The Gambia livestock master plan

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Experts	Expertise
1. Dr Sulayman Sonko	Livestock Production and Health
2. Mr Joseph Faye	Cattle Breeder
3. Dr Pa Ousman Ceesay	Livestock Production and Health
4. Mr Jerreh Ceesay	Dairy Farmer
5. Dr Duto Sainey Fofana	Livestock Production and Health
6. Mr Ebou Jobe	Livestock Production
7. Dr Famara Sanyang	Livestock Production and Health

8. Ms Isatou Savage	Livestock Production
9. Mr Ebrima Jallow	Sheep Breeder/Farmer
10. Mr Nerry Corr	Small Ruminant Production and Health
11. Mr Basirou Jatta	Poultry Expert
12. Mr Ousman Sanyang	Poultry Expert
13. Mr Momodou Mass Jobe	Poultry Expert/Farmer
14. Mrs Tida Ceesay Bojang	Poultry Farmer
15. SRPEP staff members	Project experts

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Sirak Bahta, PhD

Senior agricultural economist

Project leader, The Gambia Livestock Master Plan (G-LMP)

International Livestock Research Institute (ILRI)

Foreword

The Gambia is a country in the far west of Africa surrounded by Senegal in all direction except the west which is bordered by the Atlantic Ocean. The country is considered the smallest in mainland Africa with a land size of 10,689 square kilometres. The country population is around two and a half million with a gross domestic product (GDP) of USD 2.08 billion and GDP per capita of USD 835.6.

The economy of the country relies on agricultural activities (fishing as well as crop and livestock farming besides the service and industry sectors. The sector is significantly vulnerable to tropical and Sahelian climate which is characterized by a dry season from November to April/May and rainy season from May/June to October, with heavy rains experienced between June and October. In the last decade, the contribution of the agriculture sector to the country's GDP has declined significantly since the sector contributed to nearly twenty percent of the Gambia GDP in 2020 compared to more than one-third (35.2%) contribution in 2010.

The Gambia Agriculture Investment Plan (GNAIP) II constitutes the main investment - framework for agricultural development -in- The Gambia in the medium term (2019-2026). GNAIP II was formulated through a participatory process with stakeholders from the public and private sectors including farmer organizations. The Vision articulated for agriculture under the medium term NDP is: "a modern, sustainable and market-oriented agriculture and livestock sector for increased food and nutrition security, income and employment generation, poverty reduction and economic transformation". GNAIP II aims to increase food and nutrition security at household level including for vulnerable households through increased ANR productivity based on sustainable use and management of natural resources in support of national goals of poverty reduction and improved livelihood' .

In recent past, the Agriculture and Natural Resource (ANR) sector's performance has been mixed primarily characterized by undulating production and productivity of its enterprises with peaks denoting high outputs while troughs present low outcomes. Reasons advanced for the low outputs of the ANR sector include: short duration, unevenly distributed and erratic rainfall induced by severe climate changes; low access and utilization of essential inputs,

mechanization, machinery accessories/attachments and fishing gears; costly fuel prices, untimely availability and affordability of agro-chemicals, veterinary drugs and vaccines; low adoption of good agricultural practices (GAPs); little or no value addition of ANR produce; high post-harvest losses, inadequate storage facilities (including cold storage), limited access to markets and marketing opportunities (conditions/facilities) ; unavailability and limited affordability of relatively cheaper credit; limited access and use of genetically improved crop varieties, livestock breeds, forest seedlings, fishery species and disincentive producer price support.

Livestock as part of the farming systems is a means to accumulate assets, earn cash income, and provide draught power as well as manure for crops, and a source of food and nutrition security. The livestock species kept in The Gambia are cattle, sheep and goats (small ruminants), chickens, pigs, horses and donkeys. The key livestock commodities produced are meat (beef, mutton, goat meat and pork), milk and eggs.

The livestock subsector contributes 40% of the agricultural GDP and employs the largest number of people in the agricultural subsector after the crop subsector. The cattle, small ruminants (sheep and goat), equines (donkeys and horses) and pigs are livestock species kept by the Gambian livestock producers. Poultry production and beekeeping are also widely practiced. Overall, the livestock sector in the Gambia is constrained by the widespread animal diseases, shortage of animal feed particularly during the dry season, poor production capabilities of the local breeds due to low genetic performance of the indigenous breeds (Ndama cattle, Djallonke sheep, and West African Dwarf goat breeds), poor infrastructure, low -access to the extension/breeding (including AI) and veterinary services, poor livestock research and innovation capacities, lack of access to affordable and reliable financing schemes, and weak capacity of the relevant sector institutions.

The analysis of the performance of the agricultural sector and changes in the food and nutrition situation of the country revealed that yields for key crops such as rice, coarse grains and groundnuts remain low; livestock population growth has also been fluctuating due to disease outbreaks and climate change.

Between 2010 and 2015 the cattle population grew by 17.2% or3.4% annually. Cattle meat production increased from 4,080 Mt. in 2010 to 4,520 Mt. in 2015, an increase of 10.8% or a growth rate of 2.2% per year. During the same period milk production increased from 70,586

to 80,712 Mt., a percentage growth rate of 2.9. The annual growth rates registered for meat and milk are less than the annual population growth rate of 3.4% indicating a decline in productivity by 1.2 and 0.5% for meat and milk, respectively.

This Livestock Master Plan will help the Government of The Gambia to modernize the livestock subsector so that it achieves the aims and objectives of livestock farmers and make sustainable contributions to the government's development objectives as enshrine in its National Development Plan (NDP).

I wish to thank the Islamic Development Bank (IsDB) for its support and being a reliable development partner to the Gambia for many decades.

Dr. Demba Sabally

Honorable Minister of Agriculture Banjul, The Gambia

Foreword

In the Gambia the livestock subsector contributes to forty percent of the agricultural GDP and employs the largest number of people in the agricultural subsectors after the crop subsector.

Overall, the livestock farming is the backbone of the rural communities' food security and nutrition and act as a source of income, employment, livelihoods, and asset saving for the involved smallholder producers and households.

The Gambia Livestock Master Plan will guide the government's objectives for the livestock sector to reduce poverty, increase economic growth, and improve food and nutrition security as enshrine in the National Development Plan (NDP).

I wish to thank the Islamic Development Bank (IsDB) and ILRI for supporting the and developing the Gambia Livestock Master Plan.

Mamud Njie

Project Director

Small Ruminant Production Enhancement Project (SRPEP)

Foreword

Agriculture is a vital sector of the Gambian economy with an estimated 70 % of the country's labour force depending on the sector for their livelihood. The livestock sector in the Gambia contributes about 14 % of the agricultural gross domestic product (GDP) and 3 % of the overall GDP. In 2019, the agriculture sector contributed about 22 % to the country's GDP and about 32 % of the labour force is involved in active primary agricultural production, according to the Gambia national statistics.

The performance of the agricultural and livestock sectors play a key role in poverty reduction and enhanced food security in the Gambia. The livestock sector in particular plays an important role in creating livelihood opportunities and income generation for immediate use and savings among the rural inhabitants. Despite the importance of he livestock sector, it is faced with some challenges such as lack of access to feed, fodder and water, disease outbreaks, limited veterinary services, low level of market linkages and lack of improved germplasm which hinder the desired sector progress.

To prioritize and target support for the livestock sector as an essential element of agriculture, the Government of the Gambia, through the Islamic Development Bank (IsDB), requested the International Livestock Research Institute (ILRI) to provide technical assistance in developing a comprehensive Livestock Master Plan (LMP). The LMP includes a thorough and systematic analysis of the Gambia livestock sector (LSA), a Livestock Sector Strategy (LSS), and a value chain-specific investment roadmap. The investment roadmap is a detailed 5-year livestock sector investment plan meant to help increase and better target public and private investments. The LMP enables more substantial and better-targeted livestock sector investments from finance ministries, development partners and private sector investors.

The Gambia LMP focuses on three key livestock value chains – cattle, small ruminants and poultry and then highlights the major interventions which could help achieve the country's future objectives and targets. Some of the key interventions proposed include more engagement of the private sector to spur increased investment in the feed and animal health industries as well as in addressing the existing market gaps. I believe that the proposals provided in the LMP will inform decisions made on investments for the livestock sector to improve the performance, increase farmers sources of income and subsequently, lead to improved livelihoods through livestock.

ILRI has for the past decade been helping nations to develop roadmaps for their livestock sectors upon request in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the French Agricultural Research Centre for International Development (CIRAD). We wish to thank the Government of the Gambia and the Islamic Development Bank for entrusting us with this task and to our partners we are grateful for collaborating with us, towards the completion of this policy document.

ILRI DG **(a.i.)**

Shirley Tarawali

ILRI

1 Introduction

Agriculture is one of the vital sectors of the Gambian economy and contributes between 25% and 30% to the GDP of the Gambia and employs about 70% of the labour force (GNAIP, 2019), and about 32% of the labour force is in active primary agricultural production which involves the production of raw produce (FAO, 2018).

The agriculture sector whose contribution has been declining since 2013, contributed about 21.7% to the country's GDP in 2019 (The Gambia Bureau of Statistics, 2022). The performance of the agricultural sector has key implications for poverty reduction and food security (FAO, ICRISAT and CIAT, 2018) because approximately 40% of the population lives in rural areas, where 73.9% live below the poverty line (IFAD, 2022). Despite the importance of agriculture to most of the population, the sector has continued to underperform compared to the other sectors of the economy, particularly the services sector. According to IFAD (2019), the underlying reasons for the low performance of the agricultural sector are, among others, little diversification, the subsistence nature of agricultural production, the over-reliance on rainfed production, the low productivity due to the over-reliance on traditional systems of production and the existence of many small independent farming units. Most of these farmers also lack the requisite knowledge, skills, and access to productive resources such as credit, land ownership, and support services to enhance their production (IFAD, 2022). The sector's exposure to these shocks has necessitated significant food imports with the scarce foreign exchange available to meet rising food demand.

