from NPS and Household Budget Survey (HBS) data both conducted by the Tanzanian National Bureau of Statistics (NBS) during 2011–12 and the results are summarized in Annex 5, Table . For example, the national average per capita beef consumption was 6.31 kg/annum. There was a large difference between urban and rural consumers in terms of per capita beef consumption; the average per capita beef consumption for the urban and rural areas of Tanzania was 10.35 and 4.41 kg/annum, respectively. On the other hand, the national per capita consumption of goat meat was 1.37 kg/annum and in contrast to beef, the per capita annual consumption of goat meat was higher for rural areas than urban areas.

The average national per capita milk consumption was about 15 kg/annum and a higher level of per capita milk consumption was observed in the rural areas. The national average per capita chicken meat consumption was 2.46 kg/annum and there was no clear difference between urban and rural areas. The national average per capita pork consumption was about 0.5 kg/annum and similar levels of per capita consumption was observed for urban and rural areas.

Second, similar growth in per capita income (based on real per capita GDP) was assumed for all households regardless of their place of residence.[7] Accordingly, the computed trend in annual growth rate in real per capita GDP over the period 2005–14 was used; the computed annual growth rate in real per capita GDP was 3.8% for this period (Annex 5, Table 82).

[7]Tanzania is aspiring to achieve middle income country status by 2025; this implies faster growth rate than the assumed baseline scenario and hence higher levels of per capita consumption.

Third, the income elasticities of demand for different livestock products used in the projections were approximated by the expenditure elasticities of demand estimated using the nationally representative HBS data. The HBS was conducted in 2011–12 involving a sample of about 10,166 households in Tanzania and only households with positive expenditures were included in the computation of elasticities. The expenditure and price elasticities of demand were estimated using a STATA statistical routine called QUAIDS (quadratic almost ideal demand systems) developed by Poi (2012). The main results of QUAIDS estimates are summarized in Annex 5, Table 83.

For all livestock products, the signs of expenditure elasticities of demand were positive indicating that all the livestock products considered are normal goods; the demand for these products increase as income increases. Furthermore, the expenditure elasticities of demand for beef, chicken meat milk and egg are greater than one indicating that they are luxury goods. For a luxury good, a 1% increase in income increases the demand for that product by more than 1%. On the other hand, the elasticity of other livestock products is greater than zero but less than one indicating that they are necessities. For a necessity good, a 1% increase in income increases the demand for that product but by less than 1%. It is important to note that the expenditure elasticity of other foods (which includes all the non-livestock products) is less than one indicating that they are necessities.

The difference in the expenditure elasticities of demand for urban and rural consumers depends on the type of livestock products considered. For example, expenditure elasticities of demand for beef and eggs for rural consumers were found to be more elastic than that of urban consumers while the opposite was true for milk. For other livestock products, there were no large differences in expenditure elasticities between urban and rural areas.

The marginal expenditure shares for different livestock products are given in the first column of Table A5.3. The marginal expenditure share indicates how consumers allocate their budget among different consumption items for 1% change in their expenditure. For example, for urban consumers, if their expenditure increases by 1% they allocate about 88.35% of the budget increase to other food items. Comparing the marginal expenditure share from the demand system estimation shows sensitivity to the households' budget allocation among different food items due to changes in their expenditure (or income).

Fourth, the projected human population was based on the projection of the Tanzania's NBS population estimate of 48.7 million heads in 2012 for mainland Tanzania using the projected annual growth rate of 2.7% (Table A5.4). Accordingly, the human population for mainland Tanzania is expected to grow from 48.7 in 2016 to 72.6 in 2031. The projected national human population is divided between urban and rural areas using the projected urbanization rate (Annex 4, Table ). The urbanization rate, the proportion of total human population living in the urban areas, is projected to increase from 32.3% in 2016 to 42.5% in 2031. Dar es Salaam is expected to be one of the mega cities in Africa where over 10 million people will live by 2050. In general, urbanization is associated with increase in per capita income and consequently increases in demand for high-value products like livestock products.

Once the key variables and parameters required for projecting the future consumption of livestock products are constructed from different sources, the projection of future consumption of livestock products is made for urban, rural and the country as whole. For example, the projected per capita consumption of beef for $i^{th}$ household group ($i$=1 for urban and $i$=2 for rural household) is given as:

$$C_{it} = C_{i0} * (1 + \eta_i * \gamma)^t \quad (3)$$

Where $C_{it}$ is the projected per capita beef consumption in year *t*l, $C_{i0}$ is the assumed per capita consumption of beef for reference year (2016), $\eta_i$ is the income elasticity of demand for beef, and $\gamma$ is the projected annual growth rate in real per capita GDP. Then, the projected total consumption of beef in future year *t* ($TC_t$) is obtained by multiplying the projected per capita consumption with the projected population ($POP_{it}$) for that year:

$$TC_{it} = C_{i0} * (1 + \eta_i * \gamma)^t * POP_{it} = C_{it} * POP_{it} \quad (4)$$

The results of projected per capita consumption and total consumption for different livestock products are given in columns 8 and 9, respectively, of Table 20. Significant increase in per capita consumption is expected for all livestock products between 2016 and 2031. However, it is important to note that the percentage change in per capita consumption between 2016 and 2031 is equal to or greater than 100% for sheep meat, eggs, beef and milk. The current and projected per capita beef consumption was found to be higher for urban areas than rural areas while the opposite was observed for per capita milk consumption. In urban areas, the per capita beef consumption is projected to grow at 7.5% per annum between 2016 and 2031. For urban areas, the highest annual growth rate of 13% is projected for milk. Nationally and by rural and urban areas, the highest growth per capita livestock production is projected for milk followed by beef. For beef and milk, the per capita consumption is projected to grow by more than double between 2016 and 2031.

Table 20. Projected annual per capita consumption (kg) of livestock products by place of residence and all in Tanzania 2016–2031.

| Livestock product | 2016 | 2031 | Percentage change between 2031 and 2016 | Annually compound growth rate (%) 2016–31 |
|---|---|---|---|---|
| *Urban* | | | | |
| *Beef* | 13.79 | 40.71 | 195.21 | 7.48 |
| *Goat meat* | 0.56 | 0.96 | 71.43 | 3.66 |
| *Mutton* | 0.001 | 0.002 | 100.00 | 4.73 |
| *Chicken meat* | 3.24 | 5.77 | 78.09 | 3.92 |
| *Pork* | 0.49 | 0.80 | 63.26 | 3.32 |
| *Milk* | 19.90 | 126.08 | 533.57 | 13.10 |
| *Eggs* | 1.11 | 2.60 | 134.23 | 5.84 |
| Rural | | | | |
| *Beef* | 6.49 | 27.64 | 325.88 | 10.14 |
| *Goat meat* | 2.05 | 3.53 | 72.19 | 3.69 |
| *Mutton* | 0.002 | 0.004 | 100.00 | 4.73 |
| *Chicken meat* | 2.69 | 4.75 | 76.58 | 3.86 |
| *Pork* | 0.58 | 0.94 | 62.07 | 3.27 |
| *Milk* | 27.79 | 144.64 | 420.47 | 11.62 |
| *Eggs* | 0.50 | 1.22 | 144.00 | 6.13 |
| All | | | | |
| *Beef* | 8.88 | 32.27 | 263.40 | 8.98 |
| *Goat meat* | 1.57 | 2.71 | 72.61 | 3.71 |
| *Mutton* | 0.002 | 0.004 | 100.00 | 4.73 |
| *Chicken meat* | 2.85 | 5.05 | 77.19 | 3.89 |
| *Pork* | 0.55 | 0.89 | 61.82 | 3.26 |

| Livestock product | 2016 | 2031 | Percentage change between 2031 and 2016 | Annually compound growth rate (%) 2016–31 |
|---|---|---|---|---|
| *Milk* | 25.29 | 139.08 | 449.94 | 12.03 |
| *Eggs* | 0.69 | 1.66 | 140.58 | 6.03 |

Source: Own calculations, based on LSMS and HBS data (2011–12), NBS of Tanzania.

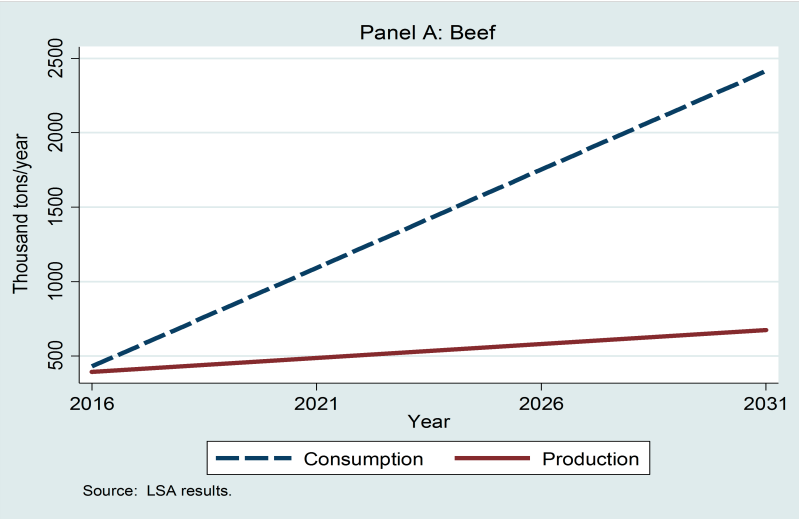
The results of baseline projections of production-consumption balance for different livestock products is given in Table 24 and Figure 15 (Panel A to I). Under the baseline situation, the projected production-consumption balances indicate that there will be a widening production gap over the coming 15 years for most livestock products except sheep meat and eggs. For example, the domestic beef production in 2031 satisfies only 15% of the domestic consumption requirements. In absolute values, the beef deficit will grow from 36 thousand t in 2016 to 1,736 thousand t in 2031. A similar pattern is observed for all livestock products. Therefore, there is urgent need to address the increasing negative production-consumption balances for different livestock products by increasing investment in domestic livestock production, otherwise the country will be more and more dependent on imports to fill the supply gap in livestock products.

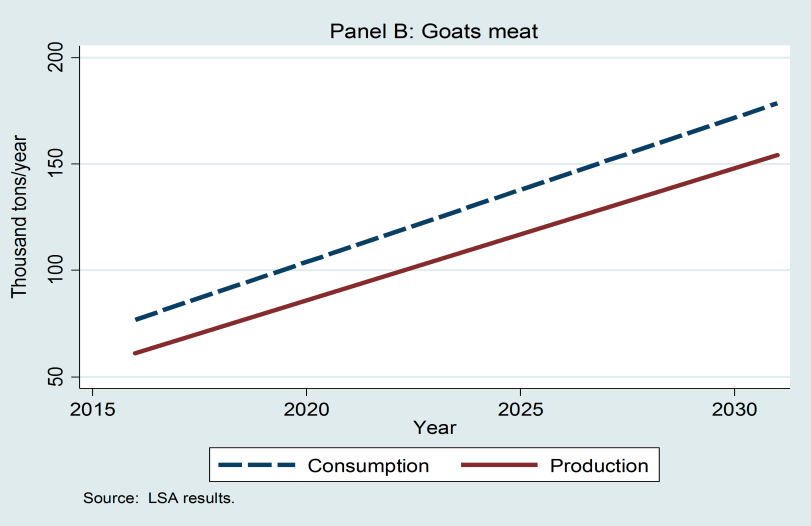
Table 21. Baseline projected annual total production-consumption balance for livestock products in Tanzania 2016–31

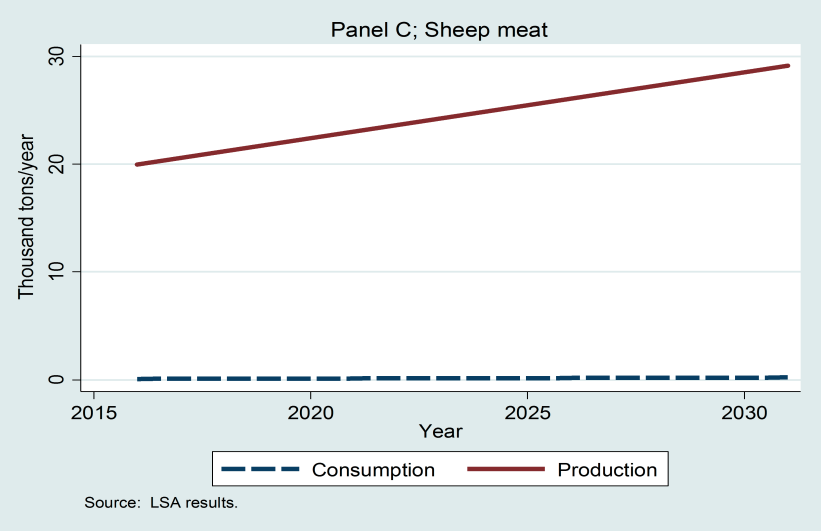
| | Production in thousand t | | Consumption in thousand t | | Per cent (%) change (2016–31) | | Production as a per cent (%) of consumption |
|---|---|---|---|---|---|---|---|
| Livestock product | 2016 | 2031 | 2016 | 2031 | Production | Consumption | 2031 |
| Beef | 394.6 | 676.2 | 431.1 | 2,412.4 | 71.4% | 459.6% | 15.5% |
| Goat meat | 61.1 | 154.2 | 76.882 | 178.4 | 152.3% | 132.1% | 115.3% |
| Mutton | 19.9 | 29.1 | 0.094 | 0.227 | 45.8% | 141.5% | 32.4% |
| **Red meat** | **475.7** | **859.5** | **508.1** | **2591.1** | **80.7%** | **409.9%** | **19.7%** |
| Pork | 18.9 | 51.5 | 27.2 | 64.9 | 172.6% | 138.5% | 124.6% |
| Chicken | 63.6 | 156.2 | 139.7 | 376.9 | 145.6% | 169.7% | 85.8% |
| **White meat** | **82.5** | **207.7** | **166.9** | **441.8** | **151.8%** | **164.6%** | **92.2%** |
| **All meat** | **558.2** | **1,067.2** | **675.1** | **3,032.8** | **91.2%** | **349.3%** | **26.1%** |
| Milk | 2,087.4 | 3,543.2 | 1,174.4 | 9,414.1 | 69.7% | 701.6% | 9.9% |
| Eggs | 153.5 | 720.5 | 33.1 | 128.2 | 369.3% | 287.6% | 128.4% |

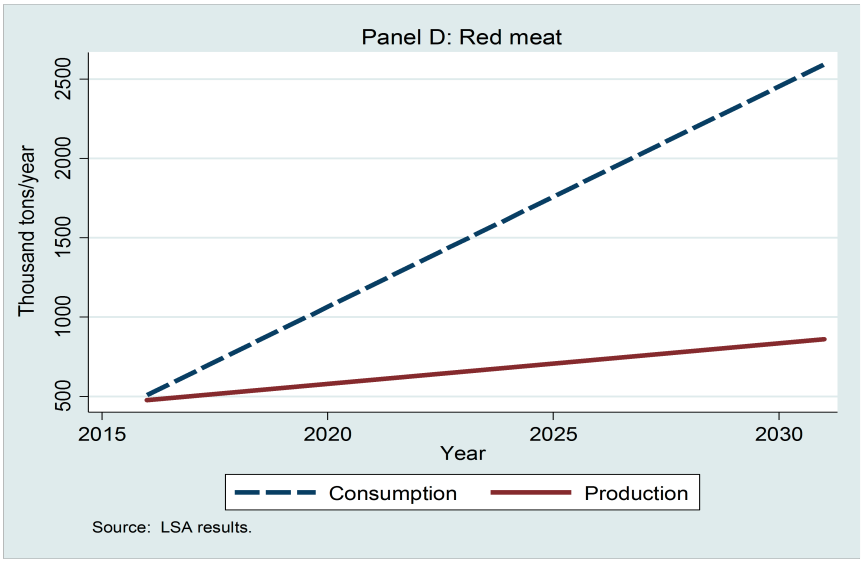
Source: LSA calculations based on HBS data (2011–12), NBS of Tanzania.

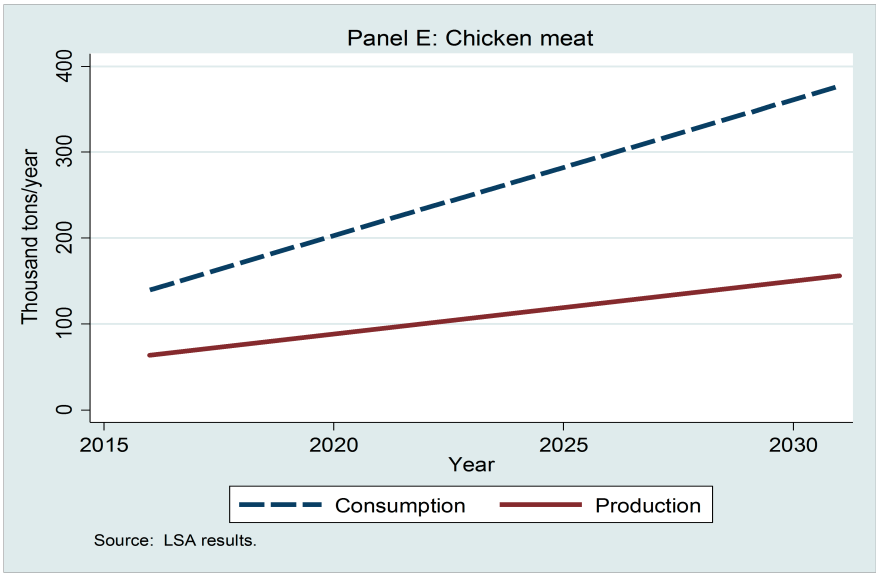
Figure 19. Baseline annual total production-consumption balance for livestock products in Ethiopia 2016–31 (Panel A-I).

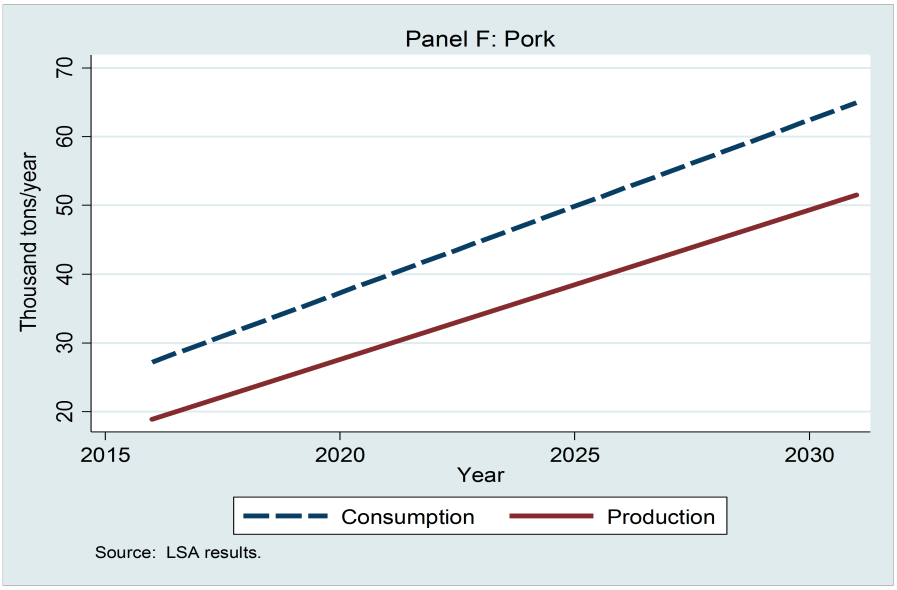


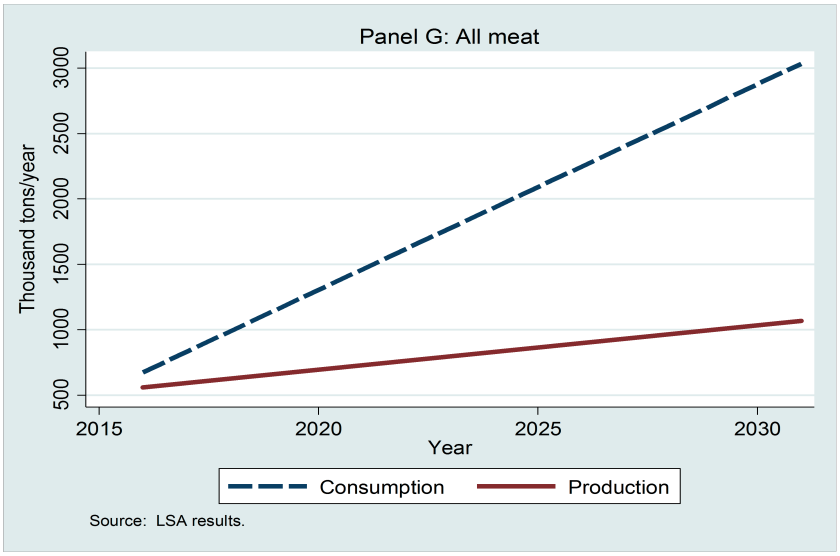



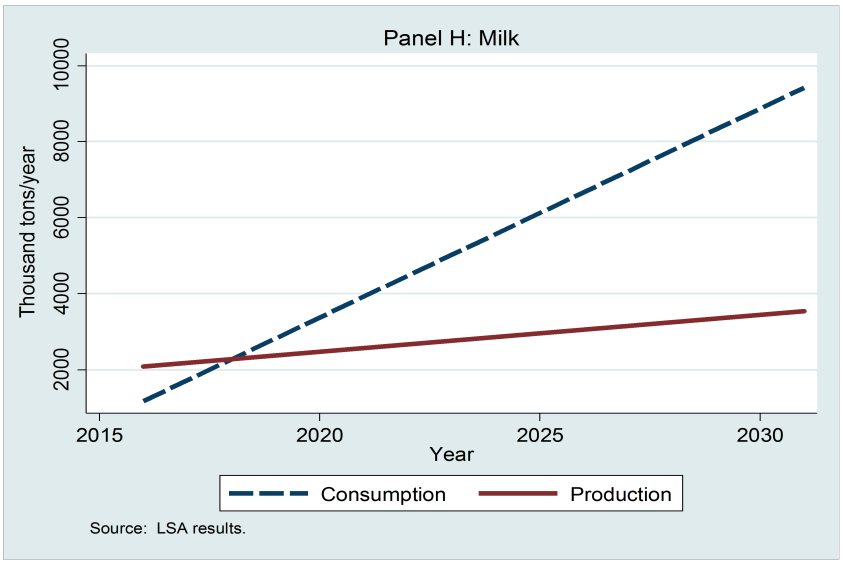



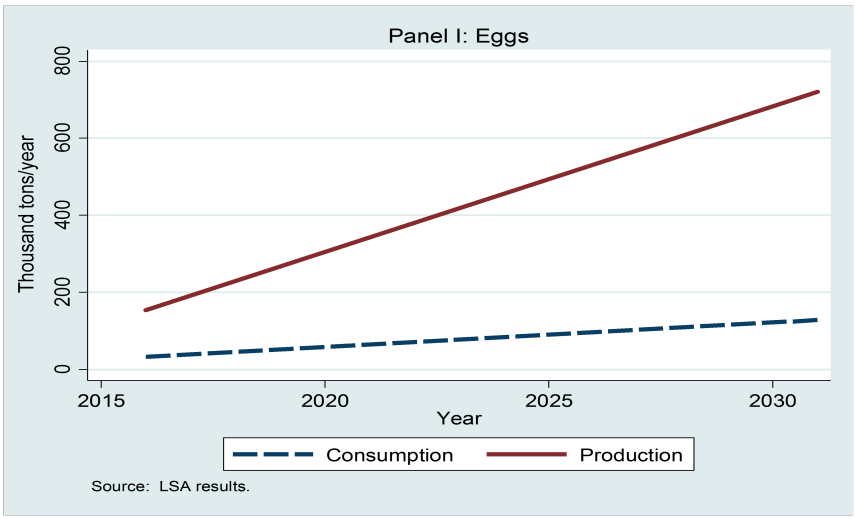

Panel D: Red meat
Thousand tons/year
500
1000
1500
2000
2500
2015
2020
2025
2030
Year
Consumption
Production
Source: LSA results.


Panel E: Chicken meat
Thousand tons/year
0
100
200
300
400
2015
2020
2025
2030
Year
Consumption
Production
Source: LSA results.


Panel F: Pork
Thousand tons/year
20
30
40
50
60
70
2015
2020
2025
2030
Year
Consumption
Production
Source: LSA results.


Panel G: All meat
Thousand tons/year
500
1000
1500
2000
2500
3000
2015
2020
2025
2030
Year
Consumption
Production
Source: LSA results.


Panel H: Milk
Thousand tons/year
2000
4000
6000
8000
10000
2015
2020
2025
2030
Year
Consumption
Production
Source: LSA results.


Panel I: Eggs
Thousand tons/year
0
200
400
600
800
2015
2020
2025
2030
Year
Consumption
Production
Source: LSA results.

# 7 Technical constraints and opportunities

## 7.1 Animal Feeds

It is important to calculate the feed balance, which is a comparison between the feed requirement (demand) for maintenance, pregnancy and production (milk yield, live weight gain, traction and number of eggs produced) for each class of livestock and amount of available and utilizable feed (supply). Analysis of the feed demand and supply provides the basis to generate empirical evidence on availability of utilizable feed that can support the current as well as projected livestock population. Thus, results of these analyses will be used to support the case for the development of the livestock production sector at the national level and at different livestock production zones (typologies) of the country.

The computation of the feed balance enables decision-making to manage a deficit of feed resources to the current herd and production and to come up with quantitative evidence-based planning to meet the feed requirements for increasing production in the future. The feed analysis tool in the LSIPT was used to estimate the supply of feeds using data gathered for the three production zones (Cn, C&L and Hi). The data gathered include amount of forage crops and pastures, yields from grazing areas, residues and agricultural by-products, and agro-industrial by-products supplied in the country.

The yields from major crops which include grain cereals, pulses, root and tuber crops were calculated and the forage amount were estimated by using crop yield indexes. Feed balances are calculated in terms of the energy required by livestock and the energy supplied by feeds. Areas available for grazing in production zones were calculated from information available from Department of Tanzania Forestry Services (TFS).

**Land use distribution**

Table 22. shows the land distribution in the three livestock production zones. The Coast and Lake zone has the biggest proportion of land size.

Table 22. Land size distribution in mainland Tanzania by livestock production zones

| Production zone | Size ($km^2$) | Percentage |
|---|---|---|
| Cn | 228,768 | 26 |
| C&L | 351,950 | 40 |
| Hi | 299,158 | 34 |
| | 879,876 | 100 |

Source: LMP Tanzania.

Table 23 shows percentage land use by various land users including crop and livestock farmers. The proportion of land for grazing is only 10%, while forestry and wildlife reserves occupy more than 50% of the land mass. Further distribution of land use size was performed for the three livestock production zones showing the high proportion of grazing land in the Central zone.

Table 23. Percentage distribution of land by land use in mainland Tanzania

| | Production zone | | | |
|---|---|---|---|---|
| Type of land use | Cn | C&L | Hi | Overall |
| Production forestry | 17 | 24 | 26 | 23 |
| Protection forestry | 10 | 10 | 12 | 10 |
| Wildlife reserve | 17 | 25 | 22 | 22 |
| Shifting cultivation | 6 | 7 | 7 | 7 |
| Agriculture | 29 | 23 | 19 | 23 |
| Grazing land | 17 | 7 | 10 | 10 |
| Built-up areas | 2 | 2 | 2 | 2 |
| Inland water body or swamp | 1 | 1 | 1 | 1 |
| Other lands | 1 | 2 | 2 | 2 |
| | 100 | 100 | 100 | 100 |

Source: LMP Tanzania.

Distribution of crop residues in agricultural land in average season (when weather is in average condition) is shown in Table 24. The crop residues proportion is lowest in the Central zone.

Table 24. Percentage distribution of agricultural land (based on major crop residue produced) in different production zones in average year*

| Description | | Production zone | |
|---|---|---|---|
| | Cn | C&L | Hi |
| Rain-fed cereals (straw) | 36 | 40 | 39 |
| Rice (straw) | 3 | 6 | 4 |
| Groundnut (haulms) | 4 | 2 | 3 |
| Cotton (leaves, adventitious plants) | 5 | 14 | 13 |
| Tubers (haulms) | 6 | 13 | 13 |
| | **55** | **75** | **73** |

***Major crop residues for livestock

Table 25. Percentage distribution of agricultural land producing major crop residues in different production zones in bad weather year

| | Production zone | | |
|---|---|---|---|
| Description | Cn | C&L | Hi |
| Rain-fed cereals (straw) | 18 | 22 | 20 |
| Rice (straw) | 2 | 3 | 2 |
| Groundnut (haulms) | 2 | 1 | 2 |
| Cotton (leaves, adventitious plants) | 1 | 8 | 8 |
| Tubers (haulms) | 2 | 6 | 5 |
| | 25 | 41 | 37 |

Note: *Major crop residues for livestock

Table 26. Percentage distribution of agricultural land producing major crop residues in different production zones in good weather year

| Description | Production zone | | |
|---|---|---|---|
| | Cn | C&L | Hi |
| Rain-fed cereals (straw) | 60 | 72 | 65 |
| Rice (straw) | 7 | 10 | 7 |
| Groundnut (haulms) | 7 | 4 | 5 |
| Cotton (leaves, adventitious plants) | 11 | 23 | 18 |
| Tubers (haulms) | 11 | 25 | 25 |
| | 97 | 134 | 121 |

Note: *Major crop residues for livestock

**Forage and concentrates productivity and availability**

The average productivity in DM/km$^2$ of natural forage, crop residue and established forage is shown in Table 27. Trees and leguminous trees had the highest biomass while lowest rain-fed cereals straws.