The livestock sub-sector remains a predominant sub-sector in the livelihood of the population of the Gambia, with cattle and chicken as the most reared species in the country. The livestock population in 2020 was estimated at 285 thousand cattle, 177 thousand sheep, 378 thousand goats, and 982 thousand chickens (The Gambia Bureau of Statistics, 2022). Official figures indicate that the livestock sub-sector alone contributed 13.8% to the agricultural GDP and 2.6% to the overall GDP of The Gambia in 2019 (The Gambia Bureau of Statistics, 2022). The contribution of livestock has been declining annually in absolute and relative terms, mainly due to the traditional production systems used and the fact that the sector's huge potential remains under-exploited (The Gambia Bureau of Statistics, 2022). The livestock sector is characterized by low productivity per animal, the presence of disease vectors and inadequate access to inputs, such as feed, veterinary and extension services, which have all contributed

to the underperformance of the sub-sector and the inability to meet the growing demand for animal-sourced foods (Olaniyan, 2017).

To boost the livestock sector, the Government of the Gambia, as a matter of policy, has prioritized livestock production in its development agenda. The purpose is to facilitate the process of commercializing and modernizing the livestock sector; strengthen selected institutions to deliver needed services; support the livestock subsector for increased production; and diversify the livestock production base (Touray, 2016). The Gambia Small Ruminant Production Enhancement Project (SRPEP) for example, aims to improve the livelihoods of livestock-producing households by improving the productivity of local breeds through better feeding and husbandry practices, fostering greater access to veterinary services and production infrastructure, supporting production and marketing management, enhancing innovations in product/processing techniques, and facilitating access to Islamic finance through a revolving fund.

This Livestock Master Plan (LMP) is an important component of the Gambia Small Ruminant Production Enhancement Project (SRPEP) and is meant to guide the ongoing project and department of livestock services to enhance the provision of additional public and private investments in the livestock sector and improve livestock contributions to achieving the stated development goals, explained in the National Development Plan (NDP), such as transforming the sector to improve livelihoods, employment (particularly for youth) and national income.

1.1 Livestock Master Plan (LMP) to support the Gambia Livestock sector

To increase the support for the livestock sector, the government of the Gambia developed an LMP. The LMP includes a thorough and systematic analysis of the Gambia livestock sector (LSA), a Livestock Sector Strategy (LSS), and a value-chain-specific investment roadmap. The investment roadmap is a detailed 5-year livestock sector investment plan meant to help increase and better target public and private investments. The purpose of producing an investment roadmap or LMP is to attract more substantial and better targeted livestock sector investments from finance ministries, development partners (DPs) and private sector investors. To help raise public and private investment and allocate more budget to the livestock sector, the Government of the Gambia, through the Islamic Development Bank (IsDB), requested that the International Livestock Research Institute (ILRI) provide technical assistance in developing a comprehensive LMP (Bahta et al., 2022a).

The Gambia livestock master plan (G-LMP) was undertaken by a team of experts from the Gambia Government institutions (Department of livestock services [DLS], veterinary college, district officers) and International Livestock Research Institute (ILRI) livestock and planning experts.

A Technical Advisory Committee (TAC) chaired by the SRPEP project manager reviewed and made recommendations related to ensuring progress in achieving the outputs of the LMP project. Once completed, the commodity value chain investment roadmaps of the LMP were also reviewed by eminent livestock scientists of ILRI and an external reviewer and were found credible and defensible. The roadmap presented here is a series of five-year investment plans or roadmaps for the development of priority livestock value chains, chosen through sector analysis and based on their potential for impacting the development objectives of the Government of the Gambia. Each roadmap includes a specific vision and targets, challenges and opportunities and strategies, and recommended technology and policy investment interventions, with expected outputs, impacts, and outcomes on the state development objectives. The roadmaps include detailed budgets and sequenced activity plans (or Gantt charts). The findings of the livestock sector analysis (LSA), profitability analysis of investing in halal slaughterhouse, and the livestock sector strategy of the Gambia are presented in separate publications.

This livestock master plan (investment roadmap) is organized into six sections. Section one is the Introduction which gives a brief background of the macroeconomic, agricultural and the livestock sectors situation of The Gambia. It also presents the process of the preparation of this The Gambia livestock master plan and the organizations involved. Section two is the Executive Summary which explains why the LMP is needed as a guide to support the livestock sector of The Gambia. The section also presents key highlights of the roadmaps of the three (3) livestock value chains (cattle, small ruminants, and chicken) for The Gambia. Sections three to five present the roadmap for the three value chains for 2023 to 2027. Each section begins with the vision of the value chains and an analysis of investment scenarios for each value chain. The sections also critically analyze each value chain in terms of production systems, opportunities that exist in the value chain, an analysis of interventions to improve each value chain, and their implementation budgets. An analysis of the impact of the interventions, budgets, and an implementation timeline for each value chain (presented in the annex) are

also explained in these sections. Finally, section six presents the contribution of the LMP in terms of its value to the livestock budget planning of the government of The Gambia.

2 Executive summary

2.1 The LMP's Support to the Gambia's Livestock Sector

The livestock sub-sector is a predominant sub-sector in the livelihood of the population of the Gambia, with cattle and chicken as the most reared species in the country. The livestock sector in the Gambia contributed 13.8% of the agricultural gross domestic product and 2.6% of the overall gross domestic product (GDP) in 2019. However, the livestock sector is bedeviled by a plethora of challenges including lack of access to feed, fodder, and water, disease outbreaks, limited veterinary services, low level of market linkages, and lack of improved germplasm. Despite these challenges, there are potential opportunities for growth. The Gambia Small Ruminant Production Enhancement Project (SRPEP) was commissioned to address some of the challenges of the livestock sector, and the livestock master plan (LMP) is one of the project's key deliverables.

The LMP is a five-year plan expected to serve as a blueprint to increase the support for the livestock sector by attracting more investment targeted at the livestock sector from finance ministries, development partners, and the private sector. The roadmaps in the LMP highlight the vision, targets, challenges, opportunities, strategies, recommended technology and policy investment, and the expected outcomes in relation to the state development objectives. The Gambia LMP was developed by scientists at the International Livestock Research Institute in collaboration with experts from the Gambia Government Institutions (Department of Livestock Services), and district officers, upon request from the Government of the Gambia through funding from the Islamic Development Bank. The LMP was reviewed by the technical advisory committee chaired by the SRPEP project.

The recommendations of the roadmaps are based on the conclusions from the livestock sector strategy which explored the impact of proposed interventions in response to value chain problems related to animal feed and fodder, breed, diseases, and marketing. Cumulatively, the proposed interventions amount to US$44.2 million, with 75% of the amount coming from public funding and 25% expected from the private sectors. Overall, the interventions aimed at improving animal health account for the largest share (35%) of the total investment budget. This is followed by education, research, and extension services

interventions with 33%, feed and feeding interventions with 14%, interventions for genetic improvement with 10%, and marketing interventions with 8%.

This report highlights the roadmaps for three livestock value chains (consisting of cattle, small ruminants (sheep and goats) and chicken value chains) earmarked for the next five years (from 2022 to 2027). The key highlights discussed in the report cover the main interventions to improve the livestock sector and the projected impact of these interventions.

2.2 Key highlights of the cattle value chain roadmap

The interventions proposed (in collaboration with stakeholders and experts in the Gambia) for the improvement of the cattle value chain in the Gambia address challenges pertaining to feed and fodder, animal health, genetic improvement, education, research and extension services, and marketing investments.

- **Key interventions for improving the cattle value chain**

Policy and legislation interventions: - Four policy and legislation interventions designed to increase the availability of feed for the cattle and small ruminants are: (i) the development of an implementation plan to operationalize the Forest Act 1998 to ensure sustainable exploitation of range resources within designated areas; (ii) the completion of the "comprehensive/systematic monitoring and inventory of the available range resources and carrying capacity of the rangelands" conducted in 1986 by the USAID Funded Mixed Farming and Resource Management Project for the CRR/N, CRR/S, and URR to include all Production Zones, feed, and fodder resources; (iii) the limitation of export of processed feed ingredients; and (iv) allocation of concessional supply for local livestock producers. For the genetic improvement of cattle in the Gambia, the development of a cattle breeding policy within two years, and the development of livestock extension policy guidelines and legal framework within three years have been outlined.

Training and sensitization interventions: The main sensitization and training interventions for feed improvement cover topics on the prevention and control of bushfires, planting of fodder and fodder trees as fences, harvesting green feeds during the wet season and conserving them for use in the dry season. Other sensitization and training topics would be on the regeneration of degraded grazing and range lands via the construction of access/slipways to rivers.

The outlined training and sensitization interventions to improve the health conditions of livestock include the revision of the curriculum to train livestock technicians, training of

laboratory technologists and technicians of the central veterinary lab, building the capacity of trainers, provision of teaching materials and equipment for the Livestock Training School of the Gambia College of Agriculture, and strengthening the monitoring and regulation capacity of the veterinary council and the training staff on disease surveillance and monitoring. Sensitization of farmers on the selection and retention of good breeding bulls and heifers is also planned to support the genetic improvement of cattle in the Gambia. Notable is the planned expansion of the sensitization on the N'Dama breeding program. Also, refresher courses on artificial insemination (AI) for technicians and para-vets together with the provision of requisite equipment and supplies to the trained AI Technicians have been planned for implementation.

Disease control interventions: The interventions outlined to improve the health conditions of cattle in the Gambia include increasing the overall vaccination coverage of Contagious Bovine Pleuropneumonia (CBPP) from 75% to 80% and Hemorrhagic Septicemia (HS), Black Quarter (BQ), and Lumpy Skin Disease (LSD) to 30% within the five years (2022-2027), and full coverage in commercial dairy farms; and increasing anti-parasite treatment to 30% and anthelmintic use to 40% within the five years.

Infrastructural development: The outlined infrastructural investment aimed at improving the health conditions in the cattle value chain in the Gambia include: (i) the establishment and provision of equipment for 53 new veterinary stations and improving the infrastructural conditions of six veterinary laboratories; (ii) the construction of 70 boreholes and the development of 40 low-lying areas are planned to ensure access to water for forage and feed production; (iii) the establishment and strengthening of Regional Diagnostic Laboratories and the Central Veterinary Laboratory for effective disease surveillance and the monitoring of vaccinations against CBPP and other Transboundary animal diseases (TADs); and (iv) the enhancement of cold chain maintenance for proper storage of vaccines, reagents, and laboratory samples collected for confirmatory diagnosis.

For genetic improvement, the construction of one artificial insemination centre in the first year and one liquid nitrogen storage facility within the five years, as well as upgrading the four existing training centres and four demonstration units have been planned for implementation.

For improving the marketing process in the cattle value chain, these infrastructural developments are outlined for implementation within the five years: fencing of holding grounds, provision of watering facilities, slaughter slabs, and cold storage facilities, provision

of market information systems in ten primary markets and two terminal markets, and modernization of the ten existing slaughterhouses.

Provision of government subsidies: For genetic improvement, it is planned that government will subsidize private artificial insemination (AI) service providers and private veterinary experts to establish veterinary pharmacies and input shops. To improve the marketing and processing activities, it is planned that government will provide subsidies to private actors to establish small-scale milk processing plants and modern abattoirs within five years.

- **Projected impacts for implementing interventions**

Results of the impact for the implementation of the outlined interventions include:

- 10.4% increase in the N'dama cattle population (from 289,857 to 320,025 cattle) in five years (2022 – 2027)
- 11.3% increase in the Zebu/Gobra cattle population (from 6,701 to 7,399 cattle) in the next five years (2022 – 2027)
- 38.8% increase in total beef production (from 4,073 MT in the base year to 5,655 MT in 2027) under an investment scenario where the various cattle improvement interventions are implemented
- N'Dama breeds will contribute 97% of the projected increase in total beef production
- 116.7% increase in milk production (from 20,173 thousand litres in 2022 to 43,724 thousand litres in 2027) is projected
- N'Dama breeds will contribute 83.6% of the total milk production
- Manure production and draught power are projected to increase by 11% and 12.2%, respectively from 2022 to 2027.
- The contribution of cattle products to GDP is projected to increase by 4% from GMD 4,182 million in 2022 to GMD 4.347 million in 2027

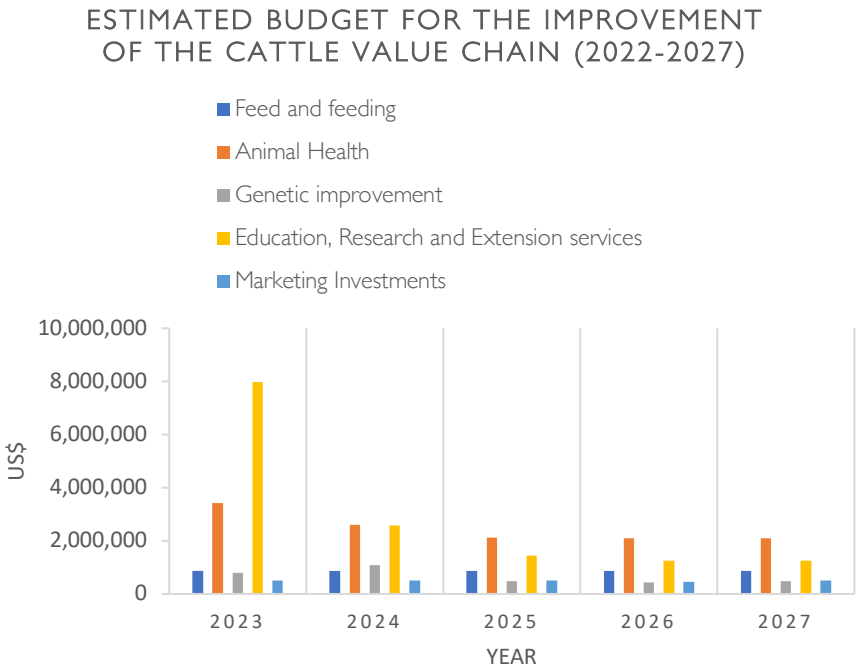
- **Estimated investment cost for improving the cattle value chain**

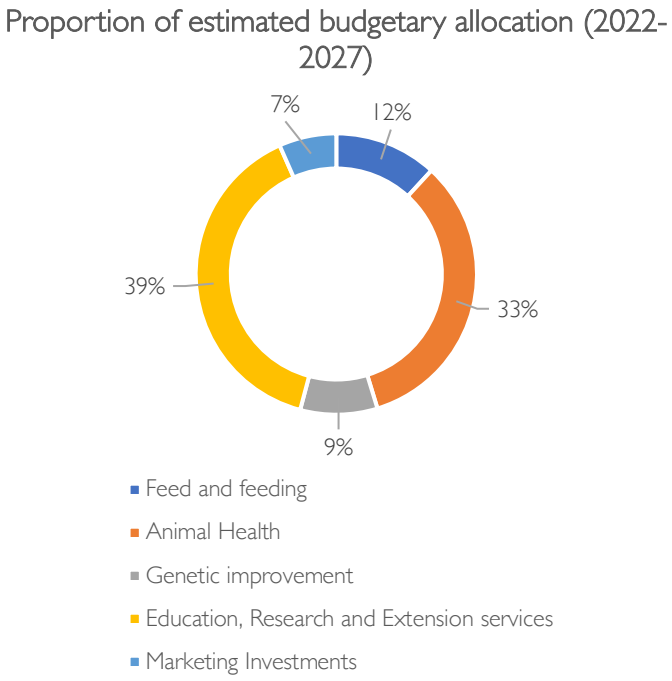
To achieve the projected impacts in the cattle value chain, a total of 36,970,809 million Dalasi is estimated for the interventions outlined to be implemented within the five years (2022-2027). Out of the total investment cost, 15% is expected to come from private and other sources and the remaining 85% from the public funds. Figure 1 presents an overview of the estimated budgetary allocation for interventions proposed to help improve the cattle value chain in the Gambia. The highest estimated budgetary allocation (39%) is planned for interventions that will improve education, research, and extension services in the Gambia.

The remaining estimated budgetary allocations in decreasing order are for animal health (33%), animal feed (12%), genetic improvement (9%), and marketing investment (7%) interventions.

Most of the private-source funds (43%) will be allocated to improve the animal feed interventions. The estimated budgetary allocation for education, research and extension service interventions has the second highest (36%) of privately sourced fundings. Therefore, for within the next five years, the Gambian government can facilitate the enabling environment for investments targeted at to improve the animal feeding, education, research, and extension services.

Figure 1: Estimated budgetary allocation to improve the cattle value chains from 2022 – 2027.





2.3 Key highlights of small ruminant (sheep and goats) value chain roadmap

The feed and health improvement interventions described above for the cattle value chain generally also apply to the small ruminant value chain as well. However, there are

interventions that are specific to the small ruminant value chains for the five-year period (2022-2027). These interventions include:

- **Idiosyncratic interventions for improving the small ruminant value chain**

Policies and legislation intervention: Develop a breeding policy for sheep and goats in the next 3 years to support genetic improvement.

Disease control interventions: Implement a routine mass vaccination (80% vaccination coverage) against peste des petits ruminants (PPR) and pasteurellosis, and routine deworming campaigns (up to 60% of total sheep and goats), and

Provision of government subsidies: Provide matching grants for US$2000 as seed capital for the establishment of private breeding farms and provide a 40% subsidy for commercial farms to implement zero-grazing schemes.

Organizational structure development: Provide resources to strengthen the local breed improvement activities conducted by the West Africa Livestock Innovation Centre (WALIC).

Infrastructural development: Construct adequate marketing facilities at the level of the weekly markets at Sare ngai, Sare Bojo, Brikamaba, Wasu, Jareng, Samitenda, Farafeni, Bureng, Kerr pateh, Ndugukebbeh, Fass Njaga Choi, Panchang with fencing livestock holding ground, watering facilities, sheds, toilets and loading rams. Also, the construction of two more terminal markets in the coming five years is an infrastructural development intervention targeted at improving the marketing and processing in the small ruminant value chain.

- **Projected impacts for implementing interventions**

Results of the LMP analysis indicate the following impact after implementing the interventions for the small ruminant value chains:

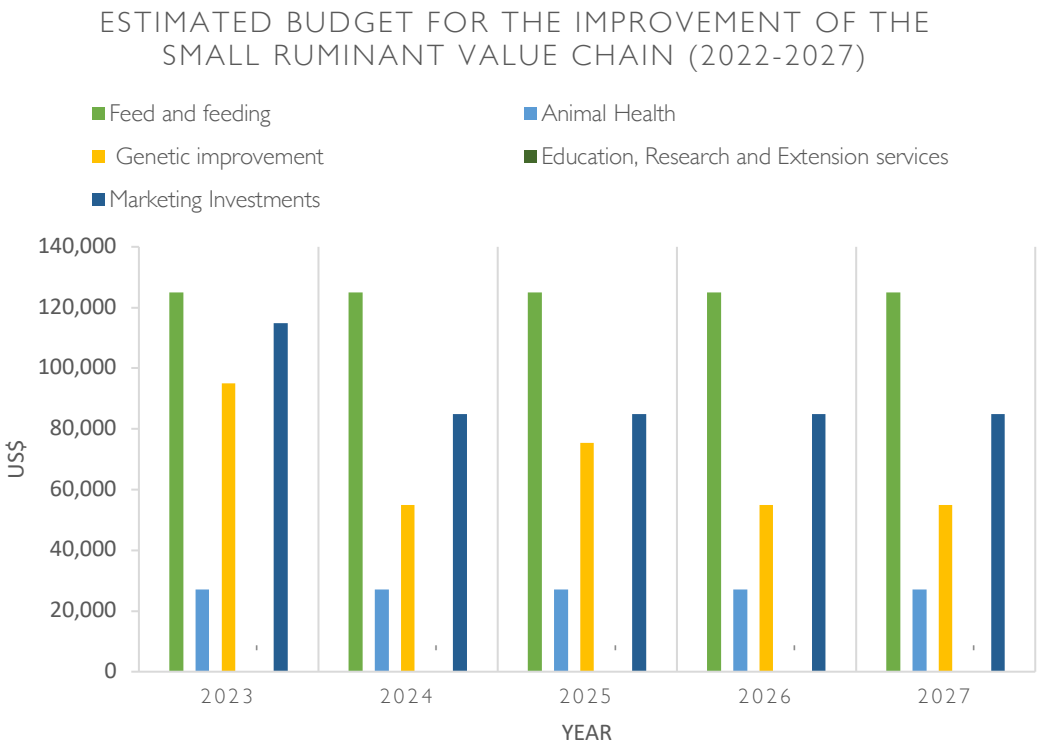
- 54% increase in goat meat production (from 1,125 tonnes to 1,736 tonnes)
- 59%% increase in sheep meat production (from 504 tonnes to 803 tonnes)
- 27.6% increase in total goat population (from 367,126 to 468.556) within 5 years (2022 to 2027)
- 28% increase in total sheep population (from 191,540 to 244,459) within 5 years (2022 to 2027)