Table 27. Average productivity of natural forage, crop residues and established forages (t DM/km2)

| Description | Cn | C&L | Hi |
|---|---|---|---|
| Natural forage | 250 | 300 | 290 |
| Rain-fed cereals (straw) | 84 | 81 | 104 |
| Rice (straw) | 161 | 197 | 272 |
| Groundnut (haulms) | 103 | 129 | 147 |
| Cotton (leaves, adventitious plants) | 393 | 407 | 595 |
| Tubers (haulms) | 178 | 183 | 165 |
| Established pastures | | | |
| - Established grasses | 800 | 1000 | 1000 |
| - Legumes | 500 | 700 | 800 |
| - Trees/leguminous trees | 1,000 | 1,500 | 1,600 |

**Concentrates availability**

Concentrates in t of DM for the three production zones in average year is shown in Table 28. Cotton and sunflower seed cakes are produced in high amount in the Central zone while cereal bran production is highest in the Coastal and Lake zone. Cereal bran production was calculated based on population of human beings and that is the reason for the large quantity in the Coastal and Lake zone (430,000 t) as compared to other zones.

Table 28. The average amount of concentrates (t DM) by production zone

| Type of concentrates | Cn | C&L | Hi |
|---|---|---|---|
| Cotton seed cake | 47,000.00 | 22,000.00 | - |
| Sunflower seed cakes | 194,000.00 | 45,000.00 | 544,000.00 |
| Cereal brans | 162,000.00 | 430,000.00 | 226,000.00 |
| Molasses | - | 56,827.00 | 24,494.00 |
| Fish meal (sardine) | - | 13,000.00 | - |

**Estimation of feed requirements**

**Chicken and pigs**

Estimations of requirements for non-ruminant livestock (chicken and pigs) are based on cereal equivalent. Cereal equivalent in percentage in relation to the production of maize, millet and sorghum was estimated by using the toolkit. The estimate was done by using cereals (maize, sorghum and millet), poultry meat and eggs, and pigs (monogastrics) meat production data as shown in the Table 29. The cereal equivalent was 14%.

Table 29. Calculation of grain equivalent for monogastric production

| Type of production | | Cereal equivalent (t) | | Production (t) | | |
|---|---|---|---|---|---|---|
| | | t | 1.37 | Maize | Sorghum | Millet |
| Meat | | | | | | |
| | Poultry (t) | 200,000 | 274,000 | | | |
| | Pig (t) | 120,000 | 164,400 | | | |
| Eggs (t) | | 232,000 | 317,840 | | | |
| Total | | | 756,240 | 4,378,069 | 777,340 | 103,423 |
| Percentage of the estimate of cereal equivalent in relation to the production of maize, millet and sorghum (%) | | 14 | | | | |

**Feed resources balance**

Feed resources availability, requirement and balance for ruminants were determined by the LSIPT in average, bad and good weather conditions. There is a negative feed balance in all years, i.e. average, bad and good years. Table 30 indicates that current resources available for ruminants feeding in average year was 26% of what is needed. When projecting the feed balance for 15 years under the current investment scenario, it is projected that only 15% of what is needed will be available.

Table 30. Average feed balance assessment

| | | tDM | % Resources available |
|---|---|---|---|
| Current | Resources | 20,964,780 | |
| Current | Requirements | 80,557,716 | |
| Current | Balance | -59,592,936 | 26 |
| Projected | Requirements | 139,409,651 | |
| Projected | Balance | -118,444,871 | 15 |

Table 31. Feed balance in the three livestock production zones

| | Cn | C&L | Hi |
|---|---|---|---|
| Current feed balance | | | |
| Average year | 18 | 27 | 51 |
| Bad year | 9 | 15 | 21 |
| Good year | 31 | 44 | 87 |
| | | | |
| Projected feed balance 15 years | | | |
| Average year | 11 | 16 | 20 |
| Bad year | 5 | 9 | 8 |
| Good year | 18 | 27 | 34 |

Source: LMP Tanzania.

**Feed policy and technological interventions**

Policy interventions:
The main cause of deficiency of livestock feed resources is the limited land available for grazing thus not meeting the demand of the high population of ruminants in the country. Therefore:

- The importance of land reserves for forest and games cannot be overemphasized. However, there is a need for ministries which are the main stakeholders of the land to conduct dialogue on proper use of land, explore the possibility of using forages available in the production forestry and shifting cultivation area.
- Explore the possibility of land reallocation in order to make available more land for grazing.
- Formalize the area allocated for grazing by registering through the Grazing Land and Animal Feed Resources Act (No. 13 of 2010).
- The formal land registration needs to be followed by a policy for ownership of grazing areas according to carrying capacity.

Technological interventions

- Improve quality of pastures in order to increase carrying capacity: oversowing with high quality forage seeds including legumes, reduce bush encroachment in the grazing land and promote establishment of private pasture and pasture seed farms.
- Selection: crossbreeding coupled with selection and use of breeding technologies (AI, multiple ovulation and embryo transfer) coupled with increased efforts to encourage livestock intensification.
- Increased use of crop residues, agro-industrial by-products and other locally available nonconventional feed resources.
- Technologies to improve the digestibility and intake of crop residues
- Production and use of non-conventional animal feeds like soya beans, yellow maize etc. should be encouraged.

Animal feed resources in the country are not sufficient for both ruminants and non-ruminants even in good years of forage production. There is a need for employing interventions to improve rangelands carrying capacity, fodder conservation and application of technologies in livestock herds to increase production coupled with decreasing the growth rate of livestock while increasing productivity per animal. Generally, there is a need to implement a strategy to improve intensification in feeding programs along with pursuing proper breeding programs to increase livestock genetic potential and thereby high productivity.

## 7.2 Animal health

Animal health services remain the main drivers of livestock production and productivity through enhanced animal disease control and prevention. It contributes significantly to profitability, competitive marketing, quality and safe processing of animal-source foods; it is essential for certifying quality of exports and for international trade competitiveness of livestock products (Thornton 2010). The health status of the national herd, now and in future, is rigorously reviewed for planning, funding and execution by the government and other stakeholders in the industry. Also, the constraints limiting the delivery of quality animal health services and recommendations for improvement are presented.

The LSIPT tool kit is a multi-criteria decision-making tool; based on real quantitative performance data and opinions of experts, it has been used to analyse the impacts of animal diseases on production and productivity, characterize animal health services delivery and prioritize them. The pre-listed animal diseases were adjusted and then based on pre-defined criteria; we evaluated their impacts on household assets, markets/value chains and intensification as a process to prioritize

diseases for intervention. The animal health tool in the LSIPT toolkit was used to assess the qualitative and quantitative socio-economic impacts of diseases, obtain a priority list of animal diseases and characterize the status of veterinary infrastructures in the country. The main objective of disease prioritization is to optimize allocation of scarce financial and human resources to control, prevent or eliminate the selected high-impact diseases.

The list of priority livestock diseases (by species) deduced from their impacts on households' assets, markets and value chains, and effects to intensification has been analysed. The relevant final scores are summarized in Annex 6, Tables 82 - 85.

**Impact of the diseases**

a) Households' asset (HHD) impact—the priority cattle diseases (in decreasing order) affecting households' assets are contagious bovine pleuropneumonia (CBPP), Rift Valley fever (RVF), East Coast fever (ECF)/ vaccine preventable diseases (VPDs), brucellosis and foot-and-mouth disease (FMD), for sheep and goats, RVF, Contagious caprine pleuropneumonia (CCPP), peste des petits ruminants (PPR), brucellosis and Orf disease (in decreasing order) while for pigs it's African Swone fever (ASF), transmissible gastroenteritis (TGE), Erysipelas, brucellosis then porcine helminthoses. For poultry (local chicken), high impact diseases affecting households' assets are Newcastle disease, Salmonellosis, Fowl pox, infectious bursal disease (IBD) and coccidiosis.

b) Markets and value chain—priority diseases affecting cattle markets and value chains (in decreasing order of importance) are FMD, brucellosis, CBPP, RVF and least is ECF/VPDs. For sheep and goats (in same order) are brucellosis, RVF, PPR, CCPP then Orf disease while in pigs, it's ASF, brucellosis, erysipelas, TGE and least helminthoses. In poultry, salmonellosis, ND, IBD followed by fowl pox and least by coccidiosis.

c) Hampering intensification—the impacts of priority livestock diseases limiting the farming intensification of livestock production were characterized. In declining orders, for cattle are FMD, RVF, CBPP, brucellosis and ECF/VPDs; for sheep and goats it is PPR, CCPP, RVF, Brucellosis and Orf disease, while for the pig industry it is ASF, TGE, Brucellosis, Erysipelas and helminthoses. For poultry, diseases hampering poultry intensifications are Salmonellosis, ND, Fowl Pox, IBD then coccidiosis.

## Animal health technological, institutional and policy interventions

The major bottlenecks that affect efficient delivery of animal health services in Tanzania are mainly technological and institutional innovations. Hence, the following interventions are recommended to modernize and commercialize the services and increase its coverage.

- Strengthen disease control targeting the elimination of all the priority vaccine preventable transbourdary diseases and zoonotic diseases. Special emphasis is to use $I_2$ strain of ND virus; it is avirulent, immunogenic and highly protective against virulent isolates of ND as a suitable vaccine to use in village chickens to vaccinate them against ND in rural areas.

- Allocate sufficient funds/budgets for DVS annual plans—adequate public budget and private financing (from the livestock industry) will assure delivery of quality veterinary services while addressing animal identification, registration and traceability, animal welfare, and support public veterinary service.

- Department of Veterinary Services (DVS) to strengthen chain of command—the separation of Central Veterinary laboratory (CVL) and diagnostic zonal veterinary centres from DVS is a serious institutional oversight; mechanisms must be sought to reintegrate the CVL into DVS functional mandates while supporting a harmonized but efficient working relationship with

PO-RALG to work efficiently with RAS and LGAs to control most transbourdary and zoonotic diseases.

- It is urgent that the DVS design and undertake periodical disease epidemiological and impact study/surveys to benchmark the incidence/morbidity and mortality rates and map high-risk areas for five selected species-specific priority diseases to facilitate their control.
- Improve capacity to undertake rapid disease surveillance and effective responses to understand the epidemiological situation of transbourdary diseases in the country or zone so as to address these endemic and high-impact diseases.
- Strengthen animal disease data collection, collation and analysis. It is important that current data collection sources and systems are harmonized or design a new real-time/efficient data capture and sharing system to improve animal disease reporting from field, labs and abattoirs including data from processers, market facilities and DVS animal diseases response operations.
- Improve inspectorate and certifications system—this recommendation is included to support LMP targets of commercializing the livestock sector; thus, facilitative regulatory inspectorate and certification systems must be able to ensure animal-source foods processed and consumed locally, and/or exported are safe and meet internationally desired qualities. This will entail strengthening border posts (for exports, imports), internal checkpoints, quarantine stations (with local labs), better slaughter facilities (new/renovated) and to train staff at border posts, checkpoints and abattoirs for proper inspections of live animals (ante-mortem) and carcasses (post-mortem).
- Strengthen collaboration with national, regional and international agencies
- Integration of wild animal disease surveillance and corresponding data into national surveillance system; strengthening CVL-TAWIRI-WWF-FAO cooperation tetrad is vital to understand wild animal disease processes and how to manage them at the livestock-wildlife interface.
- The DVS to support formal animal disease monitoring/evaluation system.
- Improve laboratory capacity (resources, capable facilities) of national, zonal and field (public/private) veterinary laboratories to diagnose diseases and provide timely, accurate and reliable laboratory support and analytical services (feeds residues/food-toxins etc.) to protect the health of animals, contribute to public health and backup producers, processors and traders.
- Promote alternative approaches for animal health services delivery.

Improving animal health will reduce disease losses, sustain more secure investments and favor livestock technology innovations that will allow for further productivity gains (Upton 2004). Quality animal health is an important contributor to on-farm profitability, ensures food and nutrition security and safety, and enhances the international competitiveness of livestock and livestock products. Therefore, to catalyze the commercial development of the livestock sector, the health status of the national herd, now and in future, animal health is an important issue for consideration. The DVS must strengthen its disease surveillance and reporting system including empowering livestock communities to detect and report disease incidents to facilitate prompt responses to field disease incursions, e.g. mass vaccination campaigns against outbreaks of priority transbourdary, zoonotic and other notifiable animal diseases.

## 7.3 Animal genetics

The critical issues facing genetic improvement of the national herd include the need to maintain/develop appropriate genotypes; and streamline breeding efforts for better impact. Moreover, the absence of coordinated breeding and selection programs has led to an inability of meeting demands for improved breeds within communities. Thus, there is a need for coordination of animal genetic resources (AnGR) in Tanzania that would establish reliable and sustainable germplasm delivery systems; and encourage the private sector, including farmers, to actively engage in genetic improvement system.

Using the LSIPT toolkit, an inventory and characterization of the animal genetic resources in Tanzania, a description of the management and use of animal genetic resources, a review of the intervention in the field of genetic conservation and improvement, and identification and analysis of the local policies and intervention methods for conserving and selecting local breeds were carried out. The LSIPT 'inventory and characterization of animal genetic resources' assessment tool was used to analyse the data generated.

Consultations and meetings were also conducted with various livestock stakeholders in the country including farmers, NGOs, National Bureau of Statistics (NBS), LGAs and expertise from Sokoine University of Agriculture (SUA); and staff of the Ministry of Agriculture, Livestock and Fisheries. The major typologies considered were the grassland system (Central zone -Cn), mixed rainfed or moisture deficient system (C&L) and mixed irrigated or moisture sufficient system (Hl). Secondary information on management and use of animal genetic resources in Tanzania was obtained from the DAD-IS of FAO and DAGRIS of ILRI.

A literature review identified the local policies for genetic resource management, intervention methods for conserving and selection of local and indigenous breeds, and modalities for importing and using improved genes. Annex 7, Table 86 provides the summary analysis of the results of livestock genetic characteristics and productivity parameters for indigenous, crossbreeds and exotics livestock.

The management aspects, especially breeding, selection and conservation to be considered as measures for improving livelihood of livestock keepers in Tanzania, are outlined in Annex 7, Table 87.

**Technological and policy interventions to improve the genetic potential of the herd**

a) The technological interventions to improving the genetic potential of the herd (breed selection, crossbreeding with exotics and introduction of exotic breeds for production of meat and/or milk) by genetic categories (indigenous varieties, crossbreeds and exotics) include the following:

**1) Cattle**

Tanzania is endowed with local cattle breeds; there is a benefit in crossbreeding the local with exotic breeds through AI. Improvement within the local breeds is to be directed through selection and interbreeding of breed types, taking advantage of additive gene action. To take advantage of non-additive gene action the suitable breeds of cattle, based on the type production goal, recommended for use in crossbreeding with indigenous cattle are:

- **Dairy:** Friesian, Ayrshire, Jersey and Brown Swiss.
- **Dual purpose:** Simmentals, Brown Swiss and Red Poll.
- **Beef breeds:** Angus, Hereford, Charolais, Brahman, Beefmaster and Bonsmara.
- **Improved zebu:** Sahiwal, Mpwapwa, Boran and Gir.

**2) Sheep and goat breeding**

The main focus here is breeding to improve growth rate and thus mature weight, prolificacy, survival rate for meat animals and milk yield for dairy goats. Indigenous goats form the foundation stock to improve survival and some local strains are known for special traits like twinning. Exotic breeds that can be used for crossbreeding include:

- For meat goats: Boer, Kalahari, Jamnapari and others
- For milk goats: Saanen, Norwegian, Toggenburg, Anglonubian and others.
- For mutton/sheep: Dorper and Black Head Persian (BHP)

A breeding program should involve massive multiplication of the Malya (Blended) goat so that more farmers keep the locally developed-goat breeds. The breeding program must involve characterization of locally adapted goats, followed by productivity improvement and conservation.

**3) Poultry**

The main issues of poultry breeding is lack of a) information on breeding programs used by commercial breeders and b) a developed local poultry breed for production under farmers' environment. The following considerations are put forward to support a poultry breeding program:

- Make decisions (breeding committee) on breeds and strains of chicken to be used for commercial poultry production.
- Develop a locally adapted poultry breeds/strains either through breeding or testing and approval of breeds developed elsewhere.
- Carry out characterization and selection within the indigenous chicken and establish desirable traits for improvement and conservation.

**4) Pigs**

With pig breeding, the following are proposed as key areas of intervention to increase productivity and profitability:

- Control of potential inbreeding under the current herd;
- Introduction of improved breeds;
- Upgrading and introduction of modern technologies.

Importations and multiplication of the desired breeds can be undertaken by private organizations coordinated through the government ministry responsible for livestock. Producers should obtain breeding stock from the farms that have herd performance track records.

b) Policy interventions

Efforts were made to establish a National Livestock Policy 2006 from the Agriculture and Livestock Policy of 1997; however, the case remains for the need of a specific policy document that could guide the interventions and address challenges of AnGR improvement. Thus, the call for recommendation and a road map to the establishment of legal framework for regulation, coordination and improvement of AnGR in Tanzania. In this context, Animal Breeding Policy becomes essential and by having the Livestock Policy 2006 in place, the already proposed and formulated Animal Breeding Act will be implemented, thus facilitating the establishment of institutions that will coordinate the AnGR activities and enable the implementation of the Vision 2025 for livestock sector development.

There are ample opportunities in Tanzania for successful genetic improvement interventions to increase livestock production and productivity.

**Opportunities:**

- There are local strains of zebu cattle (Iringa Red, Maasai, Fipa, Sukuma, Mbulu, Gogo), goats (Gogo White, Sonjo Red, Pare Goats), sheep (Red Maasai, Gogo), chicken (Kuchi, Kinyavu, Kishingo, Kawaida, Bukini), that have already been identified and documented, and thus are available for improvement through selection and/or crossbreeding with suitable exotics.
- The emerging local and regional markets and the existing improved transport and communication infrastructure in Tanzania.
- The peace and political stability in Tanzania are a welcome trend that encourages investment in commercial livestock production.
- Favorable climatic conditions for livestock keeping under minimal disease control and availability of extensive rangelands and water resources to support animal breeding programs.

The success in genetic improvements hinge upon the extent to which the following are addressed:

- Encouraging and facilitating the engagement of farmers and the private sector in genetic improvement.
- Maintaining/developing appropriate genotypes and streamlining breeding efforts for better impact.
- Establishing reliable and sustainable germplasm delivery systems.
- Sustaining interventions and optimizing productivity, in a given environment
- Establish/strengthen institutional arrangements and policies for livestock genetic improvement.

Also, there is a need for a livestock breed of choice fitting a typology of livestock production, region/zone or to communities' preferences. The following considerations are recommended to make best use of AnGR in Tanzania:

- Lobbying and initiating the formulation and release process of the Animal Breeding Act that will facilitate the establishment of institutions to coordinate the AnGR activities.
- Characterization of the environment and AnGR to determine the phenotypic and genotypic diversity and uniqueness in such breed types, so that they can be matched with the appropriate production environment.
- AnGR management implementation to enhance breeding, selection, conservation programs, and sustainable use and development. This will include developing methods for an Open Nucleus Breeding Schemes (ONBS) and renovation of Public Livestock Farms and AI centres.
- Establishment of a data recording system for on-station and on-farm breed evaluation programs for both locally adapted and exotic breeds and their crosses.
- Capacity building for stakeholders in terms of training and strengthening animal-breeding infrastructure such as AI and MOET laboratories.
- Institutional framework including release of the Animal Breeding Act and associated regulations.

# 8 Priority institutional and policy constraints and opportunities

A detailed policy review was carried out using LSIPT as part of the formulation of intervention strategies for the livestock sector (LSA). It covered veterinary services, dairy, poultry (chicken), hides and skins, meat live animals, livestock identification, registration and traceability, livestock research, extension and training, industrial feedstuffs, animal breeding, rangeland resource management in pastoral and agro-pastoral areas, and cross-cutting issues: land tenure for livestock farming, cross border trade, private sector involvement, animal health services, artificial insemination, other livestock by products, employment and human resource capacity building (policy planning, monitoring and evaluation).

The review of existing policies, institutions, laws and regulations related to the livestock sector in Tanzania indicates that several relevant national policies have been enacted. However, the lack of capacity to enforce these policies is one of the key problems identified in the analysis. There are also several outdated policies, which need to be replaced or modified to deal adequately with the circumstances currently facing the livestock sector.

This section highlights the main policy issues and recommended actions. The proposed actions are essential to enable the introduction of the key technologies to increase productivity. They are fully in line with the main objectives of the overall livestock development strategy, i.e. a combined focus on economic growth, food and nutrition security, and poverty reduction by improving smallholder productivity and income.

In general, awareness of responsibilities between the public and private sector needs to be strengthened; in particular, improved livestock husbandry along the value chain is crucial. Revision of the regulations for land allocation and land tenure to incentivize private sector investment in local feed production to address dramatic feed gaps is also recommended.

## 8.1 Veterinary services

Livestock diseases are among constraints limiting the development of the livestock industry. There is a high prevalence of livestock diseases in the country such as trans-boundary, vector borne, zoonoses and emerging diseases that present a big challenge to the development of the livestock industry. Animal health service delivery is constrained by weak private sector involvement, inadequate infrastructure, high cost of veterinary inputs, inadequate technical support services and low adoption of technologies.

The main approaches to the promotion of the commercial livestock sector include provision of an enabling environment to encourage the private sector to operate in rural areas through provision of incentive packages, preparation of a policy statement providing for cost sharing for prevention and control of diseases of economic importance, promotion and strengthening of PPP in delivery of animal health services, and establishment of a reporting system that will facilitate collection of information on veterinary drugs/vaccines performance at all levels.

## 8.2 Animal breeding

Good quality breed is an important input for increased livestock productivity. Most of the national herd is characterized by animals of low genetic potential resulting in low production and productivity. However, few animals possess desirable characteristics such as good mothering ability, high prolificacy and growth rates. Genetic improvement of these animals can result in increased productivity. The development of Mpwapwa breed and Blended goat are examples of these efforts. The policy response will consist of finalizing and implementing the draught Animal Breeding Act,

ensure adequate expertise and infrastructure, sufficient improved genetic resources and establishment of livestock breeders associations and societies.

## 8.3 Land tenure for livestock farming

Land tenure is a form of right, which enables utility of land parcels under prescribed conditions. These are conditions under which land is acquired, retained, used, disposed of, transferred or forfeited. Land for livestock use in this country is mainly communal and it is being utilized without guaranteed security of tenure. This has resulted in social conflicts between livestock farmers and other land users, land degradation and spread of animal diseases.

The main cause of the problems associated with the land tenure system, water and pasture resources is lack of proper arrangements to allocate land and give ownership of grazing areas according to traditional or legal procedures. Other causes are frequent changes of livestock grazing areas into crop cultivation and game reserves, and the migration of livestock farmers that limit them from developing their areas.

In order to increase the availability of land for animal feed production, the GoT in collaboration with other stakeholders will strengthen technical support services on utilization of land for livestock production, demarcate or delineate grazing land in accordance with the provisions of the Village Land Act and the Land Use Planning Act, and promote and support formation of pastoral and agro-pastoral associations.

## 8.4 Industrial feedstuffs

There are two types of industrial feedstuffs, compounded feedstuffs and feed additive. Compounded feedstuffs are composed of protein, energy, mineral and vitamin concentrates and are important especially for poultry, dairy and pig production. These feedstuffs account for about 60% of farm animal production costs. Optimum productivity of animals largely depends upon the adequacy of all essential nutrients in rations. Compounded feedstuffs production is estimated at 500,000 t per annum while the potential demand stands at 2.5 million t. Production of compounded feedstuffs is constrained by low quality of feedstuffs, seasonal availability of raw material, inadequate credit facilities, inadequate raw materials, inadequate knowledge of feed formulation, high cost of production and weak associations.

The use of feed additives, which are included in animal rations, is growing especially in intensive livestock production, i.e. dairying, poultry and pig production. The use of feed additives is constrained by high cost and inadequate knowledge on the part of livestock farmers.

There is need to enforce the Grazing Land and Animal Feed Resources Act No. 13 of 2010, promote commercialization of maize and soybeans production for livestock feeds and promote contract farming in feed raw materials such as soybean.

## 8.5 Rangeland resource management in pastoral and agro-pastoral areas

Utilization of range resources in open and sparse areas is common in places where land is abundant. In some instances, these areas are owned and managed communally and sometimes privately. Communal grazing encourages movement of livestock from one area to another in search of pasture and water. Such movements, if not regulated through both formal and customary rules, may lead to spread of animal diseases, as well as social conflicts between livestock farmers and other land users.

Utilization of rangelands for sustainable livestock production is hampered by seasonal variations of quality and quantity of forage, uncontrolled burning, overstocking and overgrazing, weak pastoral and agro-pastoral organizations, and conflict between livestock farmers and other land users.

Policy action needed to address these problems include encouraging livestock farmers to adopt rangeland improvement practices, protect rangelands by law-designated grazing areas to be legally owned by livestock farmers, introducing environmentally friendly technologies for tsetse control, introducing mandatory dipping and vaccinations, adoption of animal health certification when moving from area to area, formation of apex organization for pastoral and agro-pastoral groups, formation of a cooperative society for livestock farmers and introduction of climate change adaptation and mitigation practices.

## 8.6 Dairy

Dairying is one of the fast-growing enterprises in the livestock industry. Cattle dairy is the common dairy species in the country. Milk marketed comes mainly from small-scale livestock farmers who supply on average about 70% while large-scale farmers supply about 30%. The development of the dairy industry is limited by poor nutrition and support services, and insufficient supply of dairy stocks. Other constraints include inadequate financial and credit facilities, poorly organized milk collection and distribution, inadequate processing facilities and livestock diseases. The policy response recommendation includes finalize enactment of the Animal breeding Act and implement regulations to guide dairy animal breeds and breeding, strengthen cooperatives and saving and credit cooperatives to provide capital to smallholders, strengthen the enforcement of the Dairy Act and regulations by training more inspectors, strengthen milk inspection and promote milk consumption through school nutrition programs.

### 8.7 Poultry (chicken)

The poultry industry in Tanzania is divided into traditional and commercial production systems. The traditional system contributes to over 70% of the flock, supplying most of the poultry meat and eggs consumed in rural and about 20% consumed in urban areas. The main indigenous breed subtypes include Kuchi, Kishingo, Sukuma, Kinyafuzi and Kiduchu. Both commercial and traditional systems are constrained by diseases, poor quality feeds, inadequate technical support services, low genetic potential of the local breed and weak farmer organizations. In addition, there is inadequate regulatory framework in hatcheries and breeding farms.

Recommended policy actions are to strengthen enforcement of the Animal Disease Act 2003 and its regulations, formulate biosecurity guidelines for disease control and other relevant guidelines, enforce stricter disease controls on the importation of commercial replacement stock, enforce the Grazing Land and Animal Feed Resources Act of 2010 and its regulations, build capacity for animal feed inspectors in various levels, and prepare guidelines for inspection of poultry feed.

## 8.8 Live animals and meat

Common sources of meat in this country include cattle, sheep and goats, poultry, pigs, fish, game and non-conventional animals. Cattle produce most of the red meat contributing to 68% of total meat production. Meat produced from cattle is mainly for the domestic market although part of the annual offtake is exported as live animals to neighbouring countries. Currently, the beef industry is constrained by the low genetic potential of existing stock, inadequate infrastructure, inadequate marketing system, prevalence of animal diseases, inadequate feed resources, weak livestock farmers' organizations and inadequate technical support services.

Some of the policies needed are cost effective and relevant AI technologies, improving the genetic potential of zebu and strengthening livestock market prices.

## 8.9 Hides and skins

Hides and skins are important by-products of livestock that form an important input to the industrial sector and contribute significantly to foreign exchange earnings. Most of the hides and skins are produced from the traditional production system. The potential annual output of raw hides and skins is about 2.6 and 2.5 million, respectively, of which about 75% are collected. About 95% of the hides and skins are exported in raw form mainly as air dried and wet salted. The importance of hides and skins as commercial products is not well appreciated by most livestock farmers, and thus the poor development of the hides and skins industry. Quality of hides and skins for both domestic and export markets is limited by poor animal husbandry practices such as improper branding, inadequate control of external parasites and improper flaying, preservation and processing.

The recommendations, therefore, are to promote proper branding, slaughtering, flaying, preservation and storage of hides and skins, promote trading of hides and skins according to grades, strengthen marketing information and support services, promote investment in processing facilities of hides and skins, and enforcement of the hides, skins and leather trade regulations.

## 8.10 Livestock research

Livestock research deals with development of technologies that address the problems affecting the livestock industry in order to increase livestock productivity. Currently, the main focus of research is on dairy cattle, beef cattle, small ruminants, animal feed resources, non-ruminants, farm AnGR and animal diseases. Livestock research is constrained by high investment costs, inadequate facilities and infrastructure, insufficient expertise, weak coordination among research collaborators with other stakeholders and low private sector participation.

## 8.11 Livestock extension services

Livestock extension services deal with the transfer of knowledge and skills from experts to livestock farmers and the sharing of information and experiences amongst stakeholders in order to increase production and productivity. Several approaches have been used in delivering livestock extension services including training and visit, livestock farmer field schools and livestock-product promotion. Other approaches include study tours, farmer field days, mass media, agricultural shows, residential training and demonstration units/plots. In order to improve livestock extension services, there is a need for strong collaboration among stakeholders (clear roles among stakeholders especially MALF and local government authorities (LGAs)), sufficient expertise both in quantity and quality, research-training-extension-farmer linkages and adequate infrastructure and facilities.

There is a need to define clear-cut roles between MALF and LGAs, establish sections of linkage such as zonal Research and extension liaison offices and/or zonal liaison officer, promote formulation of research, training and extension linkage and platforms and strengthen group formation, e.g. farmer field school.