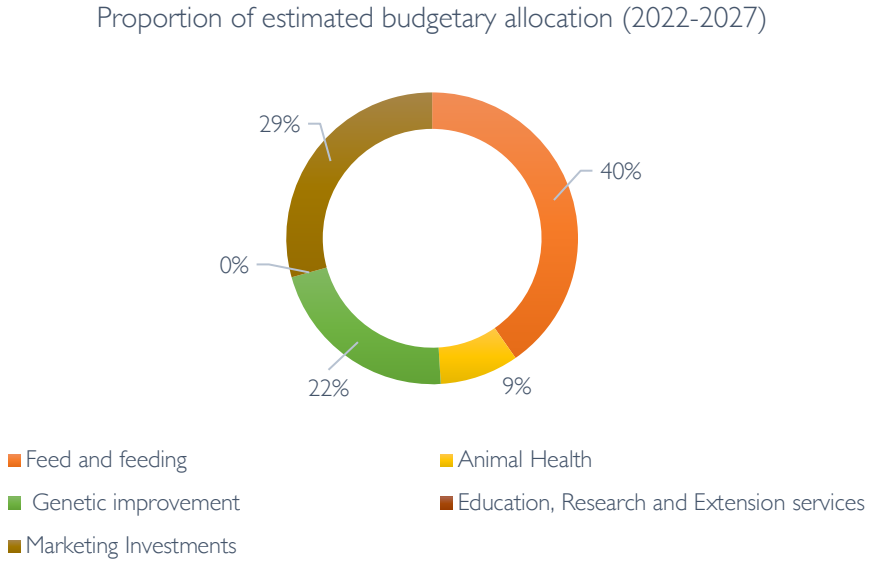
- **Estimated investment cost for improving the small ruminant value chain**

A total of 1,550,345 million Dalasi is budgeted for the interventions outlined to be implemented within the five years (2022-2027) to achieve the impacts in the small ruminant value chains. Out of the total investment cost, 39% is expected to come from private and other sources and the remaining 61% from the public funds. A summary of the estimated budgetary allocation for interventions proposed to help improve the small ruminant value chain in the Gambia is shown in Figure 2. The highest estimated budgetary allocation (40%) is planned for interventions that will improve the availability of feed and forage for small ruminant in the Gambia. The remaining estimated budgetary allocations are for marketing investment (29%), genetic improvement (22%), and animal health interventions (9%) follow in decreasing order. No budget is allocated for education, research, and extension services because the estimated budgets are accounted for in the budgets for the cattle value chain.

Most of the privately sourced funds (53%) will be allocated to marketing investments. The estimated budgetary allocation for interventions to improve availability of animal feed has the second highest (34%) of privately sourced fundings. Therefore, within the next five years, the Gambian government can facilitate the enabling environment for marketing investments and investments targeted at the animal feed industry

Figure 2: Estimated budgetary allocation to improve the small ruminant value chains from 2022 - 2027





2.4 Key highlights of chicken value chain roadmap

The health interventions listed under the cattle value chains apply to all other livestock value chains. However, there are interventions that are specific to the chicken value chains in the Gambia.

- **Key interventions for improving the chicken value chain**

Policy and legislation interventions: Enactment of regulations and acts to discourage the export of brans and oil seed cakes outside the country within three years is planned to improve the availability of chicken feed in the Gambia. For genetic improvement, the development of a backyard indigenous chicken breeding policy is outlined for implementation in the next two years.

Training and sensitization interventions: Farmers will be trained on the utilization of locally available feed supplements, and different possible feed ration formulas to improve the chicken feeding situation in the Gambia. Also, training manuals on backyard indigenous chicken improvement will be developed and farmers will be trained within the five years.

Disease control interventions: To improve the health of chickens, vaccination against Newcastle and Fowl pox is planned for 65% of the backyard chicken population by the end of 2027, and the percentage of farmers applying internal and external parasite treatments increased to 65% by the end of 2027.

Infrastructural development: Government will create veterinary outlets (pharmacies) and cold storage facilities for vaccines to improve access to medication and benefit multiple livestock species.

Organisational development: To improve the marketing activities in the chicken value chain, the government will support the establishment of cooperatives for producers with indigenous chicken breeds. To improve the food safety in the value chain, government will promote contracts between hatcheries and parent stock farmers.

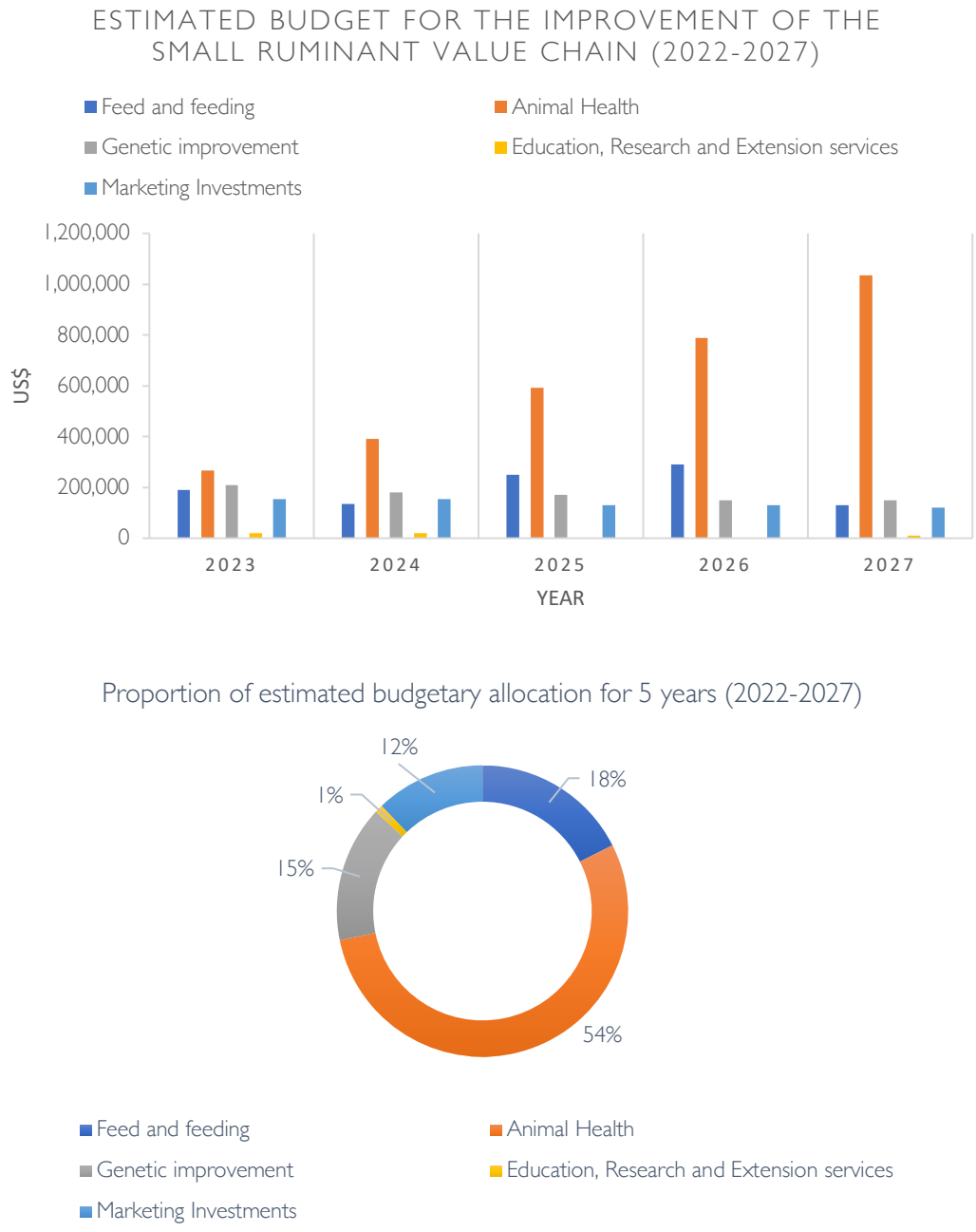
Provision of government subsidies: Government will provide funding for the establishment of one commercial chicken parent stock farm.

- **Projected impacts for implementing interventions**

Implementation of the outlined interventions will result in the following impacts:

- 315% increase in poultry production (from 1,228 metric tonnes to 5,096 metric tonnes) within the five years
- 25% increase in egg production from backyard indigenous chicken within the five years
- 208% increase in the contribution of the backyard indigenous chicken within the five years
- Total GDP contribution to increase from GMD 82.7 million GMD to 284.47 million GMD within the five years.

Figure 3: Estimated budgetary allocation to improve the chicken value chains from 2022 – 2027.



Estimated investment cost for improving the chicken value chain

A total of 5,671,830 million Dalasi is budgeted for the interventions outlined to be implemented within the five years (2022-2027) to achieve the impacts in the chicken value chains. Out of the total investment cost, 85% is expected to come from private sector and

other sources and the remaining 15% from the public funds. A summary of the estimated budgetary allocation for interventions proposed to help improve the chicken value chain in the Gambia is shown in Figure 3. The highest estimated budgetary allocation (54%) is planned for interventions geared at improve the health conditions in the chicken value chain in the Gambia. Most of the privately source funds (62%) will be allocated to animal health improvement interventions. This is followed by interventions aimed at genetic improvement (16%), and interventions to improve availability of chicken feed (13%).

In sum, to increase the livestock sector GDP, household income, and improve availability of livestock products, the government would have to create an enabling environment that incentivises private sector investment in specific sectors. For the cattle value chains, private investment targeted at the feed industry, research and development should be supported by the government. For improvement of the small ruminant value chain, marketing investments and the investment in the animal feed industry by private sectors should be a key. Finally, for improvement in the chicken value chains, government's support should be tailored towards private investments that seek to improve the health conditions of the chicken value chain in the Gambia.