## 8.12 Training in livestock husbandry

The role of training is to develop, implement, coordinate, monitor and review a training program in order to produce well-trained livestock personnel and other stakeholders for development of the livestock industry. Currently, there are six Livestock Training Agency (LITAs) campuses and two training centres, all with the capacity of 2,500 students. These campuses are LITA-Tengeru, Mpwapwa, Morogoro, Madaba, Buhari and Temeke, and the LITA training centres of Mabuki and Kikulula Kagera. Other collaborators in livestock training include SUA, Ministry of Agriculture Training Institutes (MATIs), Open University of Tanzania (OUT), University of Dar es Salaam (UDSM), Vocational Education Training Authority (VETA) and NGOs.

To improve livestock training, the GoT in collaboration with other stakeholders will improve and maintain infrastructure and training facilities, improve the government scheme of services, improve incentives packages to tutors to minimize departures to private institutes, set clear roles of regulatory bodies and other private livestock training institutes, set clear roles of each regulatory body and harmonization of the National Council for Technical Education and Veterinary Council of Tanzania Acts, promote formulation of research, training and extension linkage and platforms, encourage group formation, establish bottom-up technology formulation participatory approach and establish coordination mechanism.

## 8.13 Livestock identification, registration and traceability

Livestock identification, registration and traceability are on-farm management tools that are used to increase productivity and profitability of livestock and their products for local and export markets. It involves identification, registration and collection of data for each animal throughout its entire life cycle such that individual characteristics and the history of the animal can be traced back at any stage of the value chain. This data includes date and place of birth, ancestry, sex, geographic movement, health and other production records for purposes of tracing the animal and its products. Currently, the national identification, registration and traceability system operates but it requires adequate infrastructure and facilities, sufficient expertise and a program to promote identification, registration and traceability activities. Amendment should be made to the Act to enable the private sector to supply identification devices rather than sole reliance on ALGs.

## 8.14 Human resource capacity for policy, planning, and monitoring and evaluation

The LMP and LSA were conducted with the support and collaboration of ILRI and funded by BMGF. The MALF needs to build in-house capacity to conduct detailed LSAs, implement, monitor and evaluate, formulate new policies and revise or develop new LMPs after the current one has expired. The MALF needs to develop the institutional capabilities to generate and compile reliable social, economic and environmental statistics which facilitate the monitoring and evaluation of the impact of new investments, policy and institutional changes tools.

## 8.15 Cross border trade

Livestock, livestock products and by products export and import is a key element in the livelihood systems of traders, pastoral and agro-pastoral populations in Tanzania. Export and import trade is supported by a network of regional cross-border trade. Responsible ministry for livestock development has the mandate to enforce stipulated laws, rules and regulation related to livestock trade facilitation.

**Challenges:**

Fail to adhere to laws, rules and regulations for livestock, livestock products and by products trade including illegal cross border trade particularly live animals and animal feeds and importation of livestock products from neighbouring countries without following the proper channels and required permits. Waiving of various taxes and levies for imported livestock products, inputs and importation of expired livestock inputs.

**Strategies:**

1. Continuous control of livestock trade and its products
2. Strategic issuing and availability of livestock permits
3. Strategic issuing and availability of license
4. Registration of production, storage, transportation and selling premises for livestock inputs
5. Strategic centers on stock routes, livestock products and livestock feed ingredients for export in neighbouring counties.
6. Application of electronic system
7. Strategic supervision of primary, secondary and boarder markets

## 8.16 Private Sector involvement in value addition of livestock products and by- products

The Government has a role of creating a conducive environment to attract investments in the livestock sector. Some of the challenges to be addressed include presence of many Government regulatory bodies which causes unnecessary disturbances to the investors; un fare competition caused by importation of products from abroad especially inferior goods which leads to lack of markets of local products; many taxes in some products; and lack of reliable electricity for the industries.

There is a need of cooperation between the government and private sector especially to invest in livestock processing plants (milk, meat and leather) and rehabilitation of abandoned industries.

**Milk Processing Industries in Tanzania in 2016/2017**

There are 81 milk processing industries in Tanzania which has a capacity of processing 276.55 million litres per year. Currently there are 65 working industries which has a capacity of processing only 40.13 million litres per year which is 14.5%.

Challenges:-

i) Availability of long term capitals which has low interest rate
ii) Some businessman fails to pay back the loan
iii) Uncontrolled sales of milk which leads to loss of government revenue
iv) More than 20 % of milk are imported through black markets
v) Access and availability of raw milk as raw materials for working industries
vi) Availability of cold chain

Table 32: Milk Processing Plants in Tanzania (2016/2017)

| No. | Region | No of Industries | Name of Industry | Processing Capacity (Litres/day) | Status | Current Processing capacity (Litres/day) | % capacity |
|---|---|---|---|---|---|---|---|
| 1. | Arusha | 14 | Northern Creameries | 30,000 | Not working | - | - |
| | | | International Dairy Products | 10,000 | Working | 3,500 | 35.00 |
| | | | Mountain Green Dairy | 1,500 | Working | 1,000 | 66.67 |
| | | | Agape Dairy Group | 500 | Working | 200 | 40.00 |
| | | | Jitume Dairy Group | 300 | Working | 150 | 50.00 |

| No. | Region | No of ndustries | Name of Industry | Processing Capacity (Litres/day) | Status | Current Processing capacity (Litres/day) | % capacity |
|---|---|---|---|---|---|---|---|
| | | | Idafaso Dairy Group | 300 | Working | 100 | 33.33 |
| | | | Inuka Dairy Group | 500 | Working | 300 | 60.00 |
| | | | Kijimo Dairy Cooperative | 1,000 | Working | 500 | 50.00 |
| | | | Ayalabe Dairy Cooperative Society | 1,500 | Working | 400 | 26.67 |
| | | | Uvingo Dairy | 1,000 | Working | 500 | 50.00 |
| | | | Grand Demam | 15,000 | Working | 2,000 | 13.33 |
| | | | Prince Food Technologies | 2,000 | Working | 400 | 20.00 |
| | | | Hillside Dairies | 1,500 | Working | 400 | 26.67 |
| | | | Nasinya Dairy Ltd | 300 | Working | 150 | 50.00 |
| | | | | | 13/14 | | |
| 2. | Dar es Salaam | 8 | Bakresa Food Products | 10,000 | Working | 8,000 | 80.00 |
| | | | Profate Dairy Investment | 2,000 | Working | 800 | 40.00 |
| | | | Manow Dairy | 1,000 | Working | 300 | 30.00 |
| | | | SADO Farm Dairy | 1,000 | Working | 500 | 50.00 |
| | | | Fabian and Family Co. Dairy | 1,500 | Working | 500 | 33.33 |
| | | | TAMU Milk | 500 | Working | 150 | 30.00 |
| | | | Dairy Daily | 500 | Working | 300 | 60.00 |
| | | | Milk Com | 100,000 | Working | 26,000 | 26.00 |
| | | | | | 8/8 | | |
| 3. | Iringa | 2 | Mafinga Milk Group | 600 | Working | 100 | 16.67 |
| | | | ASAS Dairy | 50,000 | Working | 14,000 | 28.00 |
| | | | | | 2/2 | | |
| 4. | Kagera | 5 | Kagera Milk | 3,000 | Working | 400 | 13.33 |
| | | | Kyaka Milk Plant (Mgando) | 1,000 | Working | 450 | 45.00 |
| | | | Kagera Mgando | 1,000 | Working | 300 | 30.00 |
| | | | Kagoma Ranch | 800 | Working | 200 | 25.00 |
| | | | Delco Food Ltd | 1,000 | Working | 300 | 30.00 |
| | | | | | 5/6 | | |

| No. | Region | No of ndustries | Name of Industry | Processing Capacity (Litres/day) | Status | Current Processing capacity (Litres/day) | % capacity |
|---|---|---|---|---|---|---|---|
| 5. | Kilimanjaro | 11 | Nronga Women | 2,000 | Working | 800 | 40.00 |
| | | | West Kilimanjaro | 2,000 | Working | 800 | 40.00 |
| | | | Mboreni Women | 1,000 | Working | 300 | 30.00 |
| | | | Marukeni | 1,000 | Working | 450 | 45.00 |
| | | | Foo Dairy | 1,000 | Working | 200 | 20.00 |
| | | | Ng'uni Women | 1,000 | Working | 350 | 35.00 |
| | | | Kalali Women | 1,000 | Working | 300 | 30.00 |
| | | | Fukeni Mini Dairies | 3,000 | Working | 500 | 16.67 |
| | | | Kilimanjaro Creameries | 10,000 | Working | 4,000 | 40.00 |
| | | | Neema Dairies | 500 | Working | 300 | 60.00 |
| | | | Kondiki Small Scale Dairy | 4,000 | Working | 1,000 | 25.00 |
| | | | | | 11/11 | | |
| 6. | Lindi | 2 | Lindi Dairy | 500 | Working | 200 | 40.00 |
| | | | Narunyu Sisters Dairy | 500 | Working | 300 | 60.00 |
| | | | | | 2/2 | | |
| 7. | Manyara | 1 | Nasinya Dairy Ltd | 400 | Working | 200 | 50.00 |
| | | | | | 1/1 | | |
| 8. | Mara | 9 | Musoma Dairy | 120,000 | Not working | - | - |
| | | | Baraki Sisters | 250 | Working | 100 | 40.00 |
| | | | Nyuki Dairy | 3,500 | Working | 1,200 | 34.29 |
| | | | Mara Milk | 16,000 | Not working | - | - |
| | | | Kwetu milk | 200 | Working | 100 | 50.00 |
| | | | Bwai Milk | 300 | Working | 100 | 33.33 |
| | | | Mema Milk | 500 | Working | 150 | 30.00 |
| | | | Musoma Milk Group | 1,200 | Working | 700 | 58.33 |
| | | | AFRI Milk | 400 | Working | 100 | 25.00 |
| | | | | | 7/9 | | |
| 9. | Mbeya | 3 | Lwis Milk | 300 | Working | 150 | |
| | | | Mbeya Maziwa | 1,000 | Working | 800 | 80.00 |

| No. | Region | No of ndustries | Name of Industry | Processing Capacity (Litres/day) | Status | Current Processing capacity (Litres/day) | % capacity |
|---|---|---|---|---|---|---|---|
| | | | Malt Uyole | 1,000 | Working | 200 | 20.00 |
| | | | | | 3/3 | | |
| 10. | Morogoro | 5 | SUA | 200 | Working | 100 | 50.00 |
| | | | Bakilana Dairy | 500 | Working | 300 | 60.00 |
| | | | Shamo Dairy | 300 | Working | 100 | 33.33 |
| | | | Twawose | 500 | Working | 200 | 40.00 |
| | | | Shambani Graduates | 3,000 | Working | 1,500 | 50.00 |
| | | | | | 5/5 | | |
| 11. | Mwanza | 2 | Mother Dairy-Sengerema | 1,600 | Working | 300 | 18.75 |
| | | | Tukwamuane Dairy | 500 | Working | 200 | 40.00 |
| | | | | | 2/2 | | |
| 12. | Njombe | 1 | Njombe Milk Factory | 6,000 | Working | 4,200 | 70.00 |
| | | | | | 1/1 | | |
| 13. | Pwani | 2 | Chawakimu Cooperative | 1,000 | Working | 500 | 50.00 |
| | | | Mother Dairy Ltd | 3,000 | Working | 2,000 | 66.67 |
| | | | | | 2/2 | | |
| 14. | Rukwa | 1 | Motherland Dairy | 5,000 | Working | 800 | 16.00 |
| | | | | | 1/1 | | |
| 15. | Ruvuma | 2 | Mother Dairy Ltd | 300 | Working | 200 | 66.67 |
| | | | Ruvuma Dairies | 500 | Working | 300 | 60.00 |
| | | | | | 2/2 | | |
| 16. | Shinyanga | 2 | Saweka Cooperative | 200 | Working | 150 | 75.00 |
| | | | Propavet Dairies | 500 | Working | 200 | 40.00 |
| | | | | | 2/2 | | |
| 17. | Simiyu | 2 | Lamadi Milk (Busega) | 400 | Working | 100 | 25.00 |
| | | | Meatu Milk | 1,000 | Working | 200 | 20.00 |
| | | | | | 2/2 | | |
| 18. | Singida | 1 | Singidani Dairy | 500 | Working | 300 | 60.00 |
| | | | | | 1/1 | | |
| 19. | Songwe | 1 | Ushirika wa Maziwa wa Vwawa | 5,000 | Working | 200 | 4.00 |
| | | | | | 1/1 | | |
| 20. | Tabora | 2 | Uhai Mazingira (Sikonge) | 200 | Not working | - | - |
| | | | New /Tabora Dairies | 2,000 | Working | 500 | 25.00 |

| No. | Region | No of ndustries | Name of Industry | Processing Capacity (Litres/day) | Status | Current Processing capacity (Litres/day) | % capacity |
|---|---|---|---|---|---|---|---|
| | | | | | 1/2 | | |
| 21. | Tanga | 4 | Tanga Fresh Ltd | 160,000 | Working | 41,000 | 25.63 |
| | | | Ammy Brothers Ltd | 1,000 | Working | 250 | 25.00 |
| | | | Irente Farm | 1,000 | Working | 300 | 30.00 |
| | | | Montensory Sister's | 1,000 | Not working | - | - |
| | | | | | 3/4 | | |
| 22. | Unguja | 1 | Azam Dairy | 150,000 | Working | 25,000 | 16.67 |
| | | | | | 1/1 | | |
| | **Total** | **82** | | **757,550** | | **154,100** | |

**Leather Processing Industries**

The Government has continued to encourage private sector to invest in leather processing industries in Tanzania. Through the involvement of private sector the leather industries there is 9.

Table 33: Leather Industries in Tanzania (2016/2017)

| NO | NAME OF INDUSTRIES | PLACE | PROCESING CAPACITY (Feet$^2$) | | STATUS |
|---|---|---|---|---|---|
| | | | Cattle | Sheep/ Goats | |
| 1 | Lake Trading Co. Ltd | Kibaha | 90,000 | 420,000 | Working |
| 2. | Himo Tanneries and Planters | Moshi | 90,000 | 900,000 | Working |
| 3 | Sak International Ltd | Arusha | 450,000 | 900,000 | Working |
| 4 | Ace Leather Ltd | Morogoro | 1,200,000 | 3,600,000 | Working |
| 5 | Salex tanneries Ltd | Arusha | 624,000 | 1,500,000 | Working |
| 6 | Moshi Leather Industries Ltd | Moshi | 180,000 | 1,200,000 | Working |
| 7 | Afro Leather Industries | DSM | 300,000 | 700,000 | Not Working |
| 8 | Hua Cheng | Dodoma | 900,000 | 1,500,000 | Not Working |
| 9 | Xing Hua Investment | Shinyanga | 900,000 | 2,100,000 | Not Working |
| | **TOTAL** | | **4,734,000** | **12,820,000** | |

**Meat Industries in Tanzania**

Tanzania has 32 meat processing industries, which has the capacity of processing 626,992 tons of meat per year. Currently the processing capacity is 81,220 per year.

Table 34: Meat Industries in Tanzania in 2016/2017

| NO | SLAUGHTER SLAB/ INDUSTRY | LOCATION | CAPACITY/DAY | STATUS |
|---|---|---|---|---|
| 1 | Alpha Choice LTD-Magu | Magu | Cattle 80 | Working |
| 2 | SAAFI Ltd | Sumbawanga | Cattle 150, Sheep & goats 150 | Working |
| 3 | Orpul Ltd | Simanjiro | Cattle 40, Sheep & goats 40 | Not working |
| 4 | Arusha Meat Company | Arusha | Cattle 300, Sheep & goats 400 | Working |
| 5 | Mtanga Farms Iringa | Iringa | Cattle 80 | Working |
| 6 | Peramiho | Songea | Cattle 40 | Working |
| 7 | Triple S Company | Shinyanga | Cattle 500, Sheep & goats 700 | Not working |
| 8 | Tandan Farms Iringa | Mkuranga | Nguruwe 100 | Not working |
| 9 | Happy Sausage | Arusha | Nguruwe 100 | Working |
| 10 | Kuku Poa | Mwanza | Kuku 5,000 | Working |
| 11 | Interchick | Dar es salaam | Kuku 3,000 | Working |
| 12 | Kijenge Farms | Arusha | Kuku 4,000 | Working |
| 13 | Kiliagro | Moshi | Kuku 4,000 | Working |
| 14 | Mkuza Chicks | Kibaha | Kuku 5,000 | Working |
| 16 | Aman (Endanahai) | Babati | Kuku 4,000 | Working |
| 17 | Al Kafir Co.Ltd | Dodoma | Cattle 300, Sheep & goats 3,000 | Working |
| 18 | Fudar Enterprise Co | Dodoma | Cattle 200, Sheep & goats 1,000 | Not working |
| 19 | S and Y Group Meat Co. Ltd | Dodoma | Cattle 200, Sheep & goats 1,000 | Working |
| 20 | Ali Allaba Company Ltd | Bagamoyo | Cattle 400, Sheep & goats 3,000 | Not working |
| 21 | Fan Hua Investment Co. Ltd | Shinyanga | Punda 100 | Working |
| 22 | Chobo Investment Ltd | Mwanza | Cattle 360, Sheep & goats 400 | Working |
| 23 | Manispaa ya Iringa | Iringa | Cattle 200, Sheep & goats 200 | Not working |
| 24 | Nguru Hills Ranch | Mvomero | Cattle 150, Sheep & goats 200, chicken 16,000 | Not working |

| | | | | |
|---|---|---|---|---|
| 25 | Kampuni ya Ranchi za Taifa (NARCO) | Ruvu | Cattle 800 | Not working |
| 26 | Mitoboto farms Ltd | Kibaha | Cattle 3000 | Working |
| 27 | Brich Company Ltd | Ubungo DSM | Pigs 20 | Working |
| 28 | Huacheng International Ltd | Dodoma | Donkeys 40 | Working |
| 29 | Buibui Investment Ltd | Kibaha | Ostriches 5 | Working |
| 30 | Meat King Ltd | Moshono Arusha | Pigs 3 and cattle 7 | Working |
| 31 | Zheng He International (T) Ltd | Temeke | Ofoals 4 tons | Working |
| 32 | GES Company Ltd | Kinondoni | Meat 8 tons | Working |

## 8.17 The Tanzania Livestock Sector Reforms

### i) Animal Health Services

Before 1986, the Government provided most of the veterinary services, both public and private. Following the introduction of a pluralistic political system and free market economic policies in late 1980s, the Government started to embark on several reforms that resulted in hiving-off a number of commercial related services to the private sector and concentrating on regulatory, policy formulation and law enforcement functions.

#### Government Reforms and Veterinary Services Privatization

Preceded by the Sector Reforms, the Privatization of Animal Health Services was equally affected by the removal of Government support to Livestock Extension and Input-supply (drugs, pesticide chemicals, and vaccines). The Public Sector Reforms (PSR), which included the Civil Service Reform (CSR), Agricultural Sector Reform and the Local Government Reform. The PSR prescribed the main areas to remove government's funding especially those which are contestably attractive to the private sector in 1992. The basic vision is that the roles of central government and sectoral ministries be confined to policy making, regulation, periodical performance monitoring or assessments and intervention to ensure the legality of public services provision.

These reforms, culminated in developing a new Agricultural and Livestock Policy of 1997 (NALP 1997). The agricultural sector reform, restructured the livestock services delivery system starting with the separation of functions that should be performed by the private sector, public sector, and those that should be shared. However, the Livestock Policy (2006) which is a part of the NALP 1997, prefered a cautious approach in implementation of new mandates. For example, as far as privatization of livestock services is concerned, the policy provides under section 3(iii) that: "the *privatization of veterinary services and drug supply will be gradual, starting in urban and peri-urban areas where services can easily be provided by the private sector".* The NALP 1997 envisaged that veterinary services and drug supply in rural areas would remain under government control in the near future.

The Local governments reform program of 1999, introduced the new local government system based on political devolution and decentralization of functions and finances within the framework of a unitary state. It came with the re-deployment of sector ministries' staffs to the districts or local government authorities (LGAs). Under this system LGAs are a holistic institutions, i.e. they are multi-

sectoral in operations, representing government units with legal status, operating on the basis of discretionary, but general powers.

However, despite the implementation of these reforms, still they had observable effects to the division of responsibilities between state veterinary officers and private veterinary officers, especially as far as provision of private good veterinary services in rural areas is concerned.

**The Animal Health Strategy of 1998 and Privatization**

The animal health strategy was to devise means for efficient utilization of both public and private veterinary sectors in accelerating efforts towards reduction of animal diseases, morbidity and mortality and protect livestock and livestock consumers against infections, pests and diseases. The overall principle embedded in the strategy is that farm level disease control is the responsibility of the livestock keeper and services such as the procurement and distribution of veterinary especially drugs, vaccines and other livestock inputs supplied by the private veterinary sector. The role of the government be limited to the control of epidemic and infectious diseases outbreaks, sanitary control, inspection and controlling pests and related diseases, which are in such a magnitude that individual farmers cannot control. The Strategy provides a summary on how the private and public sectors will share or divide among themselves the veterinary services.

**Livestock Sector Reforms and Animal Health Services Delivery**

The national government stopped providing animal health services among several agricultural and social services in the country in 1992. The efforts to implement these reforms resulted into limited success, it has resulted into the division of roles (still in papers), the privatization of clinical veterinary services, management of livestock infrastructures, and drug distribution (through veterinary clinics and Agrovet shops) accompanied by attempts to induce government veterinarians to leave government services and enter private practices.

However, as the Livestock Policy portrays, successes of such a move will highly depend on ability to cultivate a clientele able to pay for the services. This means privatization though is a step in the right direction, but it will not be able to succeed in the near future and help the majority of agro-pastoralist and pastoral livestock producers who are also subsistence herders. As such, the hiatus left by the government withdrawal from the provision of private veterinary services, will be much more felt in rural areas than in urban and peri-urban areas, where private veterinary services is prominent. The inability of some livestock keepers to pay veterinary service fees, normally leads to breakdowns pf services. There is also a potential lack of cooperation or participation of local government authorities, which further undermine the effectiveness of veterinary services delivery.

**Reasons for Privatization of Veterinary Services in Tanzania.**

In Tanzania, the growing fiscal deficits to support public livestock services, and the huge economic costs of an inefficient pubic livestock services have renewed the interest to transfer (selectively) the delivery of important livestock services from public to private sector. These services includes veterinary surveillance and diagnostics, animal diseases and vector controls, vaccinations, clinical treatment of sick animals, inspection of livestock products, and veterinary research and extension.

However, from the point of view of the Tanzania Livestock Master Plan (TLMP), the supply of private veterinary services will be determined by profitability and several other factors arising from economies of scale, such as the size of the livestock enterprises in the locality, the nature of potential and actual animal diseases, and the types of animals raised in the production systems. It follows that,

where private veterinary work is unprofitable or where other types of market failure occurs, both economic and or social concerns may make some type of public intervention necessary.

**The Current Strategies in the Delivery of Veterinary Services**

Within the confines of TLMP framework, it's emphasized that, veterinary or animal health services will be done in modified ways through a policy of selective privatization and support. The latter means, while the public sector (in collaboration with development partners staff and through public veterinarians and para-veterinary staffs) will assume all roles of delivering quality animal health services where the private sector cannot viably deliver. The private veterinary sector will provide animal health services in moderate to high potential livestock areas and for those services that are commercially contestable.

On the contrary, the public sector may transfer the delivery of all animal health services which have limited business attractions and those which are of a public good to the private sector by co-opting the latter on short-term contract basis or by other collaborative arrangements). In this arrangements, the private sector will do specialized short-term animal health service tasks in remote underserved areas to safeguard public good and serving livelihoods. The government will retain and fully support livestock extension (for a short transient period), training and research to complement private services and ensure the success of such transfers. Being a catalytic development agent of the livestock sector, the government may grant in-kind seed capital to livestock communities to initiate or revamp a dying or slumbering livestock service. For example, the government may fund the procurement and distribution of starter supplies of seed acaricides to revamp a previously dead farmer-managed dipping scheme or routine vaccination campaigns for diseases like New Castle Disease, brucellosis, anthrax etc.

**Delivery of Preventive Animal Health Services**

The Tanzania Livestock Master Plan (TLMP) clearly emphasize that "the threats posed by endemic and epidemic animal diseases in Tanzania need to be urgently addressed. Effective disease control and prevention through efficient animal health services delivery is a perquisite to transform the livestock industry". The TLMP states that "improved preventive animal health services needs to be able to control all priority transboundary animal diseases (TADs) and neglected zoonotic diseases (NZDs) hindering production and catalyze livestock intensification, investment and innovation".
"In many arid and semi-arid parts of the country, it would be the roles of the government and its partners to provide required services like mass livestock vaccination campaigns. The public sector and partners must strive to reach as many animals as possible. In these areas, vaccinations will be a strategic option focusing to help affected remote communities out of the risk of epidemic disease and their socio-economic effects in the societies. These campaign must be done early in dry season (for predicted diseases); otherwise in the rainy periods, rains may completely cut off or make them extremely difficult to access, and a huge number of animals risk being trapped in an impossible disease situation,"

The TLMP's noble approach to ensuring the remotely placed subsistence livestock keepers (keeping the majority of beef animals) and urban smallholder livestock farmers (keeping high value dairy herds) albeit has access to and able to buy and utilize the expensive but very efficient East Coast fever

(ECF) vaccines. Such access to essential vaccines will be supported through local (LGAs) and central government or its development partner's catalytic subsidization support.

Under the supervision of a government veterinary personnel, the public sector will execute monitored arrangement where the private supplier(s) will be obliged to sell ECF vaccine and vaccination services at an agreed/prescribed price charging the deference of the actual price from the subsidized amounts instead of a full cost recovery and contract delivery which is comparatively expensive. The same arrangement can be implemented to supply acaricides to maintain a steady dipping scheme in different LGAs and regions in the country.

**ii) Establishment of the Organ/Agency**

Many livestock services and infrastructure are operating in efficiently (under capacity) due to lack of resources and proper coordination. There is need for Government to conduct a study and see to it if there is a need of establishing an agency which will supervise and operates livestock infrastructure such as, animal breeding, pastures, water points, animal health and marketing.

## 8.18 Artificial Insemination Service in Tanzania

**Historical Background**

AI services in Tanzania started way back in 1958 by white settler farmers in the northern part of the country. As the demand for grade dairy cows kept rising, the Ministry of Agriculture, by then opened up a semen production centre at Mpwapwa in 1966. This centre first produced liquid semen, but later in 1968/69 changed to deep frozen semen that was issued free of charge to AI schemes with the intention being to get smallholder dairy to participate in AI services.

New sub-centres were opened up later in Kilimanjaro, Arusha, Tanga, Mbeya, Mara and Kagera regions. Most of these AI sub-centres were being supplied by semen from Mpwapwa. The newly started AI scheme soon collapsed due to problems emanating from irregular semen supply, liquid nitrogen ($LN_2$), inadequate funds and lack of follow up of the services.

During the early 1960's to 1980's A.I field services were directly under NAIC and with support from Regional Development Directors, and Regional Livestock Development Officers. Between 1980's and 2000's support of these services shifted from state support to stakeholders mainly by development partners under dairy development programmes which were mainly operating in Southern Highlands (SHDDP) supported by the Swiss government; Kagera region by KALIDEP and Tanga region by TDPP supported by the Dutch and the Austrian Government under Austro project which was supporting Mara and Coastal regions. Under dairy development programmes most of the semen use was being imported from abroad mainly from the Netherlands and the USA from progeny tested sires and was basically used in inseminating cows (Zebu and Boran) for the purpose of crossbreeding to get F1 heifers for distribution to aspiring dairy farmers in the project areas.

Outside the dairy development programmes areas, farmers continued to use NAIC semen for inseminating their animals despite its associated problems. Even in some project areas NAIC semen was being used, mainly because of being relatively cheaper and easily available compared to imported semen (sold at 600/- TZS against 1950/- TZS per straw). Most inseminators and farmers

preferred imported semen, because NAIC semen exhibited low motility ranging between 40% and 55%, while imported semen ranged between 65% to 85% motility (KALIDEP report –Dairy conference). The low motility semen was reflected in higher number of inseminations per pregnancy for NAIC semen when compared to imported semen. For this reason Dairy programmes preferred imported over NAIC semen. Moreover, there were other attempts within AI services and dairy development programmes, to privatize A.I field services and traces of privately based A.I services are evident today in the country.

When these programmes phased out during the mid 2000's and in line with decentralization of livestock services and sensitization on the involvement of the private sector, A.I field services became the responsibility of Local Government Authorities (LGA) and the private sector. To date over 1000 public and private A.I technicians are said to be operating in the country under LGAs or privately employed. These inseminators have been trained at NAIC under the sponsorship of LGAs, Non-Government Organizations (NGOs), Dairy Development Programmes and the private sector.

A.I field technicians are operating either as LGA's employees, self-employed or as privately employed by private organizations like farms or registered veterinary facilities in urban areas. These technicians have equipment for storing and transporting semen and $LN_2$, and insemination gear.

**Current Status of Artificial Insemination in Tanzania**

AI services in the country include the following;

- Semen and Liquid Nitrogen production
- Artificial insemination field services
- Training of Inseminators

Production of Semen, liquid nitrogen and training of Inseminators is done by the Government with some cost sharing. The main reason is to ensure production of quality semen from good quality bulls. Presently semen is produced at NAIC and distributed to the zonal AI centres located in Mwanza, Dodoma, Mbeya, Lindi, Kibaha and Mpanda or through private inseminators; who practice field services which were privatized since 1997. The prices of semen have set to be 3,000/= in regional level and 5,000/= at District level.

**8.19 Other livestock by-products;**

Other livestock by-products of economic importance include wool, blood, bones, horns, hooves, bristles, feathers, hair and fur. These livestock by-products are used for different purposes such as manufacture of animal feeds, medicines and garments.

**Issues**

Promotion of sustainable production and use of these by-products is limited by inadequate knowledge, lack of code of practice and procedures on production, handling, processing and inappropriate technology.

**Objective**

To promote production and utilization of other livestock by-products for the provision of industrial inputs and income generation to livestock producers and traders.

**Interventions**

i. Efforts will be undertaken to promote production and utilization of other livestock by-products.

ii. The Government will encourage and promote establishment of processing and handling facilities for other livestock by-products.

iii. The Government will promote and support research on better use of other livestock by-products.

iv. The Government in collaboration with other stakeholders will strengthen marketing information and support services.

v. The Government will institute and strengthen quality control of other livestock by-products.

## 8.20 Contribution of Livestock Sector to the Employment

There are 4.493 million households owning livestock and majority being poultry and cattle. Each household has about five members, which makes about 22.5 million people who engage in livestock, which is estimated to be 50% of population of Tanzania. The livestock industry has an important role to play in building a strong national economy and in the process, increasing their incomes and employment opportunities'. It is a source of employment for millions of family labourers and hired external labour in Tanzania. During implementation of the first phase of TLMP it is estimated to have additional of approximately 2 million people who will be employed in livestock sector.

# 9 Ex-ante assessment of strategic options (combining technology interventions with supporting policy)

The GoT Development Vision 2025 (TDV 2025) includes 'raising the standard of living of Tanzanians to a medium-income country through ensuring food security, improving incomes and increasing export earnings'. The livestock sector vision as established in the National Livestock Policy document to complement the TDV 2025 states that 'by year 2025, there should be a livestock sector, which to a large extent shall be commercially run, modern and sustainable, using improved and highly productive livestock to ensure food security, improved income for the household and the nation while conserving the environment'. The LSIPT baseline analysis provided in the preceding chapters identify the critical existing constraints and opportunities that drive the performance of the livestock sector in Tanzania. These lead to identification of the strategic intervention options included in the foresight analysis reported in this section. Through the foresight analysis, these interventions are assessed for their potential to help meet the development objectives of the country and the livestock development vision 2025 by transforming the livestock sector.

## 9.1 Constraints, opportunities and strategies

**Constraints**

- Extreme shortage of livestock **feed resources** is the overriding livestock production constraint in Tanzania: The LSIPT Feed balance analysis for the baseline year (2015–16) shows that there is not adequate feed available for ruminant livestock in all livestock production zones (Central, Coastal and Lake and Highland) in all rainfall situations (average, bad and good). As indicated in Section 7, the livestock feed that is produced nationally can meet only 16%, 31% and 52% of the current livestock feed requirements in bad, average and good years, respectively. The deficit ranges from 48% to 84% depending on rainfall situations. The deficit could be even worse in future if the livestock population maintains the same rate of growth and productivity levels as over the past decade. Infestation of a vast tract of the rangeland by tsetse has worsened the feed shortage by denying livestock access to the available forage in these infested areas. The non-ruminant (poultry and pigs) livestock feed requirement is also high and a big challenge to meet it is competition with human food requirements. In the baseline year, the competition is as high as 14%. The situation will be much worse in the future, as it grows to as high as 43% in the 15-year time horizon.
- Livestock diseases are among the constraints limiting the development of the livestock industry: As shown in Section 7, the capacity of the Tanzanian veterinary system is inadequate to meet the present and future animal health service demands of the national livestock sector. The current national animal health service coverage is 40% and it is much lower in the Central production zone where a large number of the livestock are found. The quality and quantity of services provided by both the public and private sectors are substantially inadequate. Mortality is as high as 20% for calves, kids and lambs and 50% for chickens. In general, the threats of endemic and epidemic diseases in Tanzania and absence of effective disease control and animal health services delivery systems are critical constraints that hamper transformational development of the livestock sector as envisioned in the NLP document. To achieve what has been envisioned in the NLP, improved animal health and veterinary services delivery must effectively control all priority devastating TADs and ZDs to reduce current production losses from high morbidity and mortality rates and revenue losses in international trading.

- Poor genetic composition: Even if the feed and health interventions are improved, the **poor genetic composition** of the current livestock population would still constrain increased productivity and efficiency. The current genetic potential of indigenous livestock is very low. Ninety-eight per cent (98%) of the national cattle population are indigenous breeds. The low genetic potential of the indigenous livestock coupled with limited supply of improved livestock breeds and poor breeding practices used by livestock keepers has led to poor production and productivity of the livestock industry.

- Lack of enforceable land use policy[8]: Tanzania does not have an enforceable land use policy that has clearly demarcated and allocated grazing lands and defined ownership arrangements according to either traditional or legal procedures. This has led to frequent changes of livestock grazing areas into crop cultivation, game reserves, production forests etc., and affected the movement pattern and coverage of livestock keepers, in particular, pastoral and agro-pastoral herders to access forage and water which have a feature of temporal and spatial variability in their availability. This has become a source of land disputes between livestock keepers and other land users.

- Inadequate infrastructure: Inadequate infrastructure for processing and marketing of livestock and livestock products is another constraint that hinders the development of the sector. The presence or flooding of the domestic market by highly subsidized livestock products from outside the country discourage investments and create unfair competition for locally produced products in the livestock industry.

- Inadequate extension service: Inadequate extension services and low knowledge and skills of livestock keepers are also limiting factors to the development of the industry. Knowledge and skills are important for development and quick adoption of appropriate technology and timely dissemination to livestock farmers.

- Limited credit facilities: Limited credit facilities to large, medium and small-scale livestock entrepreneurs and low capital investment limits the expansion and commercialization of the industry.

**Opportunities**

On the opportunities side, the priority-positive livestock development forces that emerge are:

- Land resource base and diverse and favourable climate and agro-ecological zones:
  Tanzania has abundant natural resources for livestock development including large and diverse herd, extensive rangelands and diverse natural vegetation for browsers and grazers. Of 95 million hectares of land resources in the country, 60 million hectares are deemed suitable for grazing.

- Favourable demographic and economic factors: Population growth, urbanization, and rising per capita income are leading to explode domestic demand for meat and milk, and resulting in high market prices.

- Suitable geographic location in the region: Tanzania borders several countries and this gives it a highly competitive edge for regional livestock export markets including cross-border trade.

[8]Note: The priority constraints which emerge from the policy analysis are summarized in Section 8.

- Livestock is one of the most important means of improving farmers/pastoralists livelihoods. The LSA household analysis revealed that 50% of all Tanzanian households keep livestock (4.6 million households) and according to TLMI 2015, 62% are rural and 23% urban, with ownership patterns dominated by chickens (86% households), goats (48%), cattle (35%), pigs (9%) and other livestock (10%).

- GoT interest in the livestock sector: The government has become increasingly interested in developing the contribution of the sector to the national economic growth, poverty reduction and enhancing food security. NLP, LDS, TLMI are evident policy, strategy and development documents that show how much the government is committed to develop the sector.

From a poverty reduction and economic growth perspective, the picture is more nuanced:

- Cattle and chicken systems are the dominant systems (for 33–53 %) of the households, whereas in terms of poverty reduction, the priority would go to chicken throughout the country as 57% of the poor are chicken-dominant households. These observations have significant policy implications for where to focus pro-poor development efforts. Chicken-dominant households across all the production zones in general and in the C&L in particular are priority targets for poverty reduction efforts.

**Strategies**

With this summarized LSIPT analysis in mind, the key elements of the strategy that emerge are:

- First, overarching priority is given to increasing the productivity or production per animal, without increasing the livestock population growth rate. Key policy and investment actions to support this strategy are enhancing breed improvement for dairy production with AI and naturally through selected bull, meat production through veterinary coverage and rationalized private and public roles and PPP partnerships, in particular to reduce mortality and morbidity, improved extension (including through PPPs and private processors) and to promote complementary improved feeding and animal husbandry interventions,; the combined interventions of breeding, health and feeding and improved management are aimed at increasing milk production, and red meat and white meat production.

    - Promoting livestock friendly investment policies to allow for adequate land allocation to increase livestock inputs (DOCs, forage, feed rations (from mills) etc.), production and processing; promotion of a policy that enhance PPP in livestock development.

    - Promoting a comprehensive animal health and marketing service to meet the regional and international requirements. This will require investments in this area to achieve a major increase in the quality and safety of products for export.

    - Importation and/or development, and massive dissemination of well-adapted improved tropical self-reproducing chicken breeds by the private sector or with government through PPPs where the private sector is reluctant to enter on its own, private or PPP animal health services to provide critical vaccines and GOE extension services to promote improved feeding.

This section presents the results of LSA focusing on four priority investment and policy intervention areas**.** First, an investment in the improvement of animal genetics and productivity in dairy cattle through the introduction and increased use of AI and synchronized breeding services is tested. Second, improvement in the coverage of veterinary services through rationalization of public and

private roles leading to an improvement in animal health to reduce YASM and morbidity and to increase red meat productivity. Both are combined with improved feeding and better management practices (through improved extension). Third, the importation of tropical pure chicken breeds to create well-adapted and much more productive breeds, and improvement in the indigenous breeds combined with required supplemental feed, health services (primarily vaccines) and housing is evaluated. Fourth, improvement in the breed, health and management of the swine to modernize the sector is also evaluated. The investment analyses of these four highest priority combined policy and technology interventions are then followed with a summary of the results for these scenarios. The cost figures and potential benefits (physical improvements in performance, leading to increasing yields, incomes etc.) are the result of intensive consultation with local experts and practitioners, but are approximate and must be refined as more data become available. The economic results are presented here in terms of IRR and NPV as well as contribution to GDP, poverty reduction and food security where appropriate.

## 9.2 Ruminant red meat production improvement interventions through improved animal health, breeding and feeding

### The investment context—intervention and assumptions for red meat improvement

Livestock productivity of the indigenous livestock species in Tanzania for both meat and milk are low. Average live weight of an adult female cattle is about 228 and adult male 290 kg. Adult sheep and goats weigh 25 to 30 kg on average. Mortality is as high as 20% for calves, kids and lambs. The low productivity level of the indigenous livestock coupled with high mortality rates made the large proportions of the 4.5 million livestock dependent Tanzanian households not to make enough from the sector to be able cross the poverty threshold and remained in a vicious cycle of poverty and food insecurity. Tanzania has the third largest livestock populations in Africa after Ethiopia and Sudan, but the grazing land allocated for livestock is by far less than to what is required (LSA Feed Report 2016). The national animal health coverage is only 40% (LSA Animal Health Report 2016). Hence severe shortages in livestock feeds, high prevalence of livestock diseases and low genetic potentials constrained the development of the livestock industry and limited its contribution to the household and national economy.

Since funds for various interventions are scarce, ex-ante assessment of the technical feasibility, cost-effectiveness and economic impacts of proposed investment interventions is critical. It is believed the productivity of the indigenous breeds has not been exploited to the possible maximum potential due to lack of adequate investments in the selection of better performing breeds and advancement of proper husbandry, feeding and management practices (LSA background papers 2016). The high incidence of animal disease indicates a lack of adequate investment in animal health. Appropriate breed selection, feeding and disease control measures are required to increase the productivity of the national livestock herd and its support to the household and the national economy.

The focus of the intervention is on improvement of red meat which consists of beef, sheep and goats' meat. The beef intervention will, however, be implemented in the Central and Coastal and Lake production zones only. Intervention in cattle in the Highland production zone is prioritized for increasing milk productivity and production and discussed below.

***Family beef production improvement***

Cattle is the dominant livestock species in Tanzania (about 29 million) spread in all production zones that currently contributes 83% of the red meat and 71% of the total meat produced in the country. The current production consumption balance for beef shows a 9% deficit which worsens to 257% as a result of increased human population and income in the 15-year period, if no additional investment is made to improve beef productivity in both family and commercial systems. The family beef

production improvement is expected to be achieved through investments in breed selection from among indigenous cattle, animal feed and health improvements.

**The genetic improvement interventions for beef involve:**

- Provide extension service to farmers on how to improve breeds through selection
- Select and perform interbreeding within the local breeds
- Perform crossbreeding using Boran, Sanga (Ankole and Fipa) with Tanzania short horn Zebu
- Use ranches as nuclear farms to form open nuclear breeding scheme (ONBS)

The animal health interventions to reduce young and adult stock mortality include improved veterinary services and improved extension to bring about an improvement in the efficiency and coverage of animal health services, through a full package of vaccinations against prioritized diseases such as CBPP, RVF, ECF, Brucellosis and FMD, deworming, control against external parasites, and control of tsetse and ticks. To be more effective, this will be combined with better management practices (improved housing and sanitation) and annual disease surveillance.

The animal feed interventions aim at providing adequate and improved quality feeds to cattle and this involves:

- Promotion of efficient use of crop residues and by-products (this involves proper storage, treatment etc. of crop residues).
- Improve feed availability by encouraging feed marketing from pasture established farms and non-grazing lands.
- Conserve and manage natural pastures and rangelands through establishment of reliable pasture seed sources, oversowing with grass and legume seeds, control invasive species and promote community-based pasture/rangeland management and utilization.
- Promote soil and water conservation activities in communal grazing lands and develop water sources for use by animals and forage production.
- Initiate and facilitate enforcement of the Village Grazing Land Reserves Initiative
    - Establish and secure village grazing land reserves pursuant to existing and new laws and regulations such as Grazing Land and Feed Resources Act No. 10 2010, and informed by best practices identified in the Sustainable Rangelands Initiative.
    - Give village grazing land reserves high priority in national and local land use plans and afford protection status similar to that given to village forest reserves.
    - Build technical capacity for rangeland management and platforms for knowledge dissemination
    - Train and deploy rangeland officers.

The feed intervention also involves supplementary feeding to dams one to two months before and after parturition to improve the mothering ability of the dam and the health of the calf to enhance its growth.

The combined breed, feeding, health and management investment intervention is expected to result in reduction of the young and adult stock mortality rate by 50% over the 20-year investment time horizon. It also increases the average weight of calves, subadults and adults by 10% over the same time period. The intervention will enable an increase of 5% in parturition rate, 2% in dressing percentage and an increase in the offtake from 10% to 16%.

The adoption rate for interventions is assumed to progress slowly over 20 years (Table 32). The adoption rate is expected to reach 30% by the $5^{th}$ year of the intervention, 70% by the $15^{th}$ year; then remaining the same through the $20^{th}$-year investment period. The coverage of the interventions extends from 50% in the $5^{th}$ year to 80% in the $15^{th}$ year and remain the same through the $20^{th}$ year.

Table 35. Changes in coverage and adoption rate of cattle intervention (with scenario)

| Production zone | | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|---|
| Central | Coverage | 50% | 50% | 60% | 80% |
| | Adoption rate | 20% | 30% | 40% | 70% |
| | Animals directly impacted | 10% | 15% | 35% | 56% |
| Coastal and Lake | Coverage | 40% | 50% | 70% | 80% |
| | Adoption rate | 20% | 30% | 50% | 70% |
| | Animals directly impacted | 8% | 15% | 35% | 56% |

As shown in the above table, the proportion of the national cattle herd that is directly impacted by the intervention increases from 8% in the base year to 56% in year 15. This means more than half of the indigenous national cattle herd will be improved with higher meat yield than the remaining 44%.

***Ranch cattle beef production improvement***

With additional investment, beef cattle production and productivity will be improved through major interventions of increasing the number of cattle on the ranch to their carrying capacities. Except for the increase in the parturition rate from 70–73%, reduction in mortalities of juveniles from 8–6%, and offtake rate from 18–26%, all other demographic and reproduction parameters remain the same as the baseline situation for all ranches in the three production zones. There will be concentrate feeding (0.5 kg/animal) of dams before and after parturition.

- To increase the parent stock by acquiring heifers to exploit the carrying capacity of the ranches.
- Promoting the transformation of some large-size traditional livestock keepers into ranches.
- Ensure land acquisition for the emerging ranches.

**Assumptions and targets**

- Improve parturition rate by 4% (i.e. from 0.7 to 0.73)
- reduce calf mortality by 25%
- Increase the herd size by range of 10–37% through purchasing of additional heifers in the first three to four years and to keep the herd size constant after achieving the carrying capacity.
- Increase dressing ratio by 4% (i.e. from 50% to 52%).
- Increase the offtake rate by 44% (i.e. from 18% to 26%).
- Assumptions regarding the number and average carrying capacity of ranches:
    - The carrying capacity of the ranches is estimated by using the assumption of 3 ha grazing land per animal. Based on this estimate a potential to add more cattle to the ranches is realized. The average number of animals that can be added to the ranches varies according to the where the ranch is found. The average carrying capacity exploited in ranches of the Central zone is around 67% while it is 90% in the Coastal and Lake and 66% in Highland. To fill this carrying capacity, buying heifers and reducing the offtake rate of females for the first three to four years can increase the carrying capacity to 100% by the end of fifth year.
    - The number of ranches to increase by 100% in the Central and Coastal and Lake zones while the increase will be 40% for the Highland zone (Table 33). The increase in percentage appears high in Central and Coastal and Lake due to their low starting number of ranches (6 in the Central and 27 in the Coastal and Lake, while the number of ranches in Highland is 70).

Table36. Increment in number of ranches

| Production zones | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|
| Coastal and Lake | 6 | 8 | 10 | 12 |
| Central | 27 | 34 | 42 | 54 |
| Highland | 70 | 80 | 90 | 100 |

Table 37. Changes in coverage and adoption rate of ranch intervention

| | | Base year | $5^{th}$ year | $10^{th}$ year | $15^{th}$ year |
|---|---|---|---|---|---|
| Central | Coverage | 80% | 85% | 90% | 100% |
| | Adoption rate | 40% | 60% | 70% | 80% |
| | Directly impacted animals | 32% | 51% | 63% | 80% |
| Coastal and Lake | Coverage | 80% | 85% | 90% | 100% |
| | Adoption rate | 40% | 60% | 70% | 80% |
| | Directly impacted animals | 32% | 51% | 63% | 80% |
| Highland | Coverage | 80% | 85% | 90% | 100% |
| | Adoption rate | 40% | 60% | 70% | 80% |
| | Directly impacted animals | 32% | 51% | 63% | 80% |

***Feedlot intervention to increase beef production.***

With additional investment, more beef can be produced from the feedlots. The beef production improvement interventions for the feedlots include:

- Create the investment environment that promotes the increase in number of feedlot units and number of animals fattened per unit:
    - Improving and allocating more convenient spaces for feedlot.
    - Promote the use of crop residues (e.g. rice/wheat straws as roughages) and crop by-products (molasses, rice polish, cotton seedcakes etc.).
    - Provide incentives and suitable environment to agro-processing and feed processing companies to produce more feeds.
- Training producers (fatteners) on proper cattle fattening (i.e. animal selection and feeding).
- Improve efficiency of the beef value chain (quality beef marketing).
- Branding campaign for Tanzania Zebu beef – TeeZee BEEF.
- Promote the Tanzanian shorthorn Zebu cattle as a high-quality, recognizable brand in domestic, regional and international markets.
- Use the TeeZee Beef campaign as a driver for holistic development across the beef value chain including:
    - Better slaughter and processing systems, including cold storage and transportation.
    - Traceability and quality assurance systems.
    - Branding and standard labeling (e.g. free-range TeeZee Beef).
    - Marketing systems that focus initially at domestic and regional markets.
    - Support and promote the TeeZee Beef brand through establishment of a Tanzania Zebu Breed Association.

**Assumptions and expected targets:**

- The number of cattle fattened per unit of fattening cycle will increase by 33%.

The number of fattening cycles per year increase by 17%.

- The number of total cattle fattened will increase in number over 15 years (Table 35.).

Table 38. Projection of number of commercial feedlot units, number of cattle fattened per unit and at national level

| Description of parameter | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|
| Number of feedlot units | 2,367 | 5000 | 8000 | 15000 |
| Number of animals/units | 30 | 34 | 38 | 40 |
| Number of production cycles | 3 | 3 | 3.5 | 3.5 |
| Total number of animals fattened | 213,030 | 510,000 | 1,064,000 | 2,100,000 |
| Change in number of animals fattened | - | 139% | 109% | 97% |

The major productivity changes resulting from the intervention are number of production cycles from 3 to 3.5 and additional meat obtained at the end of fattening period from 60 kg/cattle to 80 kg which is a 20 kg incremental benefit per cattle and constitutes a 33% increase. The other expected major change is in the number of feedlots, from 2,367 in the base year to 15,000, and number of cattle fattened from 213,030 to 2.1 million over the 15-year period. This requires major policy and technology interventions discussed above to attract the private sector into the feedlot industry.

***Red meat improvement from goats***

The kind of interventions that will be used to increase meat production from sheep and goats are similar to that of the beef production improvement. There will be genetic improvement through selection, animal health and feed interventions and marketing improvement. Specific genetic intervention in addition to selection from among the indigenous breeds for goats is multiplication and distribution of Malya (blended) breeds through PPP and crossbreeding using Malya goats with other indigenous breeds. The Malya breed is high meat yielding and fast growing.

- Improve breeds through selection among indigenous stock by providing extension packages to livestock farmers on selection of animals.
- Improve marketing and processing of sheep and goat products:
    - Better slaughter and processing systems, including cold storage and transportation.
    - Branding and standard labelling.
    - Marketing systems that focus initially at domestic and regional markets.

**Assumption and targets:**

Goats that receive the above interventions are expected to have changes in production and reproduction parameters (differing across the three production zones):

- Mortality rates for sheep and goats reduced by 50%.
- The price of skin increases by 10%.
- The veterinary cost related to vaccination, disease treatment, and external and internal parasite control increases by 100%.
- Parturition rate increases by 8% in Central and Coastal and Lake, and 15% in the Highland zone.
- Live weight increases by 10%.
- Dressing percentage increases by 3%.
- The offtake rate increases by 37% in the lower case and increases by 76% in the upper case in the different production zones and herd-size groups.

All of the three production zones are covered with goat meat interventions (Table 39).

Table 39. Changes in coverage and adoption rate of goat intervention

| Production zones | Adoption and coverage | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|---|
| Central zone | Coverage | 50% | 60% | 70% | 80% |
| | Adoption rate | 30% | 50% | 60% | 70% |
| | Proportion of impacted cattle | 15% | 30% | 42% | 56% |
| Coastal and Lake zone | Coverage | 40% | 50% | 60% | 80% |
| | Adoption rate | 25% | 50% | 55% | 60% |
| | Proportion of impacted cattle | 10% | 25% | 33% | 48% |
| Highland zone | Coverage | 50% | 60% | 70% | 80% |
| | Adoption rate | 50% | 60% | 70% | 70% |
| | Proportion of impacted cattle | 25% | 36% | 49% | 56% |

The intervention will lead to improvement in demographic and reproductive parameters (Annex 7, Table 90).

***Sheep improvement for increasing mutton production***

**Targets:**

Sheep that receive the proposed interventions are expected to have changes in production and reproduction parameters (differing across the three production zones):

- Mortality rates for sheep and goats reduced by 50%.
- Parturition rate increases by 8%.
- Live weight increases by 10%.
- Dressing percentage increases by 3%.
- The offtake rate increases by 38% in the lower case and increases by 62% in the upper case in the different production zones.
- The national average growth rate of sheep increases by 33% to reach 3.47% growth rate to cope up with the live sheep and mutton export demand.

The changes in coverage and adoption rate of sheep interventions is given in Table 37. Intervention area(s) (production zones): Central, Coastal and Lake and Highland production zone.

Table 40. Changes in coverage and adoption rate of sheep intervention

| | | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|---|
| Central zone | Coverage | 50% | 60% | 70% | 80% |
| | Adoption rate | 30% | 50% | 60% | 70% |
| | C*A | 15% | 30% | 42% | 56% |
| Coastal and Lake zones | Coverage | 40% | 50% | 60% | 80% |
| | Adoption rate | 25% | 50% | 55% | 60% |
| | C*A | 10% | 25% | 33% | 48% |
| Highland zone | Coverage | 50% | 60% | 70% | 80% |
| | Adoption rate | 50% | 60% | 70% | 70% |
| | C*A | 25% | 36% | 49% | 56% |

Changes in the technical and financial parameters in sheep due to meat production and productivity improvement interventions in the Central and Coastal and Lake zones and Highland are shown in Annex 7, Table 91.

### *Key economic assumptions for red meat improvement*

The key assumptions for the economic impact analysis are as follows: (1) the time horizon for the red meat investment is 20 years; (2) the total investment cost is estimated at USD 323,551,012 (TZS647 billion) to be spent over the 20 years of the investment period to improve breeding, animal health and feeding and marketing; (3) for all species, it is assumed that a full vaccination regime (once-twice per year depending on the disease risk and deworming plus mineral supplementation package is applied; (4) capacity building will occur for experts, technicians, livestock producers and livestock enterprise developers; and (5) for all scenarios, the annual discount rate is 10%, the assumed current social opportunity cost of capital in Tanzania. The details of the assumptions on the annual incremental costs associated with the investment are presented in Table 41.

Table 41. Assumptions on annual animal health recurrent costs associated with family red meat investment (TZS/head/year)

| **Animal health intervention recurrent cost items** | **Costs (TZS/head)** | | |
|---|---|---|---|
| | **Cattle** | **Goats** | **Sheep** |
| Current investment situation | 7,500 | 4,000 | 4,000 |
| With additional investment | 15,000 | 8,000 | 8,000 |

### *Analysis of investment impact (NPV and IRR) for red meat*

As shown in Figure 20 below, the NPVs for beef improvement in the family ruminant red meat system are positive in all production zones, which indicate the positive impact of the investments. The IRRs for all are substantially greater than the acceptable social discount rate in Tanzania which is 10%, a very strong justification to invest in family beef improvement (Figure 21).

Figure 20. Net present value (NPV) for beef improvement.

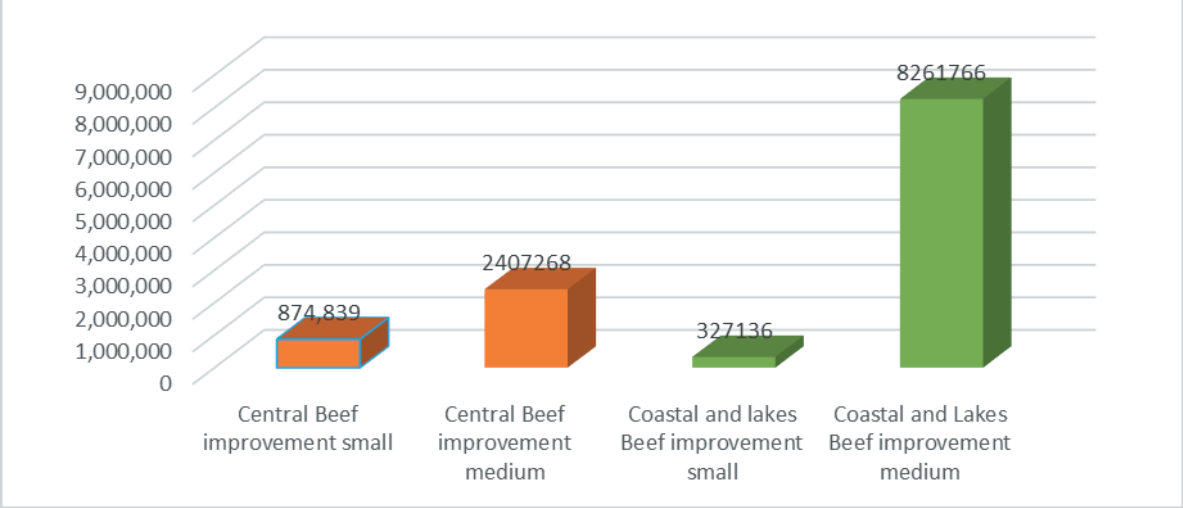
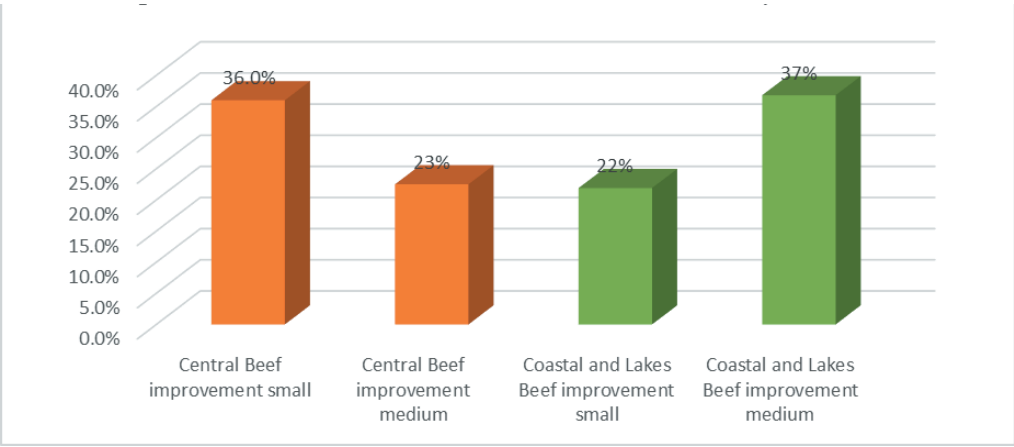


Figure 21. Internal rate of return (IRR) for beef improvement.




Investment in ranches and feedlots also follow the same pattern. They all have a very high positive NPV and IRR except for the ranches in Coastal and Lake which are lower than the other zones. In Coastal and Lake, although the IRR is slightly higher than the acceptable discount rate (10%), the NPV is not as attractive.

Figure 22. Net present value for ranch and feedlots.