3 Cattle value chain roadmap (2023 to 2027)

3.1 A summary of results and conclusions from the 15-year livestock sector strategy (LSS)

Cattle rearing is one of the most important activities in the livestock sector (FAO, 2016). Cattle are reared in all the administrative regions, but production is concentrated in the rural areas. The systems of cattle production include (i) the *Extensive system*, which is the most predominant and involves mixed crop-livestock farming, usage of indigenous breeds of low productivity (N'Dama and Gobra/zebu), and transhumance and internal migration in search of pastures and water during the dry season); (ii) the *Semi-intensive* system where selected animals (including draught animals) are given supplementary feeds using agro-industrial by-products and crop residues to increase meat, milk, manure, and draught power; and (iii) the *Intensive system* practiced mainly in the urban and peri-urban areas using purebreds (mostly European breeds) and crosses of N'Dama and European breeds to increase productivity (both milk and meat); and poultry production using commercial breeds.

Rearing of cattle in the Gambia faces numerous challenges and constraints, including poor feeding, low productivity of the traditional breeds, limited processing infrastructure, livestock diseases, and a dysfunctional marketing system (FAO, 2016). The lack of access to feed is associated with both limited production and high costs of feed. Feed production is limited due to severe rangeland degradation due to overgrazing, climate change, recurrent bushfires, and the absence of improvement strategies; seasonality - with dry periods being characterized by an acute scarcity of feed and water; dwindling rangeland resources due to demographic pressure and the lack of policy and legal frameworks for the protection and sustainable management of grazing lands and cattle tracks. Concentrate feed costs are high in the Western region, where dairy production is more prevalent. The frequent occurrence of disease leads to economic losses and is exacerbated by a critical shortage of veterinarians in the public sector and a significant lack of favorable policy for the promotion and support of private veterinary services for the delivery of animal health care services (Rich et al. 2020). The problem of a largely dysfunctional marketing system relates to poor market infrastructure together with market imperfections and lack of coordinated value chain and undermines performance and growth.

To improve the cattle production system as well as the income of small and marginal farmers, the activities that need to be implemented were identified in the LSS (see Bahta et al., 2023a).

The set of interventions to address the challenge of lack of feed include:

- Complete the "comprehensive/systematic monitoring and inventory of the available range resources and carrying capacity of the rangelands" conducted in 1986 by the USAID Funded Mixed Farming and Resource Management Project for the CRR/N, CRR/S, and URR to include all Production Zones, feed, and fodder resources.
- Facilitate the adoption of collection, storage, and utilization of groundnut hay, maize, millet stovers, and rice straws for livestock feeding during the latter part of the dry season.
- Promote of production of drought resistant forages
- Support the utilization of by-products such as groundnut cake, cotton seed cake, sesame cake, rice, and millet brans, especially in milk producing areas.
- Continue promotion of Compost Pens and other stabling techniques as a way of enhancing milk production.

For genetic improvement, the LSS recommended that:

- Broaden, strengthen, and sustain the 3-Tier National Breeding Program (nucleus, multiplier, village/farmer) being implemented by the DLS and WALIC should be and implement a long-term planning and strategic breeding program.
- Promote sustainable use, development, and conservation of indigenous animal genetic resources to reverse the trend of erosion of cattle genetic resources.
- Conduct bio-morphometric and molecular characterization of the N'Dama breed as well as phenotypic characterization.
- Initiate a national Artificial Insemination (AI) Program both for indigenous breeds and pure-bred European breeds being used in the dairy industry, particularly in the Western livestock production zone.
- Establish a cadre of well-trained geneticists and technicians
- Provide refresher courses on AI for technicians and para-vets together with the provision of requisite equipment and supplies to the trained AI Technicians.

To address the challenge of diseases, it was recommended that:

- Seek technical assistance from Commonwealth member countries (as was the case in the past) to address the current shortage of veterinarians, explore the possibility of employing retired Gambian vets on contract while prioritizing the training of vets in the long term,
- Enhance private participation in the delivery of veterinary healthcare
- Establish and strengthen Regional Diagnostic Laboratories and the Central Veterinary Laboratory for effective disease surveillance and the monitoring of vaccinations against CBPP and other Transboundary animal diseases (TADs).
- Enhance cold chain maintenance for proper storage of vaccines, reagents, and laboratory samples collected for confirmatory diagnosis.

To address the problems in marketing, the recommendations included:

- Development of improved market infrastructure and facilities for the collection, storage, processing, and transportation of milk in the Western Region.
- Construction of a modern abattoir and meat processing plants in the Western Region.

- Supporting and engaging with women involved in the informal marketing of milk and milk products in forming cooperative societies and working closely with the mini dairies in the middle and eastern regions.
- Initiate a program for the building of modern slaughterhouses and slabs in rural areas in the middle and eastern regions.

Results of the foresight analysis on the impact of the proposed additional investments (WI) versus the business as usual (BAU) scenarios Indicated that:

- Quantities of beef and milk produced are projected to rise by only 3% and 5%, respectively under BAU, compared to an increase in the level of consumption of 38% and 78%, respectively under WI. Under the BAU scenario, much of the slaughter stock for the country will continue to be imported from the neighbouring countries to satisfy demands. With the investments, the projected beef production will surpass projected consumption between the base year and 2037/38.
- The percentage share of domestic production to total consumption is projected to fall from 49% to 29% for milk and 77% to 57% for beef under BAU.
- With investments (WI), milk and beef production from the Base Year (2022/2023) to 2037/38 are projected to increase by 336% and 105%, respectively.
- Milk production in the BAU scenario is projected to be significantly below the consumption level (and satisfying only about 50% of the consumption requirement of the country by 2037/38. With the WI scenario, milk production is projected to increase by 76% from the Base year to 2037/38 and close the milk deficit by 2034.

3.2 Five-year LMP vision for the Cattle value chain

The vision is to increase income from cattle for farmers adopting cattle improvement interventions and raise the country's beef and cow milk production from the current 4.1 thousand tonnes and 20.2 million liters to about 5.7 thousand tonnes and 43.7 million liters, respectively, by 2027. The contribution of beef and cow milk to The Gambia GDP will increase from GMDs 689 and 545 million by 2022 to GMDs 723 and 1,288 million by 2026/27, respectively.

3.3 Description of the cattle production systems

The cattle value chain comprises mainly of indigenous N'Dama cattle but also includes crossbreds with Zebu cattle (known as Gobras), crossbreds with European cattle and purebred European cattle. The overwhelming majority of all cattle (98%) in The Gambia (286,220 heads) are N'Dama breeds. The remaining 2% comprises Zebus, Gobras and crossbreds of N'Dama with Jersey, Holstein- Friesian and other European breeds. (National Livestock Census 2016).[1]

N'Dama cattle are dual-purpose animals producing both milk and meat. The average milk yield is between 1.5 and 3.5 liters depending on the season (about 3.5 during the rainy season and 1.5 during the dry season). The average milk yield for crossbred cows is about 10 liters per day and for European breeds about 20 liters per day depending on management practices. The average herd size for N'Dama cattle is 56 whilst for crossbreeds and European cattle it is 20.

Across all the production zones (Western, Central and Eastern) the predominant production system for N'Dama cattle is the Extensive system that is characterized by free-range grazing and minimal supplementation. However, in the Western production zone, European breeds and their crosses in the smallholder commercial dairy production system are found in peri-urban areas under semi-intensive to intensive management. In these dairy systems, various forms of housing, zero-grazing, grazing with supplementation, and inputs for disease control are provided. Individual animals are tagged, and some production records are maintained. Milk produced is also sold either raw or as fresh pasteurized milk or yogurt.

3.4 Opportunities, challenges and strategies

The cattle sub-sector constitutes a valuable resource, the potential of which though underutilized, and remains an important complementary attribute of the farming and livelihood support system of most rural and peri-urban households in the country.

[1] The last national livestock census was used to derive the base line year parameters and validated by the national technical committee (NTC).

In this regard, cattle production forms an integral component of the agro-pastoral mixed farming system providing manure, milk, meat, and a source of income for satisfying socio-cultural and other obligations.

The sub-sector is faced with several challenges including feed shortages, disease outbreaks, lack of improved germplasm, and market constraints. These constraints are compounded by shrinking rangelands (due to demographic pressures resulting in the cultivation of marginal lands that were hitherto reserved as pastures) and inadequate access to credit and veterinary infrastructure.

However, intensification of the cattle management and production systems will provide opportunities for the enhancement of the development of the beef and peri-urban dairy industry to boost domestic milk production in order to meet the growing demand for dairy products in the expanding tourism sector and in urban and growth centers.

As mentioned earlier, opportunities exist for the expansion of the commercial dairy industry in the Western Production Zone given that the agroecological condition favors the utilization of crossbreeds and European breeds of cattle. In addition, there is considerable access to feed and water and high demand for livestock and livestock products due to the high densities of a predominantly urbanized population in the area.

3.5 Investment scenarios analyzed in the 5-year investment plan

The cattle improvement investments for the first investment period (5-year investment roadmap) are analyzed for: business as usual (BAU) and with intervention (WI). The BAU scenario represents the base case or existing scenario with the analysis showing the impacts of continuing the current type and level of investment and recurrent spending on meat and milk production, income per animal, and contribution to GDP throughout the LMP analysis period of 5 years. And the WI Scenario represents an increase in the investments in N'dama and Zebu (Gobras) cattle to improve meat and milk production, income per animal, and contribution to GDP through increasing productivity and the population of crossbreed cattle. This scenario ultimately aims to meet the country's milk and meat consumption requirements.

3.6 Overall LMP targets under the intervention scenario

- **Overall targets at the production zone and country level**

The population of cattle under an investment scenario of implementing the improvement interventions under cattle is projected to increase by 11.3%, from 296,889 in the base year to 330,390 in 2027 (Table 1). N'Dama cattle are projected to make up about 97% of the entire cattle population in The Gambia compared to 0.9% from the commercial dairy system and 2.2% from Zebu/Gobra crossbreds. The commercial dairy cattle population is projected to increase by 794.7%, from 332 in 2022 to 2,966 in 2027. The Eastern production zone is projected to produce the most cattle, comprising 55.6% of the population in 2027 whereas the Western zone will comprise 12.7% of the population by 2027.

Table 1: Cattle population targeted for 5 years under the WI scenario

Production zone	Sub-system	Livestock population WI scenario						
		Base year 2022	2023	2024	2025	2026	2027	% Change
Western	N'dama	37,363	38,110	38,872	39,650	40,443	41,252	10.4%
	Zebu/Gobra	764	779	794	810	827	843	10.4%
	Total	38,126	38,889	39,667	40,460	41,269	42,095	10.4%
Central	N'dama	89,366	91,154	92,977	94,836	96,733	98,668	10.4%
	Zebu/Gobra	2,642	2,695	2,749	2,804	2,860	2,917	10.4%
	Total	92,009	93,849	95,726	97,640	99,593	101,585	10.4%
Eastern	N'dama	163,128	166,390	169,718	173,112	176,575	180,106	10.4%
	Zebu/Gobra	3,295	3,361	3,428	3,497	3,567	3,638	10.4%
	Total	166,423	169,751	173,146	176,609	180,142	183,744	10.4%
Commercial dairy	Small	332	514	796	1,234	1,913	2,966	794.7%
Total population	N'dama	289,857	295,654	301,567	307,598	313,750	320,025	10.4%
	Zebu/Gobra	6,701	6,835	6,972	7,111	7,253	7,399	10.4%
Grand total population	296,889	303,306	309,861	316,558	323,400	330,390	11.3%	

Source: The Gambia LMP analysis

3.7 Cattle improvement interventions

- **WI Scenario - dairy improvement targets and interventions[2]**

Feed interventions

According to DLS&FAO (2022), in The Gambia, there is surplus feed production in terms of DM in the rainy and cold dry seasons. However, the amount of feed produced in hot dry season decreases substantially. In the dry season, the amount of feed produced in the country is not enough to satisfy the needs of livestock. The energy balance (available vs. need) also follows a similar trend (Bahta et al, 2022). The following proposed interventions can improve the feed production and need balance in the country:

- The DLS with the Department of Forestry should produce a detailed implementation plan to ensure sustainable exploitation of range resources within the designated areas. This is necessary even though the Forest Act 1998 (in accordance with Section 68 of this Law) allows for forest grazing in designated community forests,
- The Ministry of Agriculture should engage other relevant stakeholders (such as the Ministries of Local Government and Lands, Justice, Forestry and the Environment and Parks and Wildlife, Civil Society and Community Leaders) to update the Land Use Plan taking into consideration the urgent needs of the agriculture/livestock sector in the country. The last comprehensive Land Use Plan for The Gambia was developed in 1985, and it was followed by the preparation of the Physical Development Plan for the GBA (Greater Banjul Area) in 2000.
- Demarcate, map, and gazette grazing areas and stock routes within the first four years of the LMP period to decrease conflicts between farmers and livestock herders.
- Sensitize and train farmers on the prevention and control of bushfires.
- Regenerate degraded grazing and range lands using community-based grazing area and range land management systems, including:
    - Over-sowing of palatable feed species, including adropogon gayanas, Panicum, and Brachiaria species.
    - Construction of access/slipways to rivers to the 20 of the areas that are currently has low access to animals.

[2] For more detailes on recommended terventions for each value chain, refer to Bahta et al. (2022b) and Bahta et al. (2023a)

    - Construction of 70 boreholes with the contribution of herd owners.
    - Development of 40 low-lying (man-made and natural depressions) areas and improve harvest of water.
    - Planting of fodder tree species such as Pterocarpus Erinaceus, Leucocefala, Acacia Albida, and Leucaena in community forest parks, range lands, and around boreholes and slipways.
- Sensitize and provide incentives for farmers to grow fodder and fodder trees as fences and hedges in the backyard and other areas to supplement cattle and enhance feed availability during the dry season.
- Sensitize farmers to supplement lactating cows with concentrate feeds, salt and mineral licks, with the goal of increasing the the proportion of cattle farmers that supplement their lactating cows with some form of concentrate feeds to 50% by the end of the five years of the LMP period (2027),
- Increase the use of leguminous plants e.g., Pterocarpus erinaceous, Acacia albida (Faidherbia albida), Cajanus cajan, etc.
- Liaison with the National Seed Secretariat (NSS) to have a strong fodder seed quality regulatory department within the NSS.
- Sensitize and provide incentives for farmers to harvest green feeds during the wet season and conserve them for use in the dry season during the rainy season.
- Train farmers in collecting, preserving, and utilizing crop residues. Currently, crop residue utilization in The Gambia is very low for many crops except for groundnut and cowpea which have a very high crop residue utilization.
- Improve the availability of government and private sector professionals supporting dairy farming and milk processing by increasing the accessibility of long-term training on dairying and milk processing.
- Limit the export of processed feed ingredients and have a concessional supply for local livestock producers.
- Facilitate financial provision and long-term loan repayment schemes to commercial dairy farms that want to establish and operate dairy farms.
- Encourage the establishment of a fodder and fodder seed producers' association within three years.
- Improve the linkages with feed and fodder associations in other countries like Mali and Sénégal.

Health improvement interventions:

- Vaccinate cattle for the priority diseases like CBPP, HS, BQ, and LSD. The vaccine coverage of CBPP is targeted to increase from the current coverage of about 75% (DLS, 2020) to about 80% in the coming five years. The percentage of cattle vaccinated against HS, BQ, and LSD is targeted to increase from current coverage of very low (DLS, 2020) to 30% by the end of five year (2027).
- Vaccinate dairy cattle against CBPP, HS, BQ, LSD on commercial farms, and continue anthrax and chemoprophylaxis against tick-borne and blood parasitic infectious diseases.
- Increase the rate of anti-parasite treatment to 30% and anthelmintic use to 40% by the end of the five year (2023-2027). The current level of external and internal parasite treatment practices among N'Dama cattle owners is about 15% and 25%, respectively, using anti-parasite chemicals and anthelmintic (DLS, 2020).
- Strengthen the Veterinary Council within four years to make it able to effectively monitor and regulate the importation, distribution, and use of veterinary drugs.
- Ensure the availability of sufficient vaccines and medicines in the country.
- Strengthen the Livestock Training School of the Gambia College of Agriculture through capacity building of trainers, provision of teaching materials, equipment, and protective clothing for trainees, and provide laboratories and practical facilities and equipment throughout the LMP duration.
- Revise the current curriculum used to train livestock technicians, within two years.
- Train veterinarians and livestock technicians to scale up their capacity and increase their contribution to the improvement of extension and veterinary service delivery.
- Establish additional five veterinary pharmacies and drug outlets in the regions: in the five years (2023-2027) of the LMP duration.
- Strengthen the existing six regional veterinary stations by improving the infrastructures and providing equipment within 5 years.
- Improve infrastructure, provide equipment and hire experts on open positions for the existing 53 veterinary sub-stations.
- Establish 53 new veterinary sub-stations (one more for every district) within the five-year duration of the LMP (2023-2027).

- Strengthen the disease surveillance system by improving staff capacity with training and the monitoring system.
- There are currently 82 farmers' sanitary defense committees. It is recommended to build the capacity of existing sanitary defense committees and raise their number to 120 by the end of the LMP period (2027).
- Improve the capacity of the existing six regional veterinary laboratories in the coming 5 years by improving infrastructure, equipment, staffing, and staff capacity.
- Improve the facilities and train laboratory technologists and technicians of the central veterinary laboratory at Abuko.

Genetic improvement interventions:

- Produce a cattle breeding policy within two years
- Sensitize herd owners on the selection and retention of good breeding bulls and heifers in the local herd. It is targeted to sensitize 60% of livestock farmers by the end of five years (2023-2027).
- Expand the N'Dama breeding program being conducted by WALIC and produce and distribute elite breeding bulls to farmers through Gambia Indigenous Livestock Multipliers Association (GILMA). It is targeted that 5% of cattle farmers in the country will have access to elite N'Dama breeding bulls/semen by the end of five years (2023-2027).
- Strengthen the capacity of WALIC by coordinating and facilitating funds for the construction of more barns, the purchase of more animals, and improved research and training facilities. Also, it is equally essential to provide enhanced laboratory and storage facilities and equipment to expand the laboratories' capacity to include handling breeding materials and activities.
- Construct one AI center within the first five years of the LMP period. The AI centers will produce semen straws from elite N'Dama bulls and exotic/exotic-cross breed bulls.
- Construct one liquid nitrogen storage facility within five years.
- Train 100 additional AI technicians within five years (2023-2027).
- Subsidize private AI service providers to help them expand their AI service to more livestock producers.

Extension and research improvement interventions:

- Develop livestock extension policy, guidelines, and legal framework for extension services within three years.
- Strengthen the capacities of the livestock research section of the NARI (National Agricultural Research Institute) by improving the research facilities and staffing with livestock researchers and scientists to make it able to conduct livestock research. The research institute must also collaborate with other research institutions like WALIC and others in the sub-region.
- Coordinate and facilitate the provision of financial support, the necessary equipment, and training opportunities to the staff of WALIC to expand its local cattle improvement program and other research.
- Enhance the mobility of the public extension service providers to allow them to interact more effectively with farmers.
- Strengthen Department of Livestock Services (DLS) and other stakeholders' livestock data collection tasks by providing appropriate equipment, in addition to capacity building and training on data collection (methods and tools) and analysis.
- Improve staff retention at NARI, WALIC, and DLS through incentives, career progression opportunities, and scholarships.
- Upgrade the existing training centers and demonstration units and utilize them to full capacity. The existing 4 training centers and 4 demonstration units cater to all species in the country.
- Improve infrastructure, equipment, and staffing at 53 veterinary sub-stations and construct an additional 53 new veterinary sub-stations (one for every district) within the LMP period.
- Promote private veterinary and extension service providers by subsidizing veterinary and livestock experts to establish veterinary pharmacies and input shops that can provide farmers with veterinary and extension services.
- Support private extension service provider startups through appropriate subsidies.
- Regulate private veterinarians and extension service providers and continue researching and providing public veterinary and extension services.
- Facilitate collaboration between NARI and the University of The Gambia and other stakeholders in the livestock sector to ensure that training at the faculty of science produces graduates with needed skills.