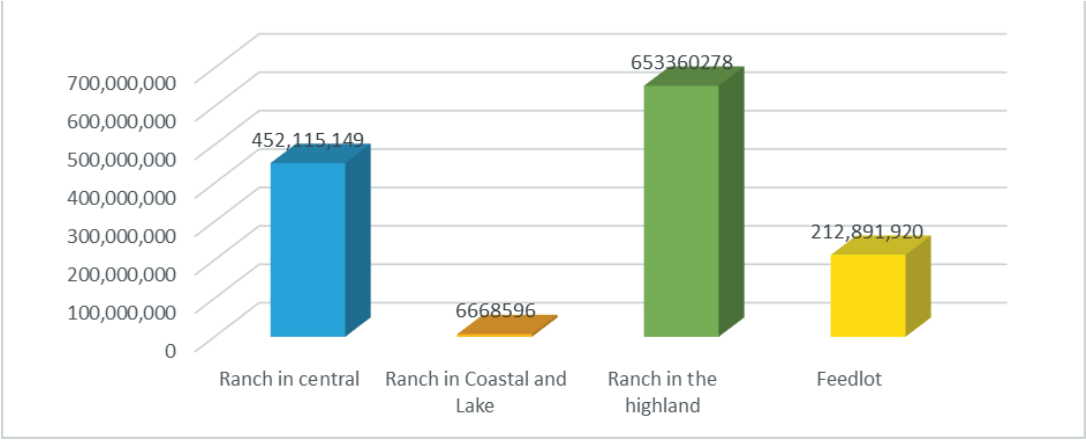
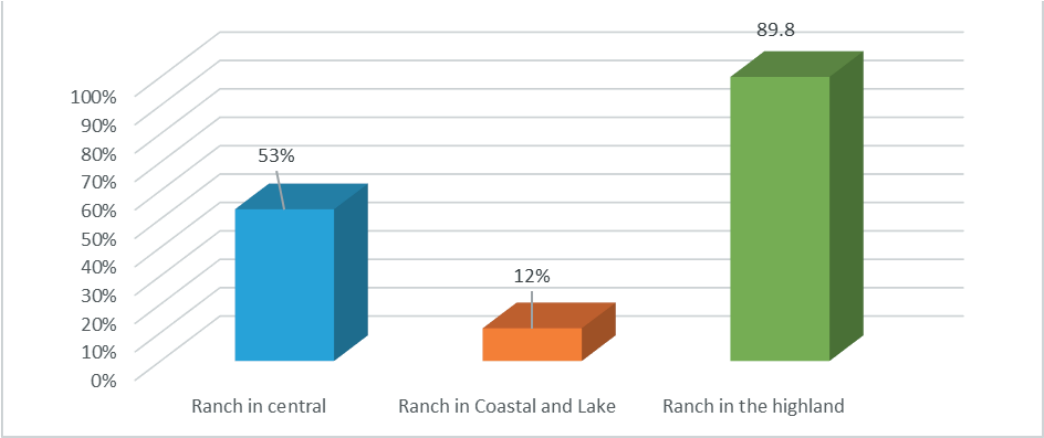



Figure 23. Internal rate of return (IRR) for ranch.



As shown in Table 42 below, for both goat meat and mutton the NPVs are positive and the IRR very high in all production zones. The highest NPV and IRR for goats' meat and mutton is observed in Highland where feeding and animal health services are much better than the other two production zones. This has resulted in a relatively higher weight gain for sheep and goats in Highland. In general, goats and sheep perform quite well in all production zones and investment in their improvement is quite valuable.

Table 42. NPV and IRR for goat meat and mutton improvement investments

| | Goats Cn small | Goats Cn medium | Goats C&L small | Goats C&L medium | Goats Hi small | Sheep Cn small | Sheep C&L small | Sheep Hi small |
|---|---|---|---|---|---|---|---|---|
| NPV | 214,021 | 2,614,969 | 316,219 | 6,173,527 | 326,055 | 318,414 | 407,640 | 410,207 |
| IRR | 32.8% | 38.9% | 45.5% | 44.5% | 58.2% | 62.2% | 50.9% | 89.7% |

***Investment impact on red meat production and GDP***

As shown in the Table 43 below, change in volume of meat as a result of the intervention is quite significant for beef, sheep and goats. The change in beef is 54% over the 15-year time horizon which is a substantial change. This is due to the intensive combined breed, health and feed interventions. Goat meat and mutton is projected to increase by 31% and 48%, respectively.

Table 43. Contribution to meat and GDP

| Red meat | Meat production (TEC) 2031 | | difference | GDP contribution (millions of TZS) 2031 | | Difference |
|---|---|---|---|---|---|---|
| | With current investment | With additional investment | | With current investment | With additional investment | |
| Beef | 676,242 | 1,040,562 | 54% | 2,355,101 | 2,791,548 | 19% |
| Goat | 154,194 | 201,567 | 31% | 533,241 | 626,270.3 | 18% |
| Mutton | 29,101 | 43,156 | 48% | 100,062 | 141,937.8 | 42% |

The corresponding increase in the GDP contribution from beef, goat meat and mutton are 18%, 19% and 42% respectively. Some increase in cow milk production is also expected as a result of the growing population, higher parturition rates and increase in cow/day milk yield. As the result of the interventions the total milk production in the Cn increases from 1,442,830,800 litres under the current investment situation to 1,568,940,400 litres with additional investment, a 9% increase. The corresponding GDP increase is from TZS518,703 million to TZS550,222 million, a 6% increase. The changes in milk volume in the C&L have been captured in the dairy improvement scenario (section 9.3.2.1)

## 9.3 Dairy breeding improvement intervention

### The investment context—intervention and assumptions, family dairy

An investment in the improvement of animal genetics to realize greater productivity of dairy cattle through the introduction and increased use of AI and synchronized breeding services as well as the use of natural services from proven bulls is next assessed. Suitable breeds of exotics dairy cattle are recommended for use in crossbreeding with indigenous cattle such as Mpwapwa**,** Friesian, Ayrshire, Jersey and Brown Swiss.

The breeding intervention is tested only in the Highland and Coastal and Lake zones, since there is little comparative advantage for dairying in the Central zone as the ambient temperature is too high and the environment is too harsh with poor moisture, inadequate grazing resources and limited availability of crop residues to support dairy crossbreeds. Changes in milk yield/cow and total milk production in Cn as a result of animal health and feeding interventions are captured in the meat/milk intervention investment scenario. A complementary feeding intervention is required and included in

the analysis. Animal health services are intensified, marketing and processing of milk and milk products improved to seize and maximize the benefits from the increased milk production.

It is assumed that 100% of the households in Hi and 60% in C&L will be reached via the AI with and without synchronization investment intervention in 15 years' time horizon (Table 44). Taking adoption rate of 60 and 45% in the Hi and C&L, respectively over the same period, 60% of the cattle in the Hi and 27% in the C&L will be dairy crossbreeds (Table 41). Thus, the population of the dairy crossbreeds in the Hi increases from 375,337 in the base year 2015 to 4,469,000 by 2031. Similarly, the population of the dairy crossbreeds in the C&L increases from 156,857 in the base year 2015 to 4,757,165 by 2031.

Table 44. Changes in coverage and adoption rate of dairy modernization intervention (with scenario)

| Production zones | | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|---|
| Highland (Hi) | Coverage | 60% | 80% | 90% | 100% |
| | Adoption rate | 17% | 25% | 50% | 60% |
| | Crossbreds as percentage of all cattle | 10.0% | 20% | 45% | 60% |
| | Number of crossbreds | **375,337** | **898,264** | **2,692,613** | **4,469,000** |
| | | | | | |
| C&L | Coverage | 20% | 30% | 40% | 60% |
| | Adoption rate | 6.5% | 35% | 45% | 45% |
| | Crossbreds as percentage of all cattle | 1.3% | 11% | 18% | 27% |
| | Number of crossbreds | **156,857** | **1,394,338** | **2,722,998** | **4,757,165** |
| **Total number of crossbreds** | | **532,194** | **2,292,602** | **5,415,611** | **9,226,165** |

In the first five years, it is expected that the nation (mainland Tanzania) will have 2,292,602 dairy crossbreeds which is fourfold of the base year number. The number rises to 9.2 million by the 15th year. This number is distributed almost equally in the Hi and C&L. This shows that in terms of absolute number of dairy cattle, the C&L is as important as the Hi, hence deserves impartial investment attentions and even becomes more important if more additional resource is invested to raise the coverage and adoption of the intervention in C&L. Note that 44% of the national cattle herd is found in the C&L compared to only 13% in the Hi.

The expected impacts of the breeding investment interventions are primarily in terms of changes in milk yield (and changes in stock as a result of substantial increase in parturition rates (see Annex 8, Tables 91 and 92). Changes in animal weights are complementary added benefits.

### *Key economic and productivity assumptions, family dairy*

As the result of the breeding intervention, the milk yield in the Highland zone for both small- and medium-size herd increases from two litres/animal/day to eight litres/animal/day. In the Central and Lake zones, the increase is from one and a half to eight litres/animal/day. The change in the lactation length is substantial. In Highland and Central and Lake, there will be an increase of 40–50% in the lactation length. The productivity change per cow daily milk yield and the change in the lactation length increased the annual milk production per cow in the Highland zone from 360 litres to 2,000 litres for small herd and from 360 litres to 2,160 litres for medium-size herd. Similarly, the productivity change per cow daily milk yield and the change in the lactation length increased the annual milk production per cow in the Central and Lake from 270 litres to 2,000 litres for small herd and from 270 to 2,160 for medium-size herd. This will bring a big boost in milk production in Tanzania with further increase in coverage and adoption of the intervention over time. It, however, requires a

major feed intervention with intensified animal health and marketing services to realize the increase in productivity and production from the breeding interventions.

**Estimate for additional feed requirement due to dairy improvement intervention in the Highland zone**

The feed balance estimate in the Highland zone is 53% on average which endures an overall deficit of 47%. Therefore, the feed intervention first needs to remove the existing deficit and produce enough additional feed to sustain production of the additional milk. This should come either from produced or purchased feeds.

Table 4532. An estimate for the total and additional amount of feed required per crossbreed dairy animal in the Highland zone

| Production zone | Total amount of feed (kg/animal/year) | Additional feed in kg (per animal/year) | Additional feed per animal in kg (animal/year) | Additional feed per animal in kg (animal/day) |
|---|---|---|---|---|
| Highland small | 2,744 | 0.47*2,744 | 1,290 | 3.5 |
| Highland medium | 2,934 | 0.47*2,934 | 1,379 | 3.8 |

Estimate for additional feed requirement due to dairy improvement intervention in Coastal and Lake zones

The feed balance in the Coastal and Lake zones is 27% on average and shows a deficit of 73%. Hence the feed intervention in the Coastal and Lake zones needs to produce enough to remove the deficit and satisfy the additional feed needed to sustain the additional milk from the crossbreds resulted from the breeding intervention. Similar to the Highland zone, this feed should come either from produced or purchased sources.

Table 46. An estimate for the total and additional amount of feed required per crossbreed family dairy animal in the Coastal and Lake zones

| Prod subsystem | Total amount of feed required (kg/animal/year) | Additional feed required in (kg/animal/year) | Additional feed per animal in (kg/animal/year) | Additional feed per animal in (kg/animal/day) |
|---|---|---|---|---|
| Central and Lake small | 2,658 | 0.73*2,658 | 1,940 | 5.3 |
| Central and Lake medium | 2,779 | 0.73*2,779 | 2,028 | 5.6 |

In both Highland and Central and Lake, it is assumed that 90% of the additional feeds will be improved forages (grass/legumes/fodder trees and shrubs) and the remaining 10% will be concentrates which are locally formulated and industrial by-products. Furthermore, out of the additionally required forage feeds, 70% may be produced and 30% may be purchased. It is noted that from a hectare of land 7,000 kg DM can be produced. Based on the above assumptions, land required to produce the required additional forage is estimated below.

Table 47. Land required to produce improved forage (90%) for the family dairy improvement

| | | **Additional forage land requirement for the total crossbred herd in ha** | | | |
|---|---|---|---|---|---|
| | Improved forage/animal | Current | 5th year | 10th year | 15th year |
| Highland | 1,335 kg | 71,555 | 171,248 | 513,327 | 851,982 |
| Central and Lake | 1,984 kg | 44,458 | 395,195 | 771,775 | 1,348,316 |
| Total additional land requirement | | 116,013 | 566,443 | 1,285,102 | 2,200,298 |

As indicated in Table 47, additional forage land of 116,000 ha is required to adequately meet the feed requirement of the current crossbred animals. This increases to 2.2 million ha additional land in 15 years or in 2031.

It is believed that in general the households with crossbred cows practice better animal health services and husbandry management than the others. The expected incremental benefit from the intensive crossbred interventions demands for more rigorous clinical service and vaccination and control in internal and external parasites.

Table 48. Recurrent costs

| Vaccines, internal and external parasite treatments | Cost per animal (TZS) | Cost per animal/year (TZS) | Remark |
|---|---|---|---|
| Brucellosis | 12,000 | 1,000 | Once in life time |
| FMD | 3,500 | 3,500 | Once per year |
| ECF | 12,000 | 1,000 | Once in life time |
| CBPP | 400 | 200 | When there is breakout |
| PPR | 300 | 150 | When there is breakout |
| Acaricides | 4,000 per 100 mls | 8,000 | Four times per year |
| Antihelminthics | 250 | 1,150 | Four times per year |
| **Total** | | **15,000** | |

The animal breeding, health and feeding investments need to be accompanied by a well-functioning marketing services for milk and milk products. The intervention in improving the marketing and processing of milk and milk products includes but not limited to:

- Promote collection of milk cooperatives, associations etc..
- Promote investment of milk processing plants.
- Promote quality of milk—Dairy Board.

The total investment required for the breeding and the complimentary feeding and marketing interventions is estimated to be about USD 409 million (Table 46). The large proportion of it, 70%, goes to marketing and processing investments. The animal health and extension costs have not been shown here; but are in the meat intervention investments. The annual *recurrent* cost for AI and synch is estimated at TZS15,000/animal for both Highland and Coastal and Lake (Table 48).

Table 49. Investment distributions

| Categories of investments | USD | % of total |
|---|---|---|
| Feeding intervention | 59,800,000 | 15% |
| Breeding intervention | 62,310,000 | 15% |
| Marketing investment including processing facilities | 287,050,000 | 70% |
| Total | 409,160,000 | 100% |

### *Investment impacts on NPV and IRR, family dairy*

The results of the ex-ante impact assessment of the cattle breeding investment are presented graphically in Figures 9.5, 9.6, 9.7 and 9.8. For Highland, the investment resulted in a 20-year NPV of TZS8.5 million for small herd and 26.6 million for medium-size herd. In the Coastal and Lake, the NPV for the same period is 605 thousand and 305 thousand for small and medium-size herd, respectively. A positive NPV was generated from the investment in both Highland and Coastal and Lake. The investment criteria thus indicate that over the 20-year time horizon, the investment intervention is economically viable in both Highland and Coastal and Lake. The IRR obtained for Highland in both herd sizes and Coastal and Lake in the small herd is greater than the acceptable minimum investment

return of 10%. From IRR and NPV perspectives in general, the diary intervention is acceptable in both Highland and Coastal and Lake. It is more viable in Highland and for small herds in Coastal and Lake.

Impacts of breeding interventions: 20-year net present value (NPV), internal rate of return (IRR)

Figure 24. Net present value (NPV) family dairy, Highland.

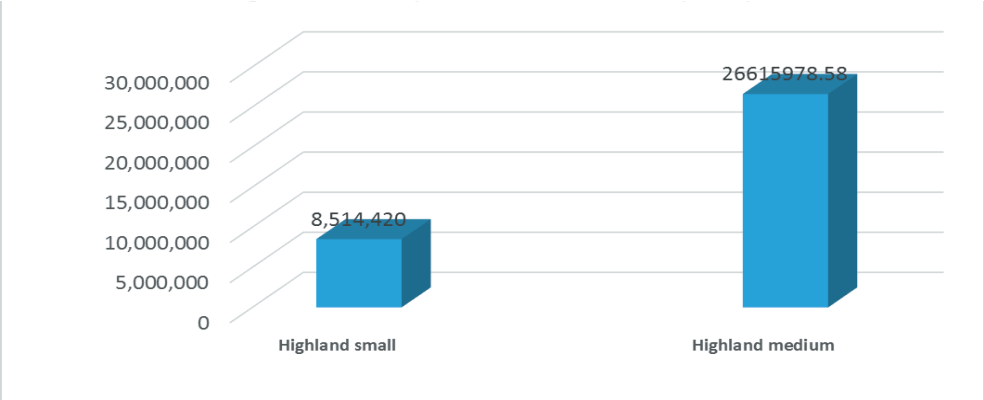



Figure 25. Internal rate of return (IRR) family dairy, Highland.

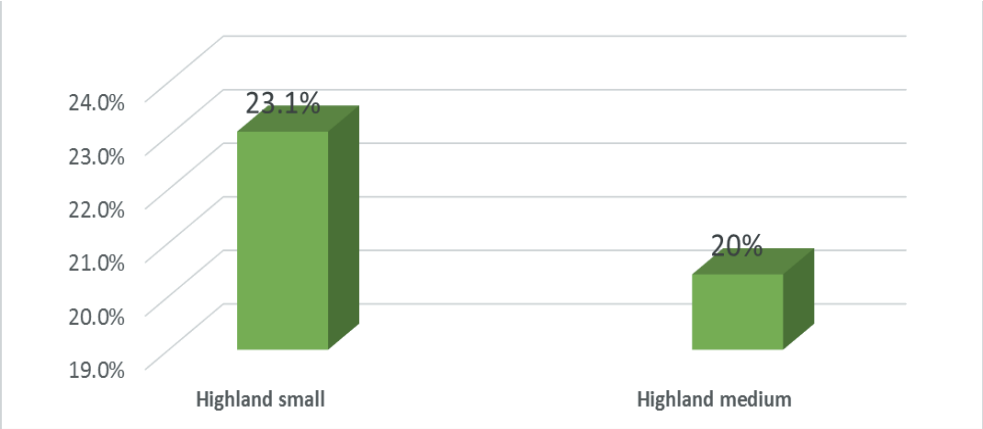



Figure 26. Net present value NPV family dairy, Coastal and Lake.

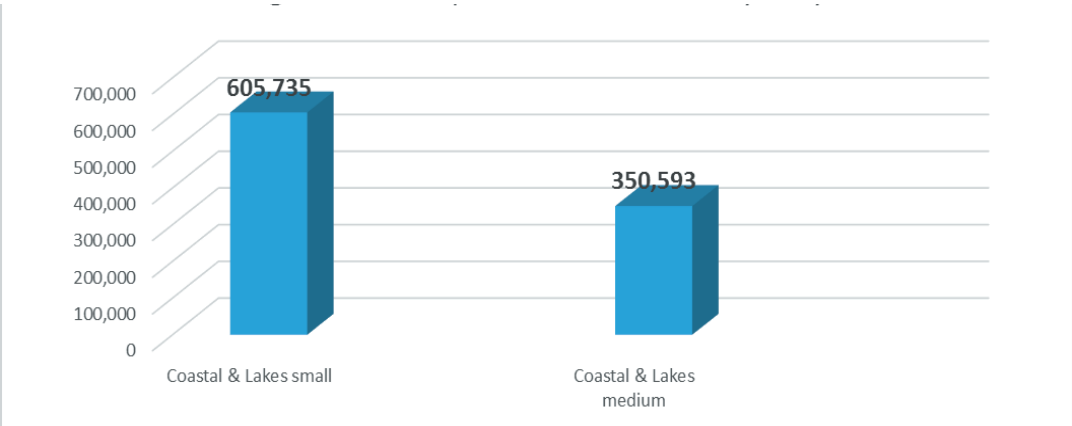
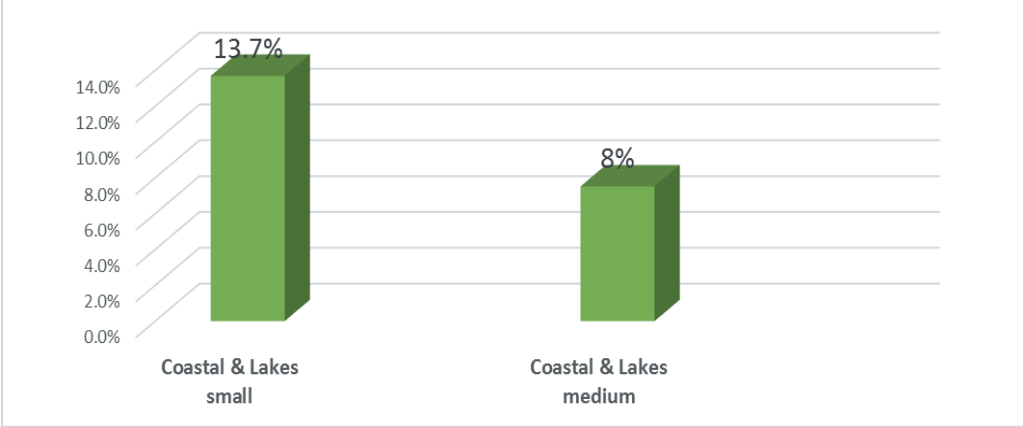


Figure 27. Internal rate of return (IRR) family dairy, Coastal and Lake.




**Family dairy breeding intervention impact on milk production and livestock GDP**

As shown in Table 50 below, the GDP impact of the breeding intervention largely comes from the increase in milk production. The milk production in the Hi and C&L changes from 1,733,824,000 litres to 4,647,401,000 in 2031, a 268% increase. The intervention raised the milk GDP contribution by 158% in 2031 compared to the current investment situation over the same period. The change in beef GDP contribution as the result of the intervention is small, only 4%. This was expected as the interventions were not meant to increase beef offtake where the beef GDP comes from. The 32% increase for hides primarily comes from the increase in prices of improved quality hides as the result of the intensive animal health services to control external parasites that damage hides. The net change in energy contribution becomes negative because the breeding intervention encourages herders to keep more female cattle which are not often used for draught power.

Table 50. GDP contribution in 2031 with current and additional breeding interventions

| | Base year | With current investment | With additional breeding investment | % Change |
|---|---|---|---|---|
| Beef | 1,374,203.02 | 2,354,853.3 | 2,439,181.708 | 4% |
| Milk | 784,857.6451 | 1,332,258.724 | 3,431,128.204 | 158% |
| Hides and skins | 1,354.492139 | 2,903.022014 | 3,820.307146 | 32% |
| Organic matter | 1,018,485.658 | 2,091,259.004 | 2,226,863.978 | 6% |
| Energy | 681,724.6947 | 947,107.7904 | 871,332.6683 | -8% |

**Interventions in the commercial dairy subsystem**

The commercial specialized dairy system which currently produces less than 5% of the national milk production in Tanzania has a real potential to grow rapidly if it is given the necessary policy and technology support to encourage the private sector invest in the dairy industry. The major interventions support proposed to improve the commercial dairy are:

- To make land available for forage production for the commercial dairy farms
- To improve feed and feed seed marketing
- To improve marketing and processing of milk and milk products
- To improve availability of drugs, vaccines and medical equipment and support to enhance the private health service providers
- Improve the availability of ECF and FMD vaccines.
- To encourage private AI service providers

- To have packages that attracts investment to the commercial dairy farming and milk processing and eases the bureaucracy of getting involved in the subsystem.

The per cent coverage of these interventions is estimated to be 60% currently and expected to grow to 80% in the fifth year and to 100% in the 15th year while the adoption rate of the technologies will remain at 80% throughout. These interventions will also expect to have impact that will result in an increase in the number of commercial dairy farms and number of crossbreeds in the subsystem from the baseline 250,800 to 3.5 million. This, with the increase in the number of crossbreds in the family dairy, brings the total number of crossbreds in mainland Tanzania to 12.7 million (Table 52).

Table 52. Changes in number of crossbreds and dairy farms in commercial dairy systems (with scenario)

| Subsystems | | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|---|
| Small herd farm | Herd size | 5 | 6 | 8 | 11 |
| | No. of Farms | 31,800 | 70,000 | 130,000 | 208,000 |
| | Number of crossbreds | **159,000** | **420,000** | **1,040,000** | **2,288,000** |
| Medium herd farm | Herd size | 450 | 600 | 860 | 1,230 |
| | No. of Farms | 204 | 400 | 700 | 1000 |
| | Number of Crossbreds | **91,800** | **240,000** | **602,000** | **1,230,000** |
| **Total no. of crossbreds** | | **250,800** | **660,000** | **1,642,000** | **3,518,000** |

After setting the production and reproduction parameters in the current commercial dairy subsystem, the expected change due to the additional investment is also projected using literature reviews and expert opinion. The most important improvements expected are per head milk production, higher parturition rate and decreased mortality. The additional feed required due to the improvement interventions is estimated based on the expected gain in outputs, especially increase in per head milk production. The per cent of feed purchased increases from 10% to 17% and 20% in small and commercial dairy subsystems (Table 53).

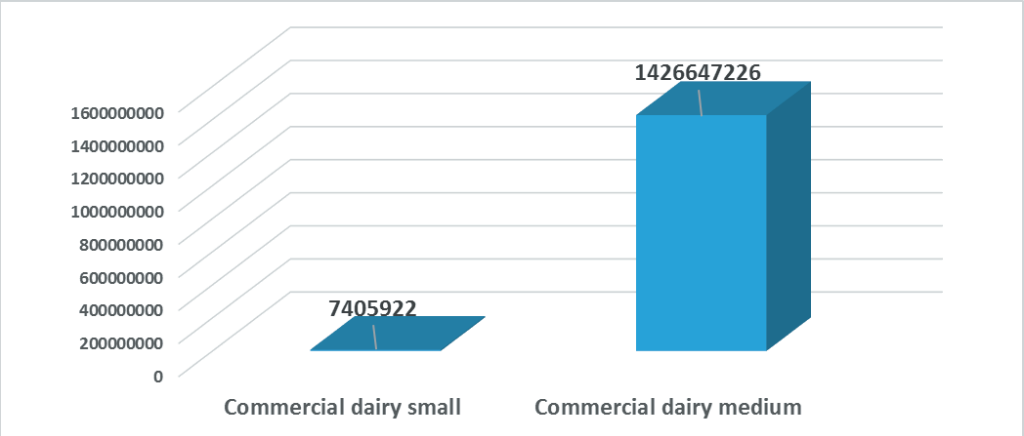
Table 53. Changes in the technical and financial parameters in the commercial dairy subsystem due to modernization interventions

| Production and productivity and financial parameters | Commercial (small size) | | Commercial (medium size) | |
|---|---|---|---|---|
| | Current situation (2015) | With additional investment (2031) | Current situation (2015) | With additional investment (2031) |
| Parturition rate | 70% | 75% | 70% | 80% |
| Mortality rate (juveniles) | 10% | 6% | 8% | 6% |
| Mortality rate (subadults) | 5% | 3% | 5% | 23% |
| Mortality rate adult females | 4% | 2% | 4% | 12% |
| Mortality rate adult males | 3% | 3% | 4% | 3% |
| Daily milk production (litres) | 8 | 10 | 9 | 12 |
| Per cent feed purchased | 10 | 17 | 10 | 20 |
| Cost of FMD | 15,000 | 20,000 | 10,000 | 15,000 |
| Cost of accessing water | 20,000 | 30,000 | 50,000 | 50,000 |
| Live weight male subadult (kg) | 150 | 171 | 130 | 148 |
| Live weight adult female (kg) | 250 | 270 | 250 | 270 |
| Live weight adult male (kg) | 300 | 321 | 300 | 321 |
| Lactation length (days) | 180 | 250 | 180 | 270 |
| Daily milk production (litres) | 8 | 10 | 9 | 12 |

### *Investment impacts on NPV, IRR, production and GDP—commercial dairy*

The net present values for both small and medium-size commercial specialized dairy over a 20-year investment scenario are positive (Figure 26). This shows the viability of the investment made in the sector and the potential profitability of the commercial specialized dairy business. It, however, requires determination of the government to promote appropriate policy measures to make land available for the private sector to grow adequate forage to meet the feed requirement of the crossbreds. It also requires improvement in the marketing systems and infrastructures to absorb the additional milk for value addition and distributions. Incentives for the private sector such as tax holiday, favourable loans and other similar incentives would attract the private sector to invest in the industry.

Figure 28. Impacts of breeding interventions: 20-year net present value (NPV) per herd for commercial dairy interventions.



As shown in Table 54 below, the feed, health and marketing interventions bring about a 1,015% increase in milk production in dairy small and an 880% increase in dairy medium over the 15-year time horizon. The corresponding change in GDP contribution of dairy small and dairy medium is 1,088% and 911%, respectively.

Table 54. Change in milk production over a 15-year period—commercial dairy

| | Over 15 years commercial dairy milk production in t and GDP in millions of TZS | | | | % change milk production | % change GDP contribution |
|---|---|---|---|---|---|---|
| | Milk with current investment | Milk with additional investment | GDP contribution with current investment | GDP contribution with additional investment | | |
| Commercial specialized dairy small | 209,725 | 2,339,461 | 73,645 | 874,725 | 1,015 | 1088 |
| Commercial specialized dairy medium | 150,727 | 1,475,554 | 60,999 | 616,413 | 880 | 911 |
| Total | 360,452 | 3,815,015 | 134,644 | 1,491,138 | 958 | 1,007 |

## 9.4 Chicken improvement

### The investment context—intervention and assumptions

Chicken production is an important source of animal-source food and income for rural subsistence producers. They also provide well-paid business opportunities for commercial chicken-production enterprises. In terms of owning livestock, chicken is dominant in Tanzania. It is reported that 86% of livestock-keeping households in Tanzania own chicken (TLMI 2015). From among the 4.6 million livestock-keeping households, 48% keep only chickens (LMP 2016). These statistics show how key chicken is in Tanzania for targeting poverty reduction and improving nutrition through promotion of chicken meat and eggs consumption.