- Promote adaptive research on exotic breeds and milk improvement along the value chain. Increase the number of farmers that receive intensive and continuous cattle improvement training (training, exchange visits, farmer advisory services, and practical demonstrations) to 50% by the end of the LMP. Currently, very few farmers get intensive and continuous cattle improvement training.

Marketing and processing improvement interventions:

- Improve the meat marketing infrastructure in 10 primary (Sare Ngai, Sare Bojo, Brikamaba, Wasu, Jareng, Samitenda, Farafeni, Bureng, Kerr pateh, Ndugukebbeh, Fass Njaga Choi, Panchang) and 2 terminal markets (Abuko, Brikama) by 2027. This improvement includes fencing of holding grounds, provision of watering facilitates, sheds, offices, and toilets, loading ramps, slaughter slabs, meat stalls, cold storage facilities, and weighing scales.
- Strengthen the newly established livestock market information system and sensitize users about it.
- Subsidize milk and meat producer cooperatives to introduce specialized vehicles for transporting live animals and animal products.
- Provide capacity-building training for market management committees
- Support the establishment of marketing cooperatives within five years[3].
- Support cooperatives to improve the collection, transportation, and processing of livestock products.
- Encourage and subsidize private actors to enable them to establish small-scale milk processing plants. It is targeted that five small-scale milk processing plants will be established by 2027.
- Encourage private sector investors to establish two modern abattoirs within five years.
- Support commercial dairy farms to increase the number of commercial dairy farms in The Gambia. It is targeted that an additional about 40 commercial dairy farms (with a current farm size of about 65 animals) will be established by 2027.
- Modernize the ten existing slaughterhouses by 2027
- Establish a tannery by 2027

[3] The establishment of marketing cooperatives within five years also applies for each of the different commodities (small ruminants, layers, broilers, and free-range chicken). However, budgetary allocation is captured in the cattle road map budget.

- Encourage online marketing to facilitate the marketing of livestock inputs, services, and products. Online marketing will require improved internet networking, faster internet, and reduced cost of data bundles.

3.8 Investment budget

The budget for the planned interventions in the cattle (beef and dairy) sector during the first five years of the LMP is US$ 36.97 million (Table 2)[4]. Overall, investments in "Education, Research and Extension services" together with "animal health" account for the highest share of the total budget (39% and 33%, respectively) (Table 2). The estimated investment cost coming from public funds amounts to US$ 31.4 million (about 85% of the total budget). The corresponding amount from the private sector is US$ 5.5 million (about 15% of the total budget). For feed interventions, the private sector will shoulder 55% of the investment cost, whereas, for genetic improvement and marketing investments, 89% to 96% will be borne by the public sector, respectively (Figure 4).

Table 2: Dairy and beef roadmap investment cost by intervention areas

	Total	Private	Public	Share of investments by category
Feed and feeding	4,371,880	2,394,690	1,977,190	12%
Animal Health	12,366,819	536,819	11,830,000	33%
Genetic improvement	3,279,971	356,486	2,923,486	9%
Education, Research and Extension services	14,509,051	2,000,000	12,509,051	39%
Marketing Investments	2,443,088	250,000	2,193,088	7%
Total	36,970,809	5,537,994	31,432,815	100%

As shown in Annex Table 3, the level of projected investments in the first-year accounts for the largest share (37%) of the total five-year costs.

Interventions accounting for the highest level of investments include:

- Feeds and feeding

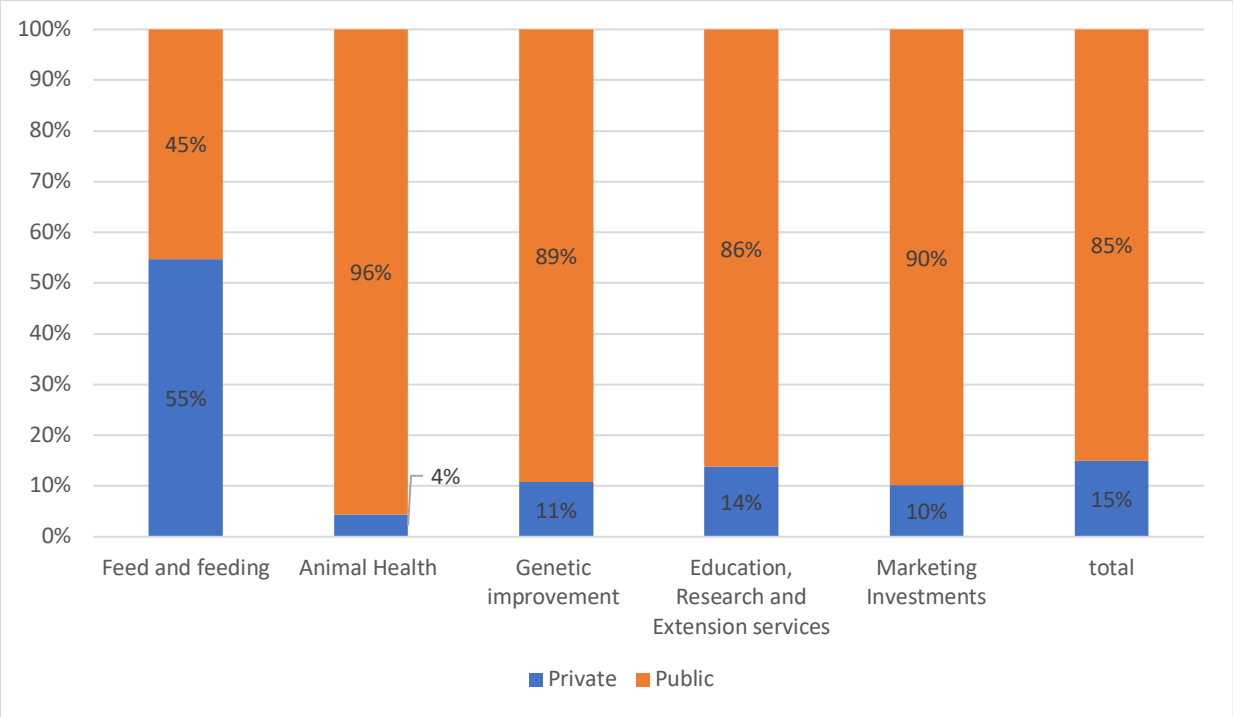
[4] Detailed budget for the cattle roadmap is in Annex XXX

- Develop low-lying areas (manmade and natural depressions) for water harvesting (US$ 1,600,000).
- Provision of guarantee funds to banks who offer loans for the establishment and running of commercial dairy farms (US$1,050,000).

- Animal Health
  - Strengthening of the existing six regional veterinary stations through infrastructure improvement and provision of equipment (US$3,840,000).
  - Infrastructure improvement, provision of equipment and hiring of personnel for the open positions in the existing 53 veterinary sub-stations (US$2,650,000).
  - Establish ten new veterinary sub-stations (US$1,000,000).
  - Capacity improvement of the existing six regional veterinary laboratories through infrastructure improvement, provision of equipment, staffing, and staff capacity development (US$3,840,000).
- Education, Research and Extension services
  - Provision of financial support, necessary equipment, and training opportunities to the staff of WALIC to expand its local cattle improvement program and other research (US$2,921,751).
  - Strengthening of public livestock extension service delivery in terms of mobility (US$1,910,000).
  - Provision of incentives, career progression opportunities, and scholarships to the staff at NARI, WALIC, and DLS to improve their retention (US$2,500,000)
  - Upgrading of the four training centers and four demonstration units for full capacity utilization (US$2,012,300).
  - Promote private veterinary and extension service providers by subsidizing veterinary and livestock experts to establish veterinary pharmacies and input shops that can provide farmers with veterinary and extension services (US$2,200,000).

  Support the emergence of private livestock extension service providers by subsidizing the private extension service providers (US$ 1,800,000).

Figure 4: Dairy and beef investments by intervention areas and source of funding.



3.9 Impacts of interventions

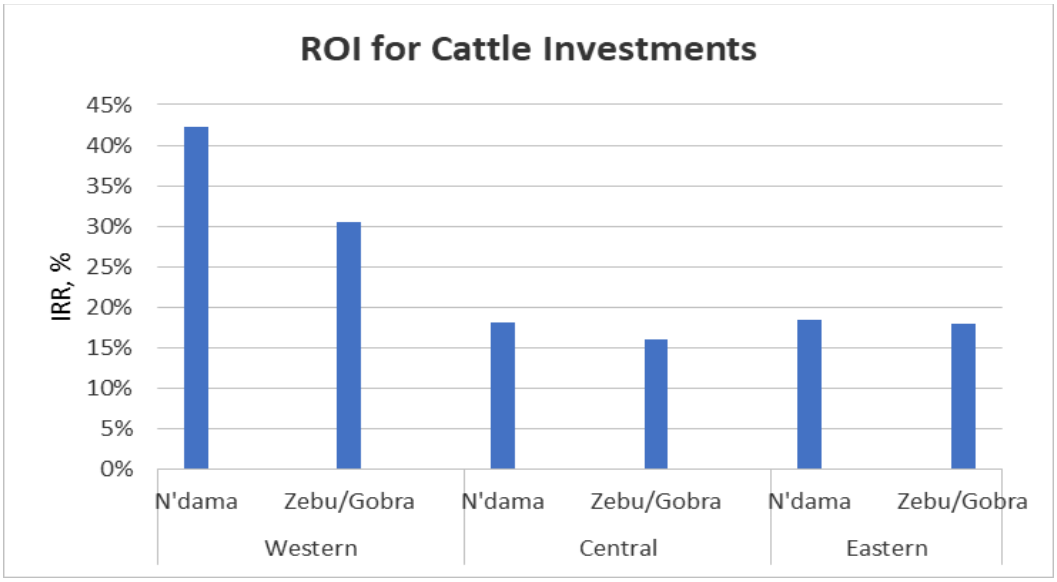
- **Return on investment (ROI) over 20 years**

To evaluate how well an investment will perform compared to a no-investment scenario, an ROI was performed, which is calculated by dividing the net income from the investment by the total cost of the investment, without considering other effects like GDP, among others. The ROI was calculated using the Internal Rate of Returns (IRR), which considers the time value of money. The IRR identifies the rate of discount, which makes the present value of the sum of annual nominal cash inflows equal to the initial net cash outlay for the investment. The ROI analysis conducted over 20 years[5] period under a W1 scenario for the dairy sector indicates a higher IRR observed in the Western production zone for both N'dama (42%) and Zebu/Gobra (31%) when milk prices are 60 GMD for the Western compared to the other zones (Figure 5). On the other hand, the IRR observed for 30 GMD milk prices for N'dama and Zebu/Gobra are 20% and 18%, respectively. The N'dama breed is projected to have a higher IRR across all production zones than the Zebu/Gobra breed. The Central zone is projected to record the least IRR of 18% and 16% for the N'dama and Zebu/Gobra cattle

[5] Internal rate of return analysis was conducted for 20-year period under a W1 scenario due to the long time it takes for most livestock improvement investments to generate full benefits due to the slow adoption rate.

farm systems, respectively, compared to 19% and 18% for Eastern for the two breeds, respectively. This illustrates a much more financially viable investment in dairy improvement interventions in the N'dama breeds compared to the Zebu/Gobra breeds across all production zones. This result is also corroborated by the positive NPV recorded for all the production zones and species but highest for N'dama breeds than Zebu/Gobra breeds indicating that the projected earnings generated by investment in dairy improvement programs discounted for their present value, will exceed the anticipated costs of the investments, hence more financially viable to invest in such interventions for N'dama breeds than Zebu/Gobra breeds.