There are two major chicken production systems in Tanzania. The traditional family indigenous chicken (TFIC) and improved family chicken (IFC) and commercial-specialized chicken C-SCP. TFIC is an extensive scavenging dual-purpose system with low egg (50 eggs/year) and meat (1.5 kg for mature chicken) production. The IFC (improved local/imported tropical breeds) is a semi-intensive, semi-scavenging moderately high productivity (150 eggs/year; and 1.8 kg live weight at maturity) system. They are both family and traditional systems. The C-SCP is an intensive layers and broilers system with high productivity (2 kg live weight at maturity broilers, 270 eggs per year layers).

The traditional indigenous chicken production system supports the largest of the national flock. Indigenous chickens supply over 70% of the chicken meat and eggs consumed in rural areas and 20% in urban areas (PASS Annual Report 2013 refereed in the LSA background paper). The most common ecotypes of local chicken include Kishingo, Kisunsu, Sasamala, Mtewa, Kuchi and Bukini. (Komwihangilo 2015).

The commercial chicken production system is comprised of broilers (for meat) and layers (for eggs) mostly produced in urban and peri-urban areas by small- and large-scale commercial

farmers/producers. The popular commercial breeds are hybrids like Hi sex, Hybro, Shavers and Arbo Acres etc. (National Livestock Policy 2006).

Low yielding genetic composition, poor animal health services and feed shortage are the major challenges to be overcome to improve the productivity of the traditional chicken production system which is the largest source of egg and meat production and upon which millions depend for their livelihood.

There have been limited interventions attempted by GoT and development partners to improve local chicken production. Crossbreeding of local chickens with exotic breeds were attempted to improve their genetic potential but could not be sustained due to lack of technical support. Furthermore, the government introduced mass chicken vaccination campaigns in a few regions in Central and Coastal and Lake zones against the killer diseases like ND using its internally manufactured ND heat stable I-2 vaccines. The vaccine is cheap and easy to administer in rural settings but was not effective because it was unable to cover a wide spectrum (MALFD Budget Speech 2015–2016, referred in the LSA animal health background paper 2016).

### *Transforming the traditional family chicken (TFIC)*

The proposed transformation of the TFC is aimed at improving the indigenous chicken productivity through improved breed selection, health, feed and mangement interventions. The intervention in the indigenous traditional family chicken involves 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. With the additional animal health services, chicken mortality before marketing will be 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% increase.

**Key interventions in TFC (indigenous and improved)**

**Chicken genetic improvement:**

- Selection (within, interbreeding) and multiply IFC: up to 70–90 eggs/year, and up to 1.4 kg and able to reproduce.

**Strengthen animal health services:**

- Vaccination against chicken priority diseases—ND, FP, IBD/Gumboro.
- Strengthen capacity for disease surveillance (LGAs, zonal veterinary centres and TVLA), quarantines and supervise mass chicken vaccination programs.
- Rationalize public and private veterinary services, with privatization where feasible.

**Feed improvement:**

- Feed supplementation—10% of requirements.

**Strength the extension service:**

- Train village chicken producers to make quality feeds to supplement 10% of needs.
- Improve housing (physical structure) and biosafety.

The adoption rate for the intervention package is 30% in year 5, 50% in year 10 and reaching 70% in year 15 (2031) (Table 55). With the low coverage in year five which is 40% of the total chicken population, the number of chickens impacted by the intervention in year five is 12% of the total reaching 42% in year 15, i.e. 2031.

Table 55. Changes in coverage and adoption rate of village poultry intervention (with scenario)

| | Base year | 5th year | 10th year | 15th year |
|---|---|---|---|---|
| Coverage (%) | 30 | 40 | 50 | 60 |
| Adoption rate (%) | 20 | 30 | 50 | 70 |
| Proportion of impacted chicken (% of national population) | 6 | 12 | 25 | 42 |

It is assumed that the traditional chicken (indigenous and improved) population increases from 33 million to 52 million in year 2031.

***Commercial specialized chicken production (C-SCP)***

The intervention for commercial specialized chicken involves increasing the scale of operations or the average number of commercial layers and broilers kept per farm and increasing the number of farms.

- Increase the number of layers from 12 million to 25 million and broilers from 26 million to 1.3 billion.
- Facilitate establishment of new commercial chicken farms.
- Feed quality and quantity improvement.
- Facilitate establishment of small, medium to large-scale feed processing plants.
- Rehabilitate and retool feed quality testing labs (TFDA and TVLA (CVL)) to regulate feed quality (periodical processors compliance to set standards).
- Make land available for production of additional cereals for production of processed feed (maize and soybean).
- Facilitate construction of modern or upgrade conditions of existing chicken slaughter houses, meat and egg processing plants catering to domestic and exports.
- Strengthen meat inspections (at abattoirs, standardized mechanized slaughters and processing facilities).
- Encourage private sector to invest in hatcheries and distribution of crossbred DOCs and/or pullets.
- Promote consumption of chicken meat in communities.
- Technical training to develop the skilled labour needed for production and processing.
- Business extension support provided to producers and processors (private entrepreneurs, farmer groups and cooperatives) to develop marketing and distribution strategies.

***Investment impacts – chicken improvement***

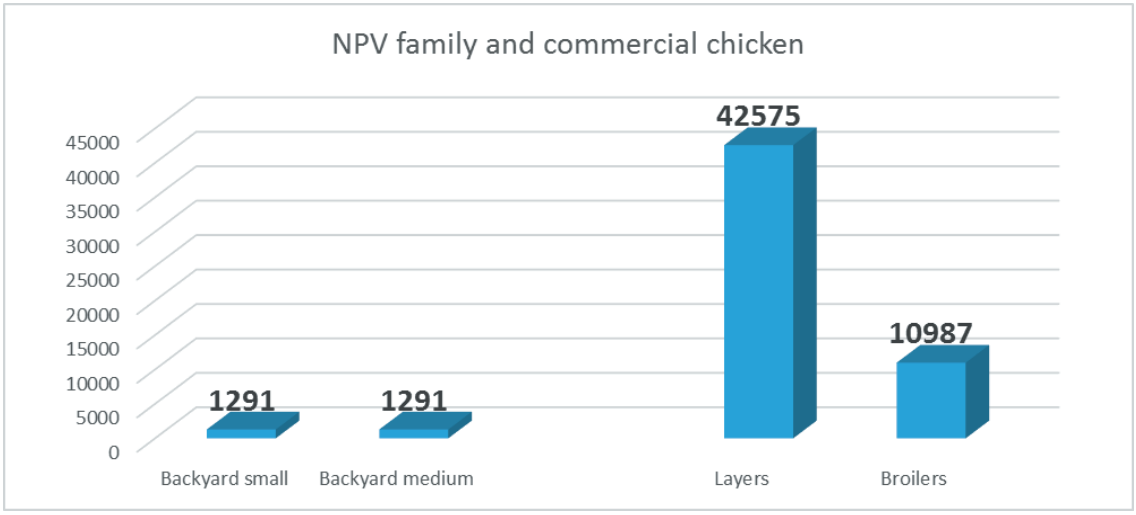
The results of investment analysis for chicken production are summarized in Table 56. All of the financial indicators based on the 15-year discounted incremental cash flow analysis indicate that the investment in both backyard and commercial production systems are financially viable. It is observed that the results indicate the BCR and IRR in backyard poultry are higher than the investment in the commercial poultry sector.

Table 56. Results of financial analysis for the combined livestock policy and investment interventions in chicken in Tanzania 2016–31

| Flock size class/farm type | Financial indictors based on the 15-year discounted incremental cash flow analysis | | |
|---|---|---|---|
| | NPV (thousands of TZS) | IRR (%) | BCR |
| Backyard | | | |
| - Small | 1,291 | 76 | 7.5 |
| - Medium | 1,291 | 58 | 5.8 |
| | | | |
| Commercial | | | |
| - Broiler | 10,987 | 36 | 1.0 |
| - Layer | 42,575 | 57 | 5.7 |

Source: Based on bio-economic simulation analysis using LSIPT.
Note: The investment analysis was made for 15 years assuming a 10% discount rate.

Figure 29. NPV family and commercial chicken.




**Impacts on Production**

As a result of the investment interventions, the overall change in chicken meat production over the 15-year time horizon is 1,071% greater than what could have been achieved in the same time horizon with the current investment scenario (Table 57). Compared to the base year, the volume of chicken meat increased from 63,596 t to 1,674,012 t. The meat gain from layers with additional investment over the 15-year period is lower than what could have been achieved with the current investment scenario.

As the result of the interventions, the egg production over the 15-year time horizon increases from 2.6 billion in the base year to 6.1 billion. Most of this change is from the commercial layers. However, the traditional family contribution is also substantial at 267% greater than what could be achieved with the current investment scenario over the 15-year period.

Table 57. Production 2031 with the current and with the additional investment scenarios

| Products | Base year 2015–16 | Production 2031 with current investment | Production with additional investment 2031 | % Change |
|---|---|---|---|---|
| Chicken meat family improved (t) | 31,655.1 | 35,146.8 | 89,359.8 | 154% |
| Chicken meat layers (t) | 8,998.5 | 43,054.0 | 21,659.1 | -50% |
| Chicken meat broilers in (t) | 22,943.0 | 78,000.2 | 1,562,993.2 | 2003% |
| **Total chicken meat** | **63,596.60** | **156,201.00** | **1,674,012.10** | **1,071%** |
| Eggs family improved in 000s | 95,068.7 | 105,555.2 | 281,361.3 | 267% |
| Eggs commercial Layers 000s | 2,581,033.0 | 12,349,183.2 | 6,131,818.2 | -50% |
| **Total eggs** | **2,676,101.7** | **12,454,738.4** | **6,413,179.5** | **-48.5%** |

**Impacts on GDP**

As shown in Table 58 below, the GDP contribution of the investment interventions in improving chicken production systems is extremely high. By 2031, with the proposed interventions scenario, the chicken meat and eggs GDP contributions grow to TZS1, 990,978 compared to only TZS533,821 million under the current investment scenario. There is a 373% change in the GDP contributions and most of it is coming from the growth in chicken meat from broilers. The GDP contribution from commercial layers is lower than what can be achieved under the current investment scenario.

Table 58. GDP contribution 2031 with the current and with the additional investment scenarios (millions of TZS)

| Products | Base year 2015–16 (millions of TZS) | Chicken GDP with current investment (millions of TZS) | Chicken GDP with additional investment 2031 (millions of TZS) | % change |
|---|---|---|---|---|
| Chicken meat family indigenous | 153,326.9 | 170,239.6 | 554,609.1 | 324% |
| Chicken meat layers | 39,162.7 | 187,377.4 | 97,313.1 | -52% |
| Chicken meat broilers | 14,284.3 | 48,562.9 | 1,077,683.8 | 2,219% |
| Eggs family Indigenous | 21,310.6 | 23,661.3 | 76,313.6 | 323% |
| Eggs commercial specialized layer | 21,732.3 | 103,980.1 | 185,058.3 | 178% |
| **Total** | **249,816.80** | **533,821.30** | **1,990,977.90** | **373%** |

## 9.5 Pig meat improvement

**The investment context—intervention and assumptions**

The pig industry in Tanzania is an emerging industry that provides income and animal-source food for 190,000 households. It also provides business for 1,436 unit of enterprises (LMP 2016). Tanzania's National Livestock Sector Policy document (URT 2006 referred to in the LMP background paper) recognizes potential and suggests promotion of pig production in order to contribute to food security, improved nutrition and increased incomes while conserving the environment. There are about 2 million pigs in Tanzania, which are distributed in all the three production zones and predominantly owned (82%) by small holders.

The two major pig production systems in Tanzania are traditional extensive family and improved family and modern semi intensive specialized commercial systems. The traditional system is characterized by low productivity, scavenging and semi-scavenging with an average holding of one to three sows and litter size of six to eight. The commercial specialized pig production system is intensive with moderately higher productivity, eight sows and a litter size of 8–11.

Pig mortality is as high as 20% for young pigs before weaning. This is due to prevalence of several diseases and poorly available animal health services. ASF is the number one killer of pigs. Once established, ASF is very difficult to eradicate; it is not zoonotic, but hampers pig meat and products export trade.
Feed is also one of the critical constraints that limits the productivity of the industry. Poor management and housing contribute to the sector's low performances. In order to achieve what has been proposed in NLP, there is a need for comprehensive interventions to modernize the low productivity traditional system and upgrade and upscale the semi intensive system to increase productivity and production of pig meat.

### *Modernizing the traditional pig production*

The proposed transformation of traditional pig production involves genetic, health and feeding interventions.

Major activities tested under this intervention include:

**Improve genetics**

Improve breed performance through crossing with improved breeds. This involves:

- Procurement of semen and equipment for AI and sires for inter/crossbreeding and multiply adapted pig breeds.
- Support the private sector in pig-breeding programs and investment in superior parent stock (e.g. Large White, Landrace, Duroc sires and sows for crossbreeding) and use F1 for multiplication of porkers.
- Develop and support a national swine registry database.
- Strengthen National Swine Association.

**Improve animal health care services and management to reduce piglets and adult pig mortality:**

- Strengthen disease control targeting the control and prevention of priority pig diseases (ASF, TGE, erysipelas, worms and mange etc.).
- Strengthen surveillance, collect and test blood/organ samples for ASF, brucellosis and Erysipelas etc.
- Public and private sector collaboration (i.e. rationalize private veterinary services, engage traders and the pig industry/their organizations).
- Improve housing (physical structures) and hygiene.
- Periodic treatments against internal and external parasites.

**Improve feed availability and feeding of animals**

- Feed supplementation—increase by 10% of the established requirements.
- Strengthen capacity of village pig keeping households:
    - to compound quality feed/home ration from local and industrial feed materials to supplement their flocks
- Strengthen extension/advisory services at all levels (skills, number of staff).

**Assumptions and targets—village pig**

- Annual veterinary and medicine cost – increase from TZS35,000 to TZS70,000
- Age at first service (days) – will decrease from 300 days to 270 days by 2031
- Mortality rate of young animals before weaning, weaners and adults (%) by 2031 – will decrease by 25%, 38% and 40%, respectively.
- Marketing age of piglets, weaned, will for each decrease by 17%
- The weight at weaning, marketing and culling of sows and boars will increase by 17%, 25% and 25%, respectively
- Number of sows (stable state) will increase from 2 to 6
- Feed quantities given/fed to gilts, gestating, lactating pig and boars will increase by 33%, 25%, 33% and 50%, respectively, while the proportion of industrial feed included in the ration will increase from 0% to 10%

### *Commercial semi intensive pig production*

The interventions for commercial specialized piggery include:

- Expanding specialized piggery and increase the number of pigs in the commercial farm units
- Increase the number of specialized piggery farms and number of pigs per unit farm
- Improve availability of feed (produced, agro-industrial by-products and processed feeds)
    - Make land available for the production of pig feed and raw materials (maize and soya beans) for processed feed production[9]
    - Provide incentives and suitable environment to agro-processing industries and feed processing factories
    - Facilitate establishment of small, medium to large-scale feed processing plants
    - Improve quality assurance of agro-industrial by-product and processed feeds
    - Encourage private sector to involve in pig slaughter houses/abattoirs and pork processing factories.
    - Assure the quality of live pig, pork and pork products marketed
- Rehabilitate and retool labs at TFDA and TVLA (CVL) to regulate feed quality through periodical compliance testing to standards
- Strengthen capacity of DVS, retool TVLA and TFDA to regulate food pig slaughters and meat processing for product safety
- Facilitate the construction of modern or upgrade conditions of existing pig slaughter houses, abattoirs, pig meat processing plants catering to domestic and exports markets
- Strengthen public/private pig meat inspection
- Promote consumption of pork

Table 59. Change in pig population

| Pig production subsystems | Unit | Base year (2016) | With current investment (2031) | With additional investment (2031) |
|---|---|---|---|---|
| Village pig (small flock size) | Number | 1,153,668 | 3,510,066 | 3,510,066 |
| Village pig (medium flock size) | Number | 433,302 | 1,318,338 | 1,318,338 |
| Commercial/specialized pig | Number | 401,856 | 420,322 | 8,820,476 |
| Total | | 1,988,826 | 5,248,726 | 13,648,880 |

[9]Total cereal equivalent requirement for chicken and swine = 2,261,546 (43% of maize, millet and sorghum produced currently).

With additional investment, the national pig population will grow to 13,648,880 which is a 160% increase (Table 59). All the changes, however, are within the commercial specialized system. The growth rate for the family system remains the same for both investment scenarios. This is intended to minimize the competition for grain between, pigs, chicken and human beings.

### *Investment impacts, NPV, IRR, production and GDP—pig improvement*

The results of investment analysis for pig production are summarized in Table 60. All the financial indicators based on 15-year projection, 10% discount rate analysis indicate that the investment in both backyard and commercial production systems are financially viable. Furthermore, it was observed that the results indicate the investment in small-size backyard pig production is the most profitable.

Table 60. Results of financial analysis for the combined livestock policy and investment interventions in pig production in Tanzania 2016–2031

| Herd/flock size class/farm type | Financial indictors based on 15-year discounted incremental cash flow analysis | | |
|---|---|---|---|
| | NPV (thousands of TZS) | IRR (%) | BCR |
| Backyard | | | |
| - Small | 10,267 | 86 | 8.6 |
| - Medium | 5,333 | 17 | 1.7 |
| - Pig fattening | 203 | 22 | 1.1 |

Source: Based on bio-economic simulation analysis using LSIPT.

**Impacts on production**

As shown in Table 61 below the change in pig meat production as a result of the investment is very high. The total production change is 63,480.8 t which is an overall increase of 223%. Ninety-nine per cent (99%) of this incremental benefit comes from the commercial-specialized pig system. Investment return from the family system is insignificant and may not be worth the additional investment.

Table 61. Production 2031 with the current and with the additional investment scenarios

| | | Pig meat production 2031 | | % change |
|---|---|---|---|---|
| **Products** | **Base year 2015–16** | **With current investment** | **With additional investment 2031** | |
| Pig meat family small | 11,856.9 | 36,075.0 | 36,796.7 | 2% |
| Pig meat family medium | 4,046.7 | 12,312.2 | 12,399.0 | 1% |
| | | | | |
| Pig meat commercial specialized | 29,95.7 | 3,133.4 | 65,755.7 | 2,099% |

**Impacts on GDP**

Similar to the impact on production, the GDP contribution of the investment interventions in improving the pig meat production systems is extremely high for commercial specialized. By 2031, with the proposed interventions, the GDP contributions of the pig meat grow to TZS518,460 million compared to only TZS119,718.8 million under the current investment intervention scenario during the same period. It is a 433% increase. 99.6% of the additional production increment comes from the commercial specialized pig production systems. This raises the question on the relevance of investing in the family pig production system.

Table 62. GDP contribution of pig meat 2031 with the current and with the additional investment scenarios (millions of TZS)

| Products | Base year 2015–16 | Pig meat GDP contribution 2031 | | % change |
|---|---|---|---|---|
| | | With current investment | With additional investment | |
| Pig meat family small | 24,863.6 | 75,648.3 | 76,959.0 | 2% |
| Pig meat family medium | 7951.6 | 24,192.9 | 24,363.5 | 1% |
| Pig commercial specialized | 19,004.2 | 19,877.6 | 417,137.5 | 2,099% |

The production and GDP contribution results reveal the fact that little is obtained from the investment in the family pig systems. The incremental benefit from the commercial-specialized system is extremely high and clearly justifies investment. This is good news for private investors. Further policy incentives, technological and extension supports are needed to encourage the private sector to invest in commercial piggery.

# 10 Main results and conclusions of the Livestock Sector Analysis (LSA)

## 10.1 Priority Interventions to modernize the sector

To identify priority interventions to modernize the livestock sector to realize the national development objectives of Tanzania using the most recently available and reliable data and the LSIPT,[10] MALF 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 (LSA). The process has been technically supported by ILRI and financially supported by the BMGF.

The results of this LSA guided in turn the preparation of LMP which is a series of five-years investment implementation plans or 'roadmaps', to be used to help implement the present larger national program of Tanzania, the 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 (2016–17 to 2021–22), MKUKUTA II, National Livestock Policy 2006, ASDS II and Livestock Sector Development Strategy (2010).

The baseline analysis of the 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 million sheep. Other livestock include 2 million pigs, 33.3 million local chickens and 38.1 million improved chickens (as also reported in the MALF Budget Speech 2016–17). Goat meat and mutton currently account for 14% and 4% of all red meat, respectively; thus, their improved productivity is unlikely to significantly close the projected meat consumption/demand gap as beef accounts for 82% of the red meat production in Tanzania. Therefore, the development focus needs 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 characterized by small size mature body weight (200–350 kg), long horn cattle such as the Ankole breed characterized by large mature body weight (500–730 kg) and the Boran breed which features 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 technology and changes in policy will the productivity and production potential of these animal resources be sufficiently improved to provide adequate levels of animal-source foods needed to feed the rapidly growing population, with its rapidly increasing income and growing demand for animal-source foods. 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 (TLMI 2015).

The widely accepted baseline results for the sector and the LSA investment scenario results shared below point to high returns for investment in livestock, and indicate that there is a need to strategically increase investments in the livestock production systems and value chains in order to

[10]This toolkit was developed by a group of international agencies under the aegis of ALive at AU-IBAR. CIRAD, FAO and the World Bank were the main contributors.

improve productivity and incomes, thus enhancing the sector's economic contributions at all levels, and contribute to the attainment of 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 five 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.

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 crossbreeding 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 YASM;
- Improving marketing and information technology infrastructure to increase efficiencies along the value chains;
- Designing and implementing policies and institutional interventions, which enable private and private-public investment interventions in animal feed, genetics, animal feed and animal husbandry.

## 10.2 Key results and conclusions

**Profitability and nutritional impacts**

The return on investment (ROI) in livestock sector is very attractive and has significant impact on household incomes and nutritional security, as well as the national economy (see section 9; table 59). For all species and commodity value chains, the Internal Rate of Returns (IRRs) obtained were greater than 10% (the assumed project financial discount rate. The IRRs ranging from 12–89.8% indicate the substantial financial viability of all the investments. The incremental change in GDP in 2031 due to the additional livestock investment interventions as compared to the base year of 2016 as well as the

BAU 2031 scenario was also found to be very large (see section 9). The incremental change was more than 80% on average in all cases.

The nutritional impact was also assessed in terms of the percentage change in livestock contribution to calories and protein (Table 63). The increase in calories was as high as 35% for medium size improved traditional cattle in the Coastal and Lake zone. Similarly, the percentage change in contribution to protein was as high as 105% for medium size improved traditional cattle in the same zone. It is important to note that 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 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).

Table 63. Profitability and nutritional impacts of investment in the livestock sector 2031

| Value chain and production zone | IRR | % change in nutrition contribution | |
|---|---|---|---|
| | | Calories | Protein |
| Improved traditional cattle small scale (Central) | 36% | 8% | 22% |
| Improved traditional cattle medium-large scale (Central) | 23% | 10% | 49% |
| Ranch cattle (Central) | 53% | NA | NA |
| Improved traditional cattle-small scale (Coastal and Lake) | 22% | 5% | 15% |
| Improved traditional cattle medium-large scale (Coastal and Lake) | 37% | 35% | 105% |
| Ranch cattle (Coastal and Lake) | 12% | | |
| Ranch cattle (Highland) | 89.8% | | |
| Urban and peri-urban dairy cattle small scale (all zones) | 23.1% | 27% | 42% |
| Urban and peri-urban dairy cattle medium-large scale (all zones) | 20% | 14% | 114% |

**Production-consumption balance**

Under the BAU investment scenario, the projected red meat production-consumption gap in 15 years (by 2031–32) is estimated to be 1.7 million t, driven by existing poor animal genetics, health and feed constraints. Moreover, the scenario analysis with the BAU level of dairy investments shows that there will be a production-consumption gap of 5.8 million litres by 2031–32. These projected deficits will also be driven by high human population, increased income, urbanization and income elasticity of demand, leading to very high projected growth in consumption of animal-source foods.

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

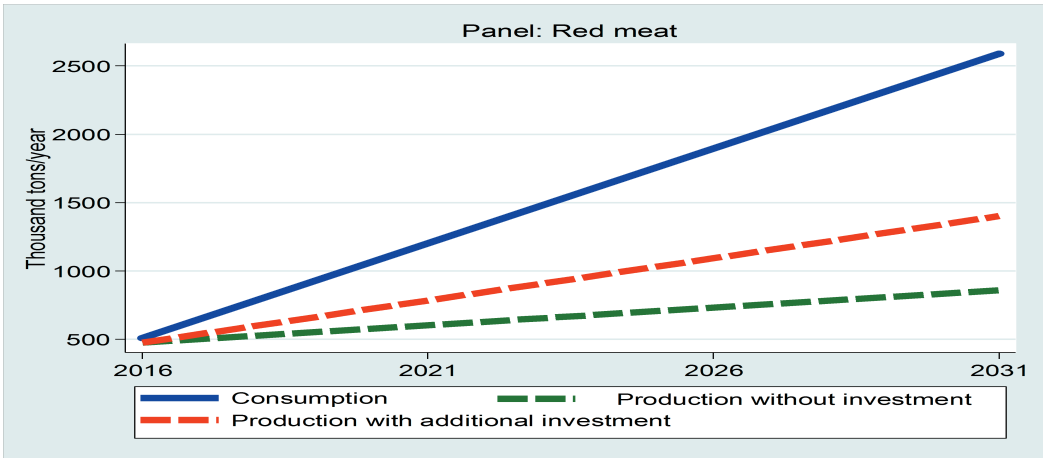
***Meat production consumption balance***

**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), the red meat production will not grow enough, even with additional investment, to close the red meat production-consumption gap in a 15-year period (Figure 30). Beef is the dominant component of red meat consumed in Tanzania, along with goat meat and mutton (sheep meat). In the base year (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 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% under BAU investment scenario and 82% % with additional investment.

Figure 30. Production-consumption balance for red meat with and without additional investments for Tanzania 2016–17 to 2031–32.

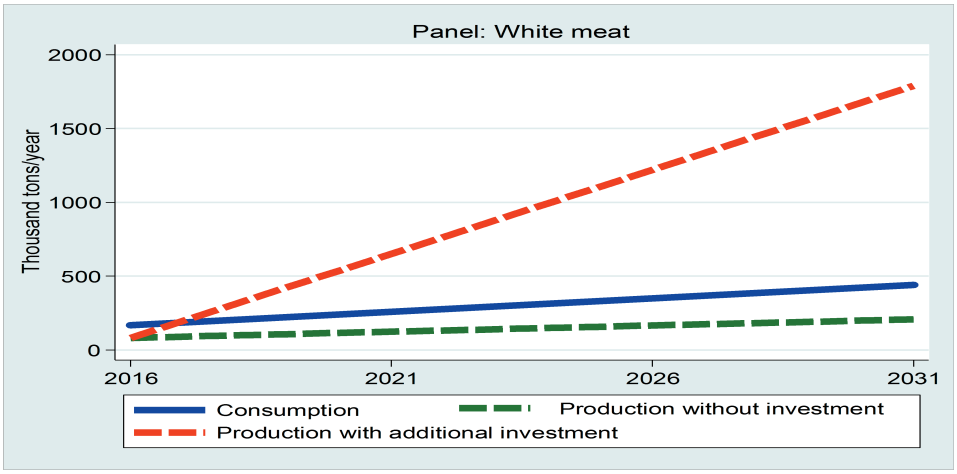



**White meat**

Improving 'white meat' requires a focus on controlling ND and ASF diseases in chicken and pigs, respectively, to increase their productivity and thus offtake and white meat production. Raising productivity would help to close the projected all-meat production-consumption gaps thus helping to achieve better food and nutrition security and enable possibilities of releasing some red meat for export. In the BAU investment scenario, by year 2031–32, a deficit of about 234,000 t of white meat is projected (Figure 31), thus resulting in a total all-meat deficit of 2 million t (Figure 32). With additional investment, the white meat deficit is removed and a huge surplus accrued to close the all-meat production-consumption gap.

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 real 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 domestic and local tastes and preferences for consumption of beef and other red meats to consumption of chicken (and eggs) and pork. 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 ASF, to increase pig productivity and pork production.

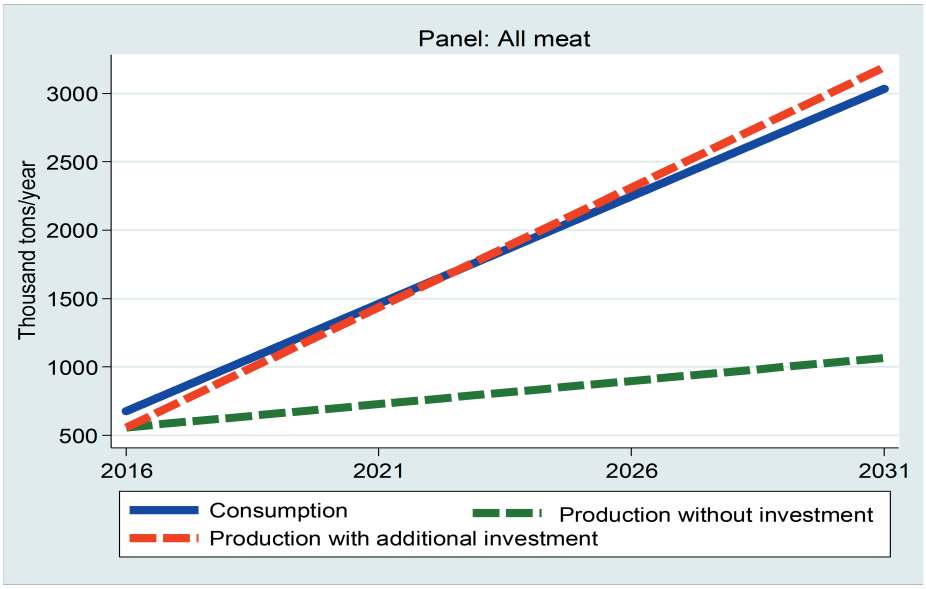
Figure 31. Production-consumption balance for white meat with BAU investment scenario 2016–31.




**All meat**

The projected all meat production 'with additional' combined investment in the livestock sector is estimated at 3.2 million metric t in 2031–32, a 199% increase from the BAU investment scenario. The self-sufficiency rate also increases from 35% to 105%, resulting in a surplus of 158 thousand metric t 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 meat.

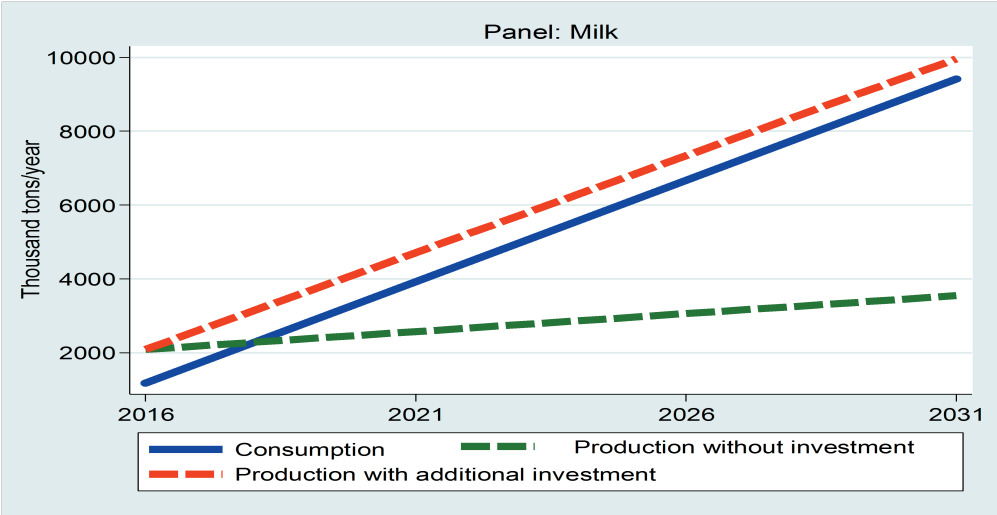
**Figure 32.** Production-consumption balance for all meat with and without additional investments for Tanzania 2016–31.




***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 litres in 15 years (Figure 33). The scenario analysis for additional dairy investments (the 'with investment' scenario) shows the gap in projected milk consumption can be closed and a surplus produced through 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 litres of milk in 2031–32 which would provide raw material for domestic industries and export, after meeting domestic consumption requirements.

Figure 33. Production-consumption balance for cow milk with and without additional investments for Tanzania 2016–31.




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.
- 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 YASM.
- Livestock genetic improvement priorities are thus dairy crossbreds and exotic chicken pure breeds for both family and large scale investment.
- Animal health interventions for YASM (vaccinations, parasite control) are critical to ensure improved productivity, thereby increasing animal and product offtake of meat and dairy.
- Feed is the biggest constraint to animal productivity improvement in Tanzania. Access to land appropriate for grazing and feed production needs to be addressed to overcome the very serious existing feed deficit.
- Land allocation and ownership policy need to change to favour 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 on improving cattle offtake and beef production is needed to increase beef production from on-farm fattening and commercial feedlots.
- Red meat production cannot be expected to increase much over time to significantly 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 close the meat gap due to their low numbers, in addition to limited feed resources and low genetic potential of indigenous breeds.
- Pigs are prone to ASF and pork 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.

**Cross-cutting issues**

The key technical factors determining the ability to raise livestock production and productivity in Tanzania are feed, health and genetics. To identify the priority technology interventions, we need to understand these factors. LSIPT includes tools to help systematically diagnose constraints related to these factors. Besides the technical constraints, policy enactment and/or implementation can hinder achievement of livestock sector development and modernization. In the LSA, we analysed the influence of all four of these factors on sector development.

***Animal feed***

Crop and livestock production are the dominant economic subsectors providing livelihoods, incomes and employment to more than 80% of Tanzania's population, and feed is one the most critical constraints to the growth in the livestock sector. Although endowed with natural resources, a large resource base for the country's about 130 million livestock, the utilization of grazing lands for sustainable livestock production is hampered by seasonal variations of quality and quantity of forage and limitation on accessing available grazing resources. While the country produces substantial amounts of cereals and root crops, whose residues are valuable feeds for livestock, these crops are produced primarily for human consumption and are often in short supply.

The LSIPT was employed to measure the potential supply of forage, fodder and other feed resources and future requirements for cattle, sheep, goats, poultry and pigs in the three production zones and the specialized systems. The analysis indicated a clear shortage in feed and forage supply in the country year-round, with available resources making up only 26% of required feed on average. 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 at the end of the 15 years.

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 and animal health programs to enhance the genetic potential of livestock.

***Animal health***

Animal health services—disease control and prevention—are 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 with 24,231 clinical cases treated. Prevention and control are a recurring and costly burden to individual livestock keepers, commercial herd owners and the local and national governments.

Transboundary animal diseases and zoonoses are particularly important constraints to livestock production and productivity 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), ASF, Marek's disease, ND, contagious bovine pleuropneumonia (CBPP), brucellosis, East Coast fever (ECF).

Based on expert opinion and data on animal diseases, the LSIPT was used to assess qualitative and quantitative socio-economic impacts of diseases on household assets, markets/value chains and intensification of production, to develop a priority list of animal diseases, and characterize the status of veterinary infrastructure in the country. This work sought to determine the optimal allocation of financial and human resources for surveillance, prevention, control and elimination of priority infectious diseases. The species targeted were food-producing animals: mainly cattle (beef, dairy), small ruminants (sheep and goats), chicken and pigs. The priority diseases[11] 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 was FMD (cattle), PPR (small ruminants), ASF (pigs) and Salmonellosis (poultry).

Inadequate resources including funds, skilled personnel and logistics weaken the ability of national veterinary services to contribute significantly 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. Adequate budget needs to be allocated so the department of veterinary services can increase personnel to strengthen the country's animal disease surveillance and reporting system, 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 continues to hinder the supply of improved breeds to farming communities. Better coordination of the development and protection of AnGR in Tanzania should involve the establishment of reliable and sustainable germplasm delivery systems, the involvement of the private sector in genetic improvement, and instituting an effective animal genetic improvement recording scheme at the farm to national herd level.

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

Crossbreeding local cattle is the highest priority and should focus on the interbreeding of breed types, to take advantage of additive gene action. It is recommended that for dairy, suitable exotic

[11]The priority disease affecting each species are listed here. The other diseases can be found in the Tanzania LMP annex on animal diseases.

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 by 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. Exotic breeds developed elsewhere also need to be tested and introduced.

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.

Livestock selection for genetic improvement needs to focus on:

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

## 11. References:


Carlo, L.L. (1976). Supplementary feeding. In: Proceedings of the Third Scientific Conference of the Tanzania Society of Animal Production, Nay 1976.

Food and Agriculture Organization of the United Nations. 2002. Cattle and Small Ruminant Production Systems in sub-Saharan Africa - A Systematic Review. Livestock Information Sector Analysis and Policy Branch. Rome.

Food and Agriculture Organization of the United Nations. 2005. Livestock Sector Brief – United Republic of Tanzania. Livestock Information Sector Analysis and Policy Branch. Rome.

French, M.H. (1943). Feeding value of tropical grasses and bulrush millet. East African Agricultural and Forestry Journal 9: 88-89. 1957. Nutritional value of tropical grasses and fodders. Herbage Abstracts 27: 1–9.

Gillah, K.A., Kifaro, G.C. and Madsen, J. 2012. Urban and peri urban dairy farming in East Africa: A review on production levels, constraints and opportunities. *Livestock Research for Rural Development* 24(11): [need p#].

Human Population Census, National Bureau of Statistics, 2012

Intergovernmental Authority on Development (IGAD). 2012. The contribution of livestock to the Kenyan economy. IGAD Livestock Policy Initiative. IGAD LPI Working Paper No. 03–11

Orungo, J., Wieland, B. and Rushton, J. 2012. Productivity in different cattle production systems in Kenya in Tropical Animal Health and Production.

John, K., Fitzpatrick, J., French, N., Kazwala, R., Kambarage, D. et al. 2010. Quantifying risk factors for human brucellosis in rural Northern Tanzania. *PLoS ONE* 5(4): e9968.

Kategile, J.A. and Mubi, S. (eds). 1992. *Future of livestock industries in East and southern Africa*. Proceedings of a workshop held at Kadoma Ranch Hotel, Zimbabwe, 20–23 July 1992. ILCA (International Livestock Centre for Africa), Addis Ababa, Ethiopia. 227 pp.

Kakengi, A.M., Shem, M.N., Mtengeti, E.P. and Otsyina, R. 2001. *Leucaena leucocephala* leaf meal as supplements to diet of grazing dairy cattle in semi-arid western Tanzania. Agro-forestry system 52: 305-314.

Kanuya, N.L., Matiko, M.K., Nkya, R., Bittegeko, S.B.P., Mgasa, M.N. et al. 2006. Seasonal changes in nutritional status and reproductive performance of Zebu cows kept under a traditional agro-pastoral system in Tanzania. *Tropical Animal Health and Production* 38(6): 511–519.

Madallali, S.A. 1974. A review of pasture research in Tanzania. In: Proceedings of the First Scientific Conference of the Tanzania Society of Animal Production May 1974.

Ministry of Livestock and Fisheries Development, (Mtazamo wa Wizara kuhusu Kupunguzwa kwa Maeneo ya Hifadhi Nchini kwa ajili ya Kupisha Shughuli za kibinadamu, May 2016)

Ministry of Natural Resources and Tourism. 2012. Forest Act 2002

Malele II. 2011. Fifty years of tsetse control in Tanzania: challenges and prospects for the future. *Tanzania Journal of Health Research* 13(5 Suppl. 1): 399–406.

Msoffe, P.L.M., Bunn, D., Muhairwa, A.P., Mtambo, M.M.A., Mwamhehe, H. et al. 2010. Implementing poultry vaccination and biosecurity at the village level in Tanzania: a social strategy to promote health in free-range poultry populations. *Tropical Animal Health and Production* 42(2): 253–263. http://doi.org/10.1007/s11250-009-9414-8

National Bureau of Statistics. 2012. National Sample Census of Agriculture 2007/2008 Small Holder Agriculture, Volume III: Livestock Sector - National Report United Republic of Tanzania.

National Livestock Policy. 2006. Ministry of Livestock. http://www.mifugouvuvi.go.tz/wp-content/uploads/2013/06/Livestock-Policy.pdf

Ndambi, O.A., Hemme, T. and Latacz-Lohmann, U. 2007. Dairying in Africa - Status and recent developments. *Livestock Research for Rural Development* 19(8):

Russell, E.W. 1966. Soils and fertility. In: Davies, W. and Skimore, C.L. (eds.). Tropical Pastures, London: Faber and Faber.

Sangeda, A.Z. and Malole, J.L. 2014. Tanzanian rangelands in a changing climate: Impacts, adaptations and mitigation. *Net Journal of Agricultural Science* 2(1): 1–10.

Seré, C. and Steinfeld, H. 1996. *World livestock production systems: current status, issues and trends*. Animal production and health paper No. 127. Rome, FAO. 82 pp.

Tanzania Livestock Sector Analysis. (2016) Ministry of Agriculture, Livestock and Fisheries

TISCO (Tanzania Industrial Studies and Consulting Organization). 1983. Dairy Development for Tanzania Livestock Development Authority (main report). Dar es Salaam.

TFS. 2015. National Forest Resources Monitoring and Assessment of Tanzania: Main Results. National Forest Resources Monitoring and Assessment (NAFORMA) Project Report. 106pp.

Thomas, D. 1973. Nitrogen from tropical legumes on the African continent. *Herbage Abstracts* 43: 33–39.

Thornton, P.K. 2010. Livestock production: recent trends, future prospects. *Philosophical Transactions of the Royal Society B: Biological Sciences* 365(1554): 2853–2867. http://doi.org/10.1098/rstb.2010.0134.

Upton, M. 2004. The role of livestock in economic development and poverty reduction. National Research Council (US) Committee on Achieving Sustainable Global Capacity for Surveillance and Response to Emerging Diseases of Zoonotic Origin: Workshop Report. Washington (DC): National Academies Press (US); 2008; from: http://www.ncbi.nlm.nih.gov/books/NBK207998/.

URT. 2013. National Land Use Frame Work Plan 2013–2033: Land Resources, Strategies and Land Use Plan Proposal. Volume I, 61pp

Wambura, P.N., Kapaga, A.M and Hyera, J.M.K. 2000. Experimental trials with thermostable Newcastle disease virus (strain I-2) in commercial and village chickens in Tanzania. *Preventive Veterinary Medicine* 43(2): 75–83.

# 12. ANNEXES

## *Annex 1. Livestock production parameters*

Table 64. Traditional cattle production system average productivity parameters

| Parameters | Central zone (small) – B1LG | Central zone (medium) – B2LG | Costal and Lake zone (small) – B1MR | Costal and Lake zone (medium) – B2MR | Highland zone (small) – B1MI | Highland zone (medium) – B2MI |
|---|---|---|---|---|---|---|
| Herd size | 15 | 77 | 10 | 113 | 5 | 76 |
| Parturition rate | 0.58 | 0.58 | 0.58 | 0.58 | 0.60 | 0.60 |
| Mortality rate (female juveniles) | 20% | 20% | 20% | 18% | 18% | 20% |
| Mortality rate (male juveniles) | 20% | 21% | 20% | 18% | 18% | 20% |
| Mortality rate (female subadults) | 6% | 7% | 8% | 8% | 6% | 6% |
| Mortality rate (male - subadults) | 8% | 8% | 8% | 8% | 6% | 6% |
| Mortality rate (female adults) | 5% | 2% | 6% | 7% | 4% | 3% |
| Mortality rate (male adults) | 7% | 8% | 6% | 7% | 3% | 4% |
| Off take rate | 11% | 10% | 10% | 10% | 13% | 13% |
| Dressing percentage | 50% | 50% | 50% | 50% | 50% | 50% |
| Live weight (female juvenile) | 50 | 50 | 50 | 50 | 55 | 55 |
| Live weight (male juvenile) | 55 | 55 | 70 | 70 | 70 | 70 |
| Live weight (female subadult) | 110 | 110 | 110 | 110 | 130 | 125 |
| Live weight (male subadult) | 130 | 130 | 130 | 130 | 150 | 130 |
| Live weight (female adult) | 220 | 220 | 250 | 250 | 250 | 250 |
| Live weight (male adult) | 280 | 280 | 280 | 300 | 300 | 300 |

| Parameters | Central zone (small) – B1LG | Central zone (medium) – B2LG | Costal and Lake zone (small) – B1MR | Costal and Lake zone (medium) – B2MR | Highland zone (small) – B1MI | Highland zone (medium) – B2MI |
|---|---|---|---|---|---|---|
| Lactation length (days) | 180 | 180 | 180 | 180 | 180 | 180 |
| Daily milk production | 1.5 | 1.5 | 1.5 | 1.5 | 2.0 | 2.0 |
| Per cent of forage feed purchased | 0% | 0% | 0% | 0% | 2% | 5% |
| Veterinary cost (per year per animal) | 7,500 | 7,500 | 7,500 | 7,500 | 8,500 | 8,500 |

Table 65. A range of production parameters for traditional cattle production systems in sub-Saharan Africa, Tanzania and Kenya

| Parameter ranges | Mean sub-Saharan Africa traditional cattle production [12] | | | Tanzania traditional cattle production | | | Mean Kenya traditional cattle production[13] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Parturition rate | Mortality rate (juveniles) | Offtake rate | Parturition rate | Mortality rate (juveniles) | Offtake rate | Parturition rate | Mortality rate (juveniles) | Offtake rate[14] |
| Minimum | 44.1% | 20.7% | 6.9% | 58.0% | 17.0% | 10.0% | 64.3% | 20.0% | 7.9% |
| Maximum | 61.0% | 23.1% | 12.3% | 60.0% | 20.0% | 13.0% | 65.0% | 24.8% | 15% |

Table 66. Ranch production system average productivity parameters

| Parameters | Central zone (large) – B3LG | Coastal and Lake zone (large) – B3MR | Highland zone (large) – B3MI |
|---|---|---|---|
| Herd size | 2,000 | 690 | 570 |
| Parturition rate | 0.70 | 0.70 | 0.70 |
| Mortality rate (female juveniles) | 8% | 8% | 8% |
| Mortality rate (male juveniles) | 8% | 8% | 8% |
| Mortality rate (female subadults) | 4% | 4% | 4% |
| Mortality rate (male subadults) | 4% | 4% | 4% |
| Mortality rate (female adults) | 2% | 2% | 2% |

[12](FAO 2002)
[13](Onono et al. 2012)
[14](IGAD 2012)

| Parameters | Central zone (large) – B3LG | Coastal and Lake zone (large) – B3MR | Highland zone (large) – B3MI |
|---|---|---|---|
| Mortality rate (male adults) | 2% | 2% | 2% |
| Offtake rate | 18% | 18% | 19% |
| Dressing percentage | 50% | 50% | 50% |
| Live weight (female juvenile) | 60 | 60 | 60 |
| Live weight (male juvenile) | 65 | 65 | 65 |
| Live weight (female subadult) | 150 | 130 | 150 |
| Live weight (male subadult) | 160 | 160 | 180 |
| Live weight (female adult) | 280 | 250 | 280 |
| Live weight (male adult) | 340 | 340 | 350 |
| Female | 150 | 150 | 150 |
| Female | 1.5 | 1.5 | 1.5 |
| Size of land used for forage production (ha) | 8,560 | 2,247 | 2,525 |
| Veterinary cost (per year per animal) | 30,000 | 30,000 | 30,000 |
| Cost of access to water per animal per year | 50,000 | 50,000 | 50,000 |

Table 67. Commercial dairy production system average productivity parameters

| Parameters | Commercial Dairy (Small) – B1OM | Commercial Dairy (Medium) – B2OM |
|---|---|---|
| Herd size | 5 | 450 |
| Parturition rate | 0.7 | 0.7 |
| Mortality rate (female juveniles) | 10% | 8% |
| Mortality rate (male juveniles) | 10% | 8% |
| Mortality rate (female subadults) | 5% | 5% |
| Mortality rate (male subadults) | 5% | 5% |
| Mortality rate (female adult) | 4% | 4% |
| Mortality rate (male adult) | 4% | 4% |
| Offtake rate | 23% | 22% |

| Parameters | Commercial Dairy (Small) – B1OM | Commercial Dairy (Medium) – B2OM |
|---|---|---|
| Daily milk production | 8 | 9 |
| Lactation length | 300 | 300 |
| Per cent of forage feed purchased | 10% | 10% |
| Cost of accessing water | 20,000 | 50,000 |
| Veterinary cost (per year per animal) | 15,000 | 10,000 |

Table 68. Production parameters of traditional goat

| Parameters | Central zone (small) – G1LG | Central zone (medium) – G2LG | Coastal and Lake zone (small) – G1MR | Coastal and Lake zone (medium) – G2MR | Highland zone (small) – G1MI |
|---|---|---|---|---|---|
| Parturition rate | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| Mortality rate (female juveniles) | 17% | 17% | 20% | 21% | 18% |
| Mortality rate (male juveniles) | 16% | 16% | 21% | 19% | 18% |
| Mortality rate (female subadults) | 12% | 12% | 15% | 13% | 12% |
| Mortality rate (male subadults) | 13% | 13% | 14% | 15% | 13% |
| Mortality rate (female adults) | 5% | 6% | 5% | 8% | 7% |
| Mortality rate (male adults) | 6% | 7% | 7% | 10% | 6% |
| Offtake rate | 32% | 25% | 29% | 25% | 32% |
| Dressing percentage | 48% | 48% | 48% | 48% | 48% |
| Live weight (female juvenile) | 13 | 13 | 17 | 15 | 15 |
| Live weight (male juvenile) | 14 | 14 | 19 | 18 | 18 |
| Live weight (female subadult) | 18 | 18 | 20 | 22 | 22 |
| Live weight (male subadult) | 25 | 25 | 25 | 23 | 23 |
| Live weight (female adult) | 26 | 26 | 25 | 24 | 24 |
| Live weight (male adult) | 29 | 29 | 30 | 28 | 28 |
| Per cent of forage feed purchased | 0% | 0% | 0% | 0% | 0% |
| Concentrate feed purchased for goats (kg/animal/day) | 0 | 0 | 0 | 0 | 0 |
| Veterinary cost (per year per animal) | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |

Table 69. Production parameters of traditional sheep

| Parameters | Central zone (small) – O1LG | Coastal and Lake zones (small) – O1MR | Highland zone (small) – O1MI |
|---|---|---|---|
| Parturition rate | 1.30 | 1.31 | 1.30 |
| Mortality rate (female juveniles) | 30% | 28% | 28% |
| Mortality rate (male juveniles) | 30% | 28% | 30% |
| Mortality rate (female subadults) | 15% | 16% | 16% |
| Mortality rate (male subadults) | 16% | 14% | 25% |
| Mortality rate (female adults) | 9% | 8% | 11% |
| Mortality rate (male adults) | 11% | 10% | 11% |
| Offtake rate | 26% | 34% | 33% |
| Dressing percentage | 45% | 50% | 45% |
| Live weight (female juvenile) | 15 | 16 | 12 |
| Live weight (male juvenile) | 17 | 18 | 12 |
| Live weight (female subadult) | 20 | 23 | 25 |
| Live weight (male subadult) | 24 | 25 | 20 |
| Live weight (female adult) | 27 | 28 | 34 |
| Live weight (male adult) | 29 | 30 | 29 |
| Per cent of forage feed purchased | 0% | 0% | 0% |
| Concentrate feed purchased for sheep (kg/animal/day) | 0 | 0 | 0 |
| Veterinary cost (per year per animal) | 4,000 | 4,000 | 4,000 |

Table 70. Chicken production average productivity parameters

| | Village chicken (V1OV) | Layers (V1OL) | Broilers (V1OF) |
|---|---|---|---|
| Average number of chicks and hens (for village system) | 2[15] | 1,000 | 1,000 |
| Age of hens at the start of the laying period (months) | 7 | 5 | NA |
| Duration of the laying period (months) | 24 | 12 | NA |
| Adult mortality (% per year) | 10% | 8% | 5% |
| Mortality in livestock production (% of animals that die before marketing) | 50% | 12% | 10% |
| Number of eggs laid: hen/year | 50 | 268 | NA |
| Age of males when sold (months) | 5 | NA | 2.5 |
| Proportion of commercial feed for layers (%) | 0 | 100% | 100% |
| Average live weight of chickens (growers) sold (kg) | 1.1 | 1.5 | 1.9 |
| Average dressing percentage (%) | 65% | 65% | 68% |
| Total income per bird (TZS) | 5,902 | 35,733 | 40,723 |
| Net income per bird or per hen (for village chicken) (TZS) | 4,410 | 4,499 | 5,462 |

[15] A hen has 8 followers (chicks, cockerels, pullets and chooks)

Table 71. Swine production average productivity parameters

| | Village pig small (P1OM) | Village pig medium (P2OM) | Commercial pig (P1OS) |
|---|---|---|---|
| Number of sows (stable state) | 2 | 3 | 8 |
| Parameters of reproduction | | | |
| Age at first service (days) | 300 | 250 | 250 |
| Litter size (live births) per sow | 6 | 10 | 10 |
| Delay weaning-successful service (ISSF) (days) | 30 | 15 | 15 |
| Mortality and culling | | | |
| Mortality rate of young animals before weaning (%) | 20% | 12.0% | 11.0% |
| Mortality rate weaning – marketing | 8% | 5.0% | 4.0% |
| Adult mortality rate | 5% | 3.0% | 3.0% |
| Feeding parameters | | | |
| Proportion of purchased feed included in the ration (%) | 10% | 10% | 80% |
| Production parameters | | | |
| Age at weaning (days) | 60 | 45 | 40 |
| Weight at weaning (kg) | 6 | 10 | 11 |
| Weight at marketing (kg) | 80 | 80 | 200 |

Table 72. Price of livestock products

| Livestock products | Milk (TZS/litre)/ eggs (TZS/egg) | Adult male - live animal (TZS) | Manure (TZS/kg) | Draught power (TZS/pair/day) |
|---|---|---|---|---|
| Cattle | 400–600 | 500,000–800,000 | 200–400 | 23,000 |
| Sheep | NA | 61,000–70,000 | 200–400 | NA |
| Goat | NA | 60,000–90,000 | 200–400 | NA |
| Pig | NA | 15,000–18,000 | 10 | NA |
| Chicken | 300 | 5,000–10,000 | 10 | NA |

### *Annex 2 livestock number and production*

Table 73. Cattle number and production in the different livestock production zones

| Livestock production zones | Cattle number | Meat production (t) | Milk production (*000 litres) | Skins production (t) | Organic matter production (t) | Traction power (*000 days) |
|---|---|---|---|---|---|---|
| Central zone | 13,092,482 | 165,775 | 818,182 | 394 | 130,427 | 16,417.90 |
| Coastal and Lake zone | 11,677,318 | 153,252 | 732,588 | 299 | 1,368,299 | 18,110.70 |
| Highland zone | 3,737,497 | 63,659 | 328,763 | 187 | 14,359,280 | 3,389.80 |
| National | 28,507,297 | 382,686 | 1,879,534 | 880 | 15,858,006 | 37,918.40 |

Table 74. Sheep number and production in the different livestock production zones

| Livestock production zones | Goat number | Meat production (TEC) | Skins production (t) | Organic matter production (t) |
|---|---|---|---|---|
| Central zone | 6,335,659 | 23,824 | 619 | 926,715 |
| Coastal and Lake zone | 7,002,570 | 24,481 | 735 | 716,648 |
| Highland zone | 3,334,557 | 12,805 | 427 | 1,118,029 |
| National | 16,672,786 | 61,109 | 1,780 | 2,761,392 |

Table 75. Goat number and production in the different livestock production zones

| Livestock production zones | Goat number | Meat production (TEC) | Skins production (t) | Organic matter production (t) |
|---|---|---|---|---|
| Central zone | 1,904,597 | 6,017 | 95 | 173,128 |
| Coastal and Lake zone | 2,355,686 | 10,813 | 209 | 177,887 |
| Highland zone | 751,815 | 3,126 | 55 | 188,983 |
| National | 5,012,098 | 19,955 | 358 | 539,998 |

## *Annex 3 Livestock contribution to household income, employment poverty reduction*

Table 76. Livestock-keeping households grouping by income dominance

| Livestock main farming system | National | Central | Coastal and Lake | Highland | Other (SP) |
|---|---|---|---|---|---|
| Cattle | 1,484,569 **(33%)** | 507,914 **(53%)** | 526,114 **(23%)** | 450,643 **(37%)** | 53625 |
| Sheep | 24,195 **(1%)** | 9,193 **(1%)** | 12,427 **(1%)** | 2,575 **(0.2%)** | |
| Goats | 440,363**(10%)** | 75,842 **(8%)** | 269,257 **(12%)** | 95,264 **(8%)** | |
| Subtotal ruminants households | 1,949,126 | 592,949 | 807,799 | 548,482 | 53,625 |
| Poultry | 2,400,034 **(53%)** | 374,611**(38%)** | 1,427,063 **(61%)** | 563,860 **(46%)** | 34,500 |
| Swine | 180,300 **(4%)** | 18,386**(2%)** | 60,065 **(3%)** | 100,413 **(8.3%)** | 1436 |
| Total livestock-keeping households | 4,529,460 | 985,946**(21.8)** | 2,294,927**(50.6%)** | 1,212,755 **(26.8%)** | 89,561 |

Table 77. Employment generated by livestock production per household (person/month/year) at production stage

| Livestock farming system | Central | Coastal and Lake | Highland | |
|---|---|---|---|---|
| Cattle | | | | |
| | Small | 14.83 | 11.70 | 9.54 |
| | Medium | 38.60 | 24.58 | 68.85 |
| | | | | |
| Goats | | | | |
| | Small | 2.50 | 0.02 | 2.12 |
| Poultry | | | 18.75 | |
| | Small | | 0.57 | 1.39 |
| Swine | | | 1.12 | |
| | Small | | 2.09 | 5.98 |
| | Medium | 5.71 | 61.10 | 16.42 |

Table 78. Poverty incidence and depth by main livestock farming system

| Main farming system | Central | | | Coastal and Lake | | | Highland | |
|---|---|---|---|---|---|---|---|---|
| Cattle | Incidence | Depth | | Incidence | Depth | | Incidence | Depth |
| Small | 85% | 46% | | 77% | 8% | | 79% | 0.35 |
| Medium | 33% | 9% | | 13% | 0% | | 50% | 0.04 |
| | | | | | | | | |
| Sheep | | | | | | | | |
| Small | 100% | 85% | | 94% | 8% | | 100% | 0.86 |
| | | | | | | | | |
| Goats | | | | | | | | |
| Small | 94% | 69% | | 91% | 12% | | 85% | 0.56 |
| Medium | 100% | 4% | | | | | | |
| | | | | | | | | |
| Poultry | | | | | | | | |
| Small | 100% | 91% | | 90% | 5% | | | |

## *Annex 4. Strength, weaknesses, opportunities and threats (SWOT) analysis for Value Chain*

Table 81. Strength, weaknesses, opportunities and threats (SWOT) analysis for Value Chain

| | |
|---|---|
| - **Poultry (local, broilers, layers) and eggs value chain** | |
| - **Strengths** | - **Weaknesses** |
| - Establishment of local associations<br>- Good management (well-designed and successful marketing strategies)<br>- Skilled labours (have qualified staff for handling sales with strong knowledge of current products)<br>- Selling products directly to customers<br>- Keeping costs below those of competitors<br>- Higher responsiveness to customer demands<br>- Strong customer relationships<br>- Strong internal communications system<br>- A strong geographical location | - Poor housing conditions<br>- Poor organization of poultry keepers<br>- Limited operating capital<br>- Poor organization of poultry traders |
| - **Opportunities** | - **Threats** |
| - Short production cycle per year<br>- Availability of cereals grains for making low-cost feed rations locally<br>- Availability of poultry house building materials locally<br>- Favourable investment policy for establishment of processing activities in the country<br>- High preference of white meat over red meat especially among high-income consumers<br>- High demand for poultry meat in consumption away from home outlet<br>- Availability of technology | - Inadequate parent stock, low capacity of hatcheries and supply of day-old chicks (DOC)<br>- Low growth rate and productivity of local poultry breeds<br>- Poor quality poultry feed<br>- Inadequate advisory services especially for local poultry keepers<br>- High prevalence of poultry diseases<br>- Inadequate processing facilities for poultry<br>- Preference for live birds to processed chicken<br>- Limited and unreliable supply of poultry especially local chicken<br>- High mortality rate of birds during transportation due to poor transportation facilities<br>- Lack of clear policies on poultry trade<br>- Lack of business and management skills among poultry product retailers<br>- Multiple taxes<br>- Poor market information system |
| - **Pigs value chain** | |
| - **Strengths** | - **Weaknesses** |
| - Establishment of local associations<br>- Good management (well-designed and successful marketing strategies)<br>- Skilled labours (have qualified staff for handling sales with strong knowledge of current products)<br>- Appropriate technology (business reputation of being innovative)<br>- Selling products directly to the customers<br>- Keeping costs below those of competitors<br>- Higher responsiveness to customer demands<br>- Strong customer relationships<br>- Strong internal communications system<br>- A strong geographical location | - Poor breeding practices<br>- Low pig productivity (yield) due to dependence on traditional pig breeds<br>- Lack of knowledge in appropriate pig husbandry practices<br>- Conflicts with neighbours with religious/cultural beliefs against pig meat |
| - **Opportunities** | - **Threats** |
| - Short gestation period with the possibility of high fecundity rate and short production cycles per year.<br>- Pigs can be fed on wide range of feeds including | - Inadequate supply of improved pig breeds<br>- High disease prevalence<br>- Inadequate advisory services on pig |

| | |
|---|---|
| household food remains<br>- Low investment cost<br>- High demand for pork and pork sausages in tourist hotels which is currently covered by importers<br>- Increase in butcher shops specializing in selling pork<br>- Increase in demand for pork in consumption 'away-from-home' selling outlets. | production husbandry practices<br>- High cost of veterinary services<br>- Absence of formal premises for slaughtering and processing pork<br>- Little or no investment in processing facilities for pork<br>- Poor organization of pig traders<br>- Poor marketing information system<br>- Multiple taxes<br>- Limited access to credit<br>- Lack of clear policies on pig trade<br>- Low demand for pock in areas with large Muslim communities |
| - **Beef value chain** | |
| - **Strengths** | - **Weaknesses** |
| - A large national herd that, which once properly managed and exploited, can be a sustainable source of cattle for processing<br>- Potential for crossbreeding of livestock | - Perception by traditional cattle keepers that livestock are only store of wealth<br>- Failure of cattle keepers to perceive cattle raising as business<br>- Inadequate supply of improved beef cattle breeds<br>- Low traditional cattle productivity (yield) due to dependence on traditional cattle breeds<br>- High disease prevalence<br>- Poor rangeland and pasture management<br>- Inadequate AI services |
| - **Opportunities** | - **Threats** |
| - Abundant rangeland resource base estimated at 50 million hectares able to support up to 20 million livestock units<br>- Abundant water resources consisting of major rivers, lakes and underground water<br>- Diverse and favourable climate and agro-ecological zones, which can support a wide range of livestock species and activities including free ranging<br>- Favourable investment policy<br>- Opportunity for educating pastoralists on productive livestock breeds and livestock-keeping methods<br>- Readily available domestic market for beef and beef products due to high population growth, increased urbanization and high economic growth all of which stimulate higher demands for beef products<br>- High demand for beef and beef products in neighbouring countries<br>- Excellent geographical location, which enhances access to potential export markets<br>- Export guarantee scheme<br>- Opportunity for livestock sellers to formally organize themselves to combat manipulation by traders and distortion of market prices | - Inadequate supply of water for livestock in the rangelands<br>- Insecure land rights for pastoralists<br>- Inadequate livestock education in terms of entrepreneurship<br>- Poor infrastructure and facilities for processing beef<br>- Under-capacity and underutilization of processing plants due to unreliable supply of raw materials such as cattle<br>- Inconsistent power supply and high utility cost<br>- Narrow focus on livestock by-products<br>- Lack of finance for investment in beef processing<br>- Poor marketing infrastructure and facilities<br>- Poor and costly transportation system for live cattle and cattle products<br>- Distorted livestock markets in terms of prices of buying animals<br>- Poor organization of beef traders<br>- Lack of information on local and export markets<br>- Manipulation of auctions by traders<br>- Multiple taxes<br>- High transaction costs<br>- Minimum investments have been directed to value addition, quality and standards so as to attract better prices<br>- Lack of clear policies on livestock trader issues |

| | |
|---|---|
| - **Small ruminants (goats and sheep)** | |
| - **Strengths** | - **Weaknesses** |
| - A large herd of small ruminants, which once properly managed and exploited can be a sustainable source of small ruminants for processing<br>- Potential for crossbreeding of livestock<br>- Rangelands have an abundant resource base | - Low productivity (yield) due to dependence on goat and sheep cattle breeds<br>- High number of small ruminants<br>- Poor rangeland and pasture management<br>- Inadequate supply of water for livestock in the rangelands<br>- Inadequate AI services |
| - **Opportunities** | - **Threats** |
| - Abundant water resource consisting of major rivers, lakes and underground water<br>- Diverse and favourable climate and agro-ecological zones<br>- Opportunity for educating pastoralists on productive small ruminant breeds and methods of raising them<br>- Favourable investment policy for establishment of processing activities in the country<br>- Availability of low-cost labour<br>- High demand for small ruminants' meat in 'away-from-home' outlets<br>- Excellent geographical location, which enhances access to potential export markets<br>- Export guarantee scheme | - Insecure land rights for pastoralists and agro-pastoralists<br>- Inadequate livestock education in terms of entrepreneurship<br>- Poor processing infrastructure and facilities<br>- Under-capacity and underutilization of processing plants due to unreliable supply of raw materials including live animals<br>- Inconsistent power supply and high utility cost<br>- Lack of finance for investment in meat processing<br>- Poor marketing infrastructures and facilities<br>- Poor and costly transport system for lives animals and small ruminants products<br>- Distorted livestock markets in terms of prices of buying animals<br>- Poor organization of small ruminant traders<br>- Poor market information system<br>- Manipulation of auctions by traders<br>- Multiple taxes<br>- Lack of clear policies on small ruminant trade issues |
| **Dairy value chain** | |
| - **Strengths** | - **Weaknesses** |
| - Presence of five government owned livestock multiplication units and two pasture seed farms that sell calf heifers and pasture seeds to farmers at a subsidized price<br>- Presence of eight livestock training institutes to train dairy experts and farmers<br>- Existence of previously government owned dairy plants and farms which have been divested to private sector but are not yet fully utilized | - Poor rangeland and pasture management<br>- Inadequate AI services<br>- High cost of supplementary feeds<br>- High disease prevalence<br>- Poor infrastructure and facilities for milk processing<br>- Low willingness to pay for processed milk products<br>- Inadequate milk collection and few cooling centres |
| - **Opportunities** | - **Threats** |
| - Potential for increasing the dairy herd through crossbreeding traditional cattle with improved breeds<br>- Favourable investment policy for establishment of milk processing activities in the country | - Inadequate supply of improved dairy cattle<br>- High dependence on dual-purpose traditional cattle with low milk yield |

| | |
|---|---|
| - Possibility of producing a wide range of processed dairy products with demand in niche markets like tourist hotels<br>- Increasing demand for processed dairy products due to increasing consumers' willingness to pay more for quality and hygienically processed products<br>- Availability of low cost labour<br>- Increasing consumption of milk resulting from consumer awareness campaigns on the nutritional value of milk | - Inadequate supply of water for livestock in the rangelands<br>- Weak dairy farmer organizations<br>- Under-capacity and underutilization of processing plants due to unreliable supply of milk<br>- Failure to enforce by-laws that require milk to be processed before consumption<br>- Inconsistent power supply and the high utility cost<br>- Unavailability and high cost of packaging materials for milk and milk products<br>- Lack of finance for investment in milk processing<br>- Poor roads and expensive transportation especially in rural areas<br>- Lack of refrigerated milk tankers for transporting milk<br>- High competition with subsidized imported milk and milk products<br>- Low milk consumption per capita (46 litres) |
| **Hides and skins value chain** | |
| - **Strengths** | - **Weaknesses** |
| - Large number of cattle and goats with offtake rate of 10–15 and 28–29, respectively.<br>- Availability of slaughter slabs/houses, abattoirs and butcher shops in rural and urban areas throughout the country.<br>- Favourable investment policy for establishment of hides and skins processing plants in the country.<br>- Levy on imported raw hides and skins (90%) and 10% on semi-processed (wet blue) imposed by government to promote local processing. | - Disease that lower the quality of skins such as lump skins disease<br>- Limited knowledge on proper husbandry for quality hides and skins production<br>- Livestock management practices such as poor branding, scratches etc. destroy quality of hides and skins.<br>- Poor storage facility for hides and skins<br>- Low quality of hides and skins due to improper slaughtering and storage. |
| - **Opportunities** | - **Threats** |
| - Increase demand for leather products especially shoes due to increasing middle class<br>- Presence of processing plants that are operating below capacity.<br>- Government support through Five Year Development Plan (FYDP II) (2016/17 – 2020/21) focusing on promoting industrialization to nurture an industrial economy. | - Outdated technology used by processors limiting their ability to produce quality products that meet consumer demand and preferences.<br>- Smuggling of raw hides and skins to neighbour countries limit availability of raw material for local processors.<br>- Fluctuation of international market prices especially for semi-processed hides and skins.<br>- High cost of imported raw materials used in hides and skins production.<br>- High cost of credit. |

## *Annex 5* Per capita livestock consumption, trends in GDP and human population growth, expenditure and own price elasticities

Table 82. Annual per capita livestock consumption by place of residence and nationally in Tanzania 2011/12

| Livestock product | Urban | | | Rural | | | All | | |
|---|---|---|---|---|---|---|---|---|---|
| | HBS | LSMS | Mean | HBS | LSMS | Mean | HBS | LSMS | Mean |
| Beef | 9.6 | 11.1 | 10.35 | 4.38 | 4.44 | 4.41 | 6.09 | 6.53 | 6.31 |
| Goat meat | 0.18 | 0.81 | 0.495 | 1 | 2.56 | 1.78 | 0.73 | 2.01 | 1.37 |
| Mutton | 0.001 | -- | -- | 0.002 | -- | -- | 0.002 | -- | |
| Pork | 0.33 | 0.53 | 0.43 | 0.5 | 0.55 | 0.525 | 0.44 | 0.55 | 0.495 |
| Chicken meat | 1.21 | 4.37 | 2.79 | 1.31 | 3.31 | 2.31 | 1.28 | 3.64 | 2.46 |
| Milk | 6.55 | 15.71 | 11.13 | 14.9 | 19.82 | 17.36 | 11.58 | 18.53 | 15.055 |
| Eggs | 0.42 | 1.33 | 0.875 | 0.12 | 0.64 | 0.38 | 0.22 | 0.86 | 0.54 |

Source: LSA calculations, based on HBS data (2011–12) and LSMS (2011–12), National Bureau of Statistics of Tanzania.

Note: $^{***}$ $^{**}$ and $^{*}$ indicate statistically significant difference between the urban and rural households at 1%, 5% and 10%, respectively. Note also that the expenditure data is real deflated using the Fisher Index.

Table 83. Trends in annual GDP growth rates for Tanzania 2005–2015

| Year | Annual GDP in Million US dollar (at constant 2006 market prices) | Annual growth rate for GDP at constant 2003 market prices |
|---|---|---|
| 2005 | 627,367 | 3.4% |
| 2006 | 638,787 | 1.8% |
| 2007 | 674,551 | 5.4% |
| 2008 | 693,771 | 2.8% |
| 2009 | 712,766 | 2.7% |
| 2010 | 739,531 | 3.7% |
| 2011 | 778,920 | 5.2% |
| 2012 | 799,851 | 2.6% |
| 2013 | 841,123 | 5.0% |
| 2014 | 882,066 | 4.7% |
| 2015 | 925,027 | 4.7% |
| Average Annual Growth Rate (%) | | 3.8% |

**Source:** The growth rates are computed based NBS GDP estimates for 2005 to 2015.

Table 84. QUAIDS estimates of marginal expenditure share, expenditure elasticities and own-price elasticities for livestock products by place of residence and nationally in Tanzania

| Livestock products | Marginal expenditure share (%) | Expenditure elasticity of demand (%) | Own-price elasticity of demand | | |
|---|---|---|---|---|---|
| | | | Uncompensated | Compensated | Income effect |
| Urban | | | | | |
| *Beef* | 7.37 | 1.929 | -1.593 | -1.593 | 0.000 |
| *Goat meat* | 0.49 | 0.937 | -0.782 | -0.713 | -0.069 |
| *Chicken meat* | 1.06 | 1.010 | -0.684 | -0.719 | 0.035 |

| Livestock products | Marginal expenditure share (%) | Expenditure elasticity of demand (%) | Own-price elasticity of demand | | |
|---|---|---|---|---|---|
| | | | Uncompensated | Compensated | Income effect |
| *Pork* | 0.38 | 0.862 | -0.960 | -0.095 | -0.865 |
| *Milk* | 2.04 | 3.376 | -0.554 | -0.514 | -0.04 |
| *Eggs* | 0.31 | 1.497 | -1.052 | -1.021 | -0.031 |
| *Other food* | 88.35 | 0.906 | -0.948 | -0.151 | -0.797 |
| Rural | | | | | |
| *Beef* | 6.73 | 2.614 | -2.012 | -2.012 | 0.000 |
| *Goat meat* | 0.60 | 0.953 | -0.833 | -0.754 | -0.079 |
| *Chicken meat* | 1.19 | 0.996 | -0.748 | -0.718 | -0.030 |
| *Pork* | 0.43 | 0.847 | -0.953 | -0.099 | -0.854 |
| *Milk* | 2.10 | 2.996 | -0.612 | -0.562 | -0.050 |
| *Eggs* | 0.22 | 1.597 | -1.061 | -1.014 | -0.047 |
| *Other food* | 88.72 | 0.908 | -0.949 | -0.124 | -0.825 |
| All | | | | | |
| *Beef* | 6.93 | 2.314 | -1.828 | -1.828 | 0.000 |
| *Goat meat* | 0.57 | 0.952 | -0.828 | -0.747 | -0.081 |
| *Chicken meat* | 1.15 | 1.000 | -0.729 | -0.718 | -0.011 |
| *Pork* | 0.41 | 0.851 | -0.955 | -0.098 | -0.857 |
| *Milk* | 2.08 | 3.102 | -0.596 | -0.549 | -0.047 |
| *Eggs* | 0.25 | 1.542 | -1.056 | -1.018 | -0.038 |
| *Other food* | 88.60 | 0.908 | -0.949 | -0.133 | -0.816 |

Source: LSA calculations, based on HBS data for 2011–12, National Bureau of Statistics of Tanzania.

Table 85. Projected total population size (in millions) in Tanzania (2016–31) used in obtaining the projected total consumption figures for different livestock products

| Year | Urban population | Rural population | Total population ($POP_t$) | Rate of urbanization (%) |
|---|---|---|---|---|
| 2016 | 15.7 | 32.9 | 48.7 | 32.3 |
| 2017 | 16.5 | 33.5 | 50.0 | 33.0 |
| 2018 | 17.3 | 34.0 | 51.3 | 33.7 |
| 2019 | 18.1 | 34.6 | 52.7 | 34.4 |
| 2020 | 19.0 | 35.1 | 54.1 | 35.1 |
| 2021 | 19.9 | 35.7 | 55.6 | 35.8 |
| 2022 | 20.9 | 36.2 | 57.1 | 36.5 |
| 2023 | 21.8 | 36.8 | 58.6 | 37.2 |
| 2024 | 22.8 | 37.4 | 60.2 | 37.9 |
| 2025 | 23.9 | 38.0 | 61.9 | 38.6 |
| 2026 | 24.9 | 38.6 | 63.5 | 39.3 |
| 2027 | 26.1 | 39.2 | 65.2 | 39.9 |
| 2028 | 27.2 | 39.8 | 67.0 | 40.6 |
| 2029 | 28.4 | 40.4 | 68.8 | 41.3 |
| 2030 | 29.6 | 41.0 | 70.7 | 41.9 |
| 2031 | 30.9 | 41.7 | 72.6 | 42.5 |

Source: Adapted from NBS (2010) population projections for Tanzania (2016–2031).

## *Annex 6: Summary of scores for different Impacts of livestock diseases (by species)*

Table 86. Cattle priority diseases

| **Disease impacts** | **CBPP** | **RVF** | **FMD** | **ECF/VPDs** | **BRUC.** |
|---|---|---|---|---|---|
| Impact on household assets | 7.93 | 7.20 | 5.72 | 6.43 | 6.27 |
| Impact on markets and value chains | 0.95 | 0.82 | 1.08 | 0.41 | 0.99 |
| Impact on intensifications | 3.35 | 3.5 | 3.76 | 3.06 | 3.12 |
| **TOTAL** | **12.23** | **11.52** | **10.56** | **9.9** | **10.38** |

Table 87. Goat and sheep priority diseases

| **Disease impacts** | **RVF** | **CCPP** | **PPR** | **ORF Disease** | **Caprine./bovine Brucellosis** |
|---|---|---|---|---|---|
| Impact on household assets | 7.90 | 7.8 | 6.0 | 5.9 | 7.1 |
| Impact on markets and value chains | 0.14 | 0.07 | 0.14 | 0.07 | 0.17 |
| Impact on intensifications | 6.90 | 7.4 | 7.8 | 5.8 | 6.70 |
| **TOTAL** | **14.94** | **15.27** | **13.94** | **11.77** | **13.97** |

Table 88. Pig/swine priority diseases

| **Disease impacts** | **ASF** | **Porcine helminthosis** | **Erysipelas** | **Transmissible Gast. Enteritis** | **Brucellosis** |
|---|---|---|---|---|---|
| Impact on household Assets | 11.45 | 5.56 | 8.16 | 10.11 | 6.46 |
| Impact on markets and value chains | 0.29 | 0.14 | 0.23 | 0.19 | 0.27 |
| Impact on intensifications | 4.36 | 2.90 | 3.21 | 3.88 | 3.24 |
| **TOTAL** | **16.10** | **8.6** | **11.60** | **14.18** | **9.97** |

Table 89. Poultry (chicken) priority diseases

| **Disease impacts** | **ND** | **Coccidiosis** | **Salmonellosis** | **IBD** | **Fowl Pox** |
|---|---|---|---|---|---|
| Impact on household assets | 10.28 | 5.76 | 8.57 | 7.97 | 7.99 |
| Impact on markets and value chains | 1.87 | 1.20 | 2.14 | 1.61 | 1.42 |
| Impact on intensifications | 3.49 | 2.67 | 4.00 | 2.88 | 3.24 |
| **TOTAL** | **15.64** | **9.63** | **14.71** | **12.46** | **12.65** |

## *Annex 7* Livestock breeds in Tanzania and their performance parameters

Table 90. Summary of inventory and parameters based on species and breeds

| Species | Breed | Total population | Parameters | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Parturition rate* | Prolificacy rates** | Mortality rates | Weight adult | Dressing % | Milk yield | LL |
| Cattle | | | | | | | | | |
| Local | TSZ | 24,014,360 | 61% | 1 | 2%-20% | 260–380 kg | 51–53% | 270–1,200 | 250 |
| | Sanga | 1,062,440 | | | | | | | |
| | Mpwapwa | 800 | | | | | | | |
| | Boran | 103,200 | | | | | | | |
| Exotics | Ayrshire | 61,920 | 67% | 1 | 2%-10% | 350–400 kg | | 1,55–2,200 | 305 |
| | Friesian | 133,840 | | | | | | | |
| | Jersey | 9,536 | | | | | | | |
| | Sahiwal | 2,384 | | | | | | | |
| | Crossbreds | 411,500 | | | | | | | |
| | **TOTAL** | **25,799,980** | | | | | | | |
| Sheep | | | | | | | | | |
| Local | EBh | 1,979,952 | 1.5 | 1.2 | 2–7% | 38–40 kg | 45–47% | NA | NA |
| | TLt | 5,182,627 | | | | | | | |
| | Red Maasai | 1,522,182 | | | | | | | |
| Exotics | BHP | 15,239 | 1.6 | 1.1 | 2–6% | 47–50 kg | 50% | | |
| | **TOTAL** | **8,700,000** | | | | | | | |
| Goats | | | | | | | | | |
| Local | SEA | 16,196,201 | 1.5 | 1.3 | 2–20% | 38–65 kg | 48% | NA | NA |
| | Malya | 1,984 | | 1.5 | | | 50% | 90 | 180 |
| Exotics | Anglo-Nubian | 672 | | 1.5 | 2–12% | 49–70 kg | 50% | 500 | 187 |
| | Boer | 1,680 | | | | | 53% | | |
| | Norwegian | 1,903 | | | | | 50 | | |
| | Saanen | 1,680 | | | | | | | |
| | Toggenburg | 3,359 | | | | | | | |
| | Crossbreds | 492,521 | | | | | | | |
| | **TOTAL** | **16,700,000** | | | | | | | |
| Pigs | | | | | | | | | |
| Local | LTz | 475,000 | 2 | 6 | 2–30% | 55–60 kg | 60% | | |
| Exotics | Hampshire | 19,000 | | 8–10 | 2–15% | 72–90 kg | 70% | NA | NA |
| | Landrace | 95,000 | | | | | | NA | NA |
| | Large White | 133,000 | | | | | | | |
| | Saddleback | 38,000 | | | | | | | |
| | Crossbreds | 1,140,000 | | | | | | | |
| | **TOTAL** | **1,900,000** | | | | | | | |
| Poultry | | | | | | | | | |
| Local | Local | 42,000,000 | Not established | Not established | 8 - 40% | 1.2–1.5 kg | 80% | NA | NA |
| Exotics | Layers | 12,000,000 | | | 2–5% | 1.2–1.6 kg | 85.5% | NA | NA |
| | Broilers | 22,500,000 | | | | | | | |
| | **TOTAL** | **76,500,000** | | | | | | | |
| | | | | | | | | | |

Table 91. Ex-situ in-vivo conservation, breeding and selection programs

| Species | S/No | Breed-type/breed | Conservation area | Total number (estimation) |
|---|---|---|---|---|
| Cattle | 1 | Mpwapwa | TALIRI-Mpwapwa | 450 |
| | 2 | Fipa | TALIRI-Mpwapwa and Uyole | 300 |
| | 3 | Ankole | TALIRI-Mabuki | 380 |
| Goats | 1 | Pare white | TALIRI-West Kilimanjaro | 250 |
| | 2 | Sonjo | TALIRI-West Kilimanjaro | 200 |
| | 3 | Malya (blended goats) | TALIRI-Kongwa | 400 |
| | 4 | Boers | Ngerengere farm | 250 |
| Sheep | 1 | Red Maasai | TALIRI-West Kilimanjaro | 300 |
| Chickens | 1 | Kuchi | TALIRI-Mpwapwa | 140 |
| | 2 | Horas | TALIRI-Mpwapwa | 180 |
| | 3 | Kishingo | TALIRI-Mpwapwa | 120 |
| | 4 | Kinyavu | TALIRI-Mpwapwa | 100 |
| | 5 | Kawaida | TALIRI-Mpwapwa | 100 |

## *Annex 8* Changes in livestock technical performance parameters with additional policy and technology investments

Table 92. Changes in technical parameters for goats

| Production and productivity parameters | Central, Coastal and Lake (small and medium size) | | Highland (small size) | |
|---|---|---|---|---|
| | Current situation (2015) | With additional investment 2031) | Current situation (2015) | With additional investment (2031) |
| Parturition rate | 1.3 | 1.4 | 1.3 | 1.5 |
| Mortality rate (juveniles) | 16.5% | 8.5% | 18% | 9% |
| Mortality rate (subadults) | 12.5% | 6.5% | 12.5% | 6.25% |
| Mortality rate (adult) | 6% | 3% | 6.5% | 3.25% |
| Live weight (female juveniles) (kg) | 13 | 14.3 | 20 | 22 |
| Live weight (male juveniles) (kg) | 14 | 15.4 | 26 | 28 |
| Live weight (female subadult) (kg) | 18 | 19.8 | 24 | 26.4 |
| Live weight (male subadult) (kg) | 25 | 27.5 | 28 | 30.8 |
| Live weight (adult female) (kg) | 26 | 28.66 | 30 | 33 |
| Live weight (adult male) (kg) | 29 | 31.9 | 32 | 35.2 |
| Offtake rate | 32% | 44% | 32% | 49% |

Table 93. Changes in the technical and financial parameters in sheep due to meat production and productivity improvement interventions in Central and Coastal and Lake zones

| | | Central zone sheep small | | Coastal and Lake zone small | | Highland small | |
|---|---|---|---|---|---|---|---|
| Parameters | Sex | Current situation (2015) | With additional investment (2031) | Current situation (2015) | With additional investment (2031) | Current situation (2015) | With additional investment (2031) |
| Parturition rate | Female | 1.30 | 1.31 | 6.9% | 1.4 | 1.30 | 1.4 |
| Mortality rate (Juveniles) | Females | 30% | 28% | 30% | 14% | 28% | 14% |
| | Male | 30% | 28% | 30% | 14% | 30% | 15% |
| Mortality rate (subadults) | Female | 15% | 16% | 15% | 8% | 16% | 8% |
| | Male | 16% | 14% | 15% | 7% | 25% | 12.5% |
| Mortality rate (adult) | Female | 9% | 8% | 8% | 4% | 11% | 5.5% |
| | Male | 11% | 10% | 9% | 5% | 11% | 5.5% |
| Live weight (juvenile) | Female | 15 | 16 | 10% | 17.6 | 12 | 13.2 |
| | Male | 17 | 18 | 10% | 19.8 | 12 | 13.2 |
| Live weight (subadult) | Female | 20 | 23 | 10% | 25.3 | 25 | 27.5 |
| | Male | 24 | 25 | 10% | 27.5 | 20 | 22 |
| Live weight (adult) | Female | 27 | 28 | 10% | 30.8 | 34 | 37.4 |
| | Male | 29 | 30 | 10% | 33 | 29 | 31.9 |
| Offtake rate | | 26% | 34% | 38% | 47% | 33% | 49% |

Table 94. Changes in demographic and reproduction parameters due to dairy interventions investment---by production zone

| Production and productivity parameters | Highland (small size) | | Highland (medium size) | |
|---|---|---|---|---|
| | Current situation (2015) | With additional investment 2031) | Current situation (2015) | With additional investment (2031) |
| Parturition rate | 60% | 70% | 60% | 75% |
| Mortality rate (juveniles) | 18% | 9% | 20% | 8% |
| Mortality rate (subadults) | 6% | 3% | 6% | 2.4% |
| Mortality rate (adult females) | 4% | 2% | 3% | 1.5% |
| Mortality rate (adult males) | 3% | 2% | 4% | 2% |
| Live weight (female juvenile) (kg) | 55 | 66 | 55 | 66 |
| Live weight (male juvenile) (kg) | 70 | 80 | 70 | 80 |
| Live weight (female subadult) (kg) | 130 | 144 | 125 | 139 |
| Live weight (male subadult) (kg) | 150 | 171 | 130 | 148 |
| Live weight (adult female) (kg) | 250 | 270 | 250 | 270 |
| Live weight (adult male) (kg) | 300 | 321 | 300 | 321 |
| Lactation length (days) | 180 | 250 | 180 | 270 |
| Daily milk production in litres | 2 | 8 | 2 | 8 |

Table 95. Changes in demographic and reproduction parameters due to dairy interventions investment in Coastal and Lake zone by size

| **Production and productivity parameters** | **Coastal and Lake small-size herd** | | **Coastal and Lake medium-size herd** | |
|---|---|---|---|---|
| | **Current situation (2015)** | **With additional investment (2031)** | **Current situation (2015)** | **With additional investment (2031)** |
| Parturition rate | 58% | 70% | 0.58 | 0.7 |
| Mortality rate (juveniles) | 20% | 10% | 18% | 7.2% |
| Mortality rate (subadults) | 8% | 4% | 8% | 3.2% |
| Mortality rate (adults) | 6% | 3% | 7% | 3% |
| Live weight (female juvenile) (kg) | 50 | 60 | 50 | 60 |
| Live weight (male juvenile) (kg) | 70 | 80 | 70 | 80 |
| Live weight (female subadult) (kg) | 130 | 145 | 130 | 145 |
| Live weight (male subadult) (kg) | 110 | 125 | 110 | 125 |
| Live weight (adult female) (kg) | 250 | 270 | 250 | 270 |
| Live weight (adult male) (kg) | 280 | 300 | 300 | 300 |
| Lactation length (days) | 180 | 250 | 180 | 270 |
| Daily milk production in litres | 1.5 | 8.0 | 1.5 | 8.0 |

# TANZANIA LIVESTOCK SECTOR ANALYSIS (2016/2017 - 2031/2032)

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