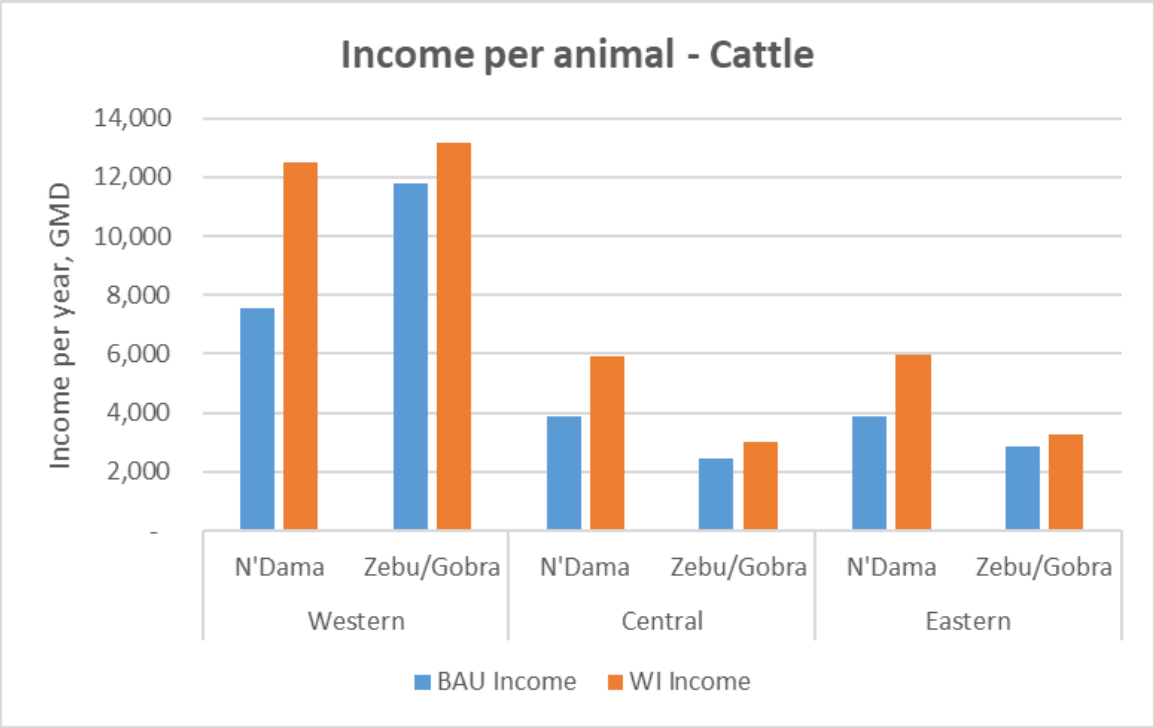
Figure 5: IRR for cattle under a 20-year investment plan.



- **Projected Income Increases per Animal in 15 Years**

The income per animal for both N'Dama and Zebu/Gobra breeds of cattle in the Western production zone is projected to be twice that of the Central and Eastern production zones. In the Western production zone, income for Zebu/Gobra cattle owners is projected to increase to GMD 13,179 under a with investment scenario compared to GMD 11,787 under a BAU scenario during a 15-year period (Figure 6). The income per animal will be slightly lower for N'Dama cattle under an investment scenario (GMD 12,497) compared to a BAU scenario (GMD 7,574) under the same 15-year scenario. The reason for the high income per animal in the Western zone is due to the production system practiced where animals, particularly the Zebu/Gobra breeds) are placed under semi-intensive and intensive farm systems and supplemented with feed and high disease control given more priority compared to the other production zones where the extensive system is highly practiced with less animal supplements and attention on the animals.

Figure 6: Cattle income per animal under BAU (2037) and WI (2037) in 15 years in GMDs
Source: LSIPT results



Meat and Milk production

Meat production

Total beef production under an investment scenario where cattle improvement interventions are implemented is projected to increase by 38.8%, from 4,073 MT in the base year to 5,655 MT in 2027 (Table 3). Most production is projected to come from the N'Dama breed, which would contribute 97% of the total beef produced in 2027. On the other hand, beef from commercial dairy, which is very small, is projected to increase from 10 MT in 2022 to 94 MT in 2027, which is an 854% increase over the 5 years (Table 3).

The Eastern production zone is projected to contribute the most beef, increasing from 2,275 MT to 3,094 MT, representing 36% over the 5 years. Beef production in Eastern zone is more than a combined production from Western and the Central. On the other hand, the projections show that the Western production zone will contribute the least beef, though it will have a larger percentage increase of 44%, increasing from 528 to 760 MT over the 5 years under an investment scenario.

Table 3: Cattle meat production projected for 5 years under WI scenario (in tonnes)

Production zone	Sub-system	Beef production (tones)						% Change
		Base year 2022	2023	2024	2025	2026	2027	
Western	N'dama	516	556	598	644	694	747	44.8%
	Zebu/Gobra	12	12	12	13	13	13	10.7%
	Total	528	568	611	657	707	760	44.0%
Central	N'dama	1,235	1,313	1,396	1,485	1,579	1,679	35.9%
	Zebu/Gobra	25	26	27	27	28	28	11.8%
	Total	1,260	1,339	1,423	1,512	1,607	1,707	35.4%
Eastern	N'dama	2,243	2,386	2,539	2,701	2,874	3,058	36.4%
	Zebu/Gobra	33	33	34	35	35	36	11.1%
	Total	2,275	2,420	2,573	2,736	2,910	3,094	36.0%
Commercial dairy	Small	10	15	24	38	60	94	854.6%
Total production	N'dama	3,993	4,255	4,533	4,830	5,147	5,484	37.3%
	Zebu/Gobra	70	72	73	75	76	78	11.3%
Grand total production		4,073	4,350	4,645	4,960	5,296	5,655	38.8%

Milk production

Like beef, milk production in The Gambia is projected to increase markedly by 2027, rising 116.7% from a projected 20,173 thousand liters in 2022 to 43,724 thousand liters in 2027 (Table 4). Most of the milk production in 2027 is projected to come from N'Dama breeds, with an estimated 36,561 thousand liters, representing 83.6% of the total milk production in The Gambia. Across all three production zones, milk production from the N'Dama breed is projected to have the largest percentage increase from 2022 to 2027 compared to the Zebu/Gobra breed. Commercial dairy farms are projected to produce only 6,326 thousand

liters, which is 14% of the total milk production in The Gambia though it is projected to increase by 2469.9% over the period. The Eastern production zone is projected to produce most of the milk in The Gambia, with an estimated 47% of the total milk production in 2027 compared to 27% from the Central and 11% from the Western.

Table 4: Cattle milk production projected for 5 years under WI scenario (in thousand Liters)

Production zone	Sub-system	Milk production (thousand liters)						% Change
		Base year 2022	2023	2024	2025	2026	2027	
Western	N'dama	2,472	2,812	3,199	3,639	4,139	4,708	90.4%
	Zebu/Gobra	95	99	102	106	110	114	20.2%
	Total	2,567	2,912	3,304	3,748	4,251	4,822	87.8%
Central	N'dama	6,112	6,951	7,906	8,991	10,226	11,631	90.3%
	Zebu/Gobra	255	265	275	285	296	308	20.7%
	Total	6,366	7,219	8,187	9,284	10,528	11,939	87.5%
Eastern	N'dama	10,648	12,105	13,762	15,646	17,788	20,222	89.9%
	Zebu/Gobra	345	358	371	385	400	414	20.1%
	Total	10,993	12,468	14,142	16,041	18,194	20,637	87.7%
Commercial dairy	Small	246	471	902	1,727	3,305	6,326	2469.9%
Total production	N'dama	19,232	21,868	24,867	28,276	32,153	36,561	90.1%
	Zebu/Gobra	695	721	748	777	806	836	20.4%
Grand total production		20,173	23,548	27,488	32,088	37,456	43,724	116.7%

Source: Odisha LMP analysis

Manure and daught power

Increases in manure and draught power from cattle are projected by 2027. Manure production is projected to increase from 160,106 tones in 2022 to 174,050 tones in 2027, an 11% increase (Table 5). On the other hand, the projected increase in draught power over the five years is 12.2%, from a base year of 5,603 to 6,141 thousand days in 2027.

Table 5: Cattle meat, milk, manure and draught power production projected for 5 years under WI scenario

Products	Sub-system	Base year 2022	2023	2024	2025	2026	2027	% Change
Beef (tonnes)	N'dama	3,993	4,255	4,533	4,830	5,147	5,484	37.3%
	Zebu/Gobra	70	72	73	75	76	78	11.3%
	Commercial	10	15	24	38	60	94	854.6%
	Total	4,073	4,350	4,645	4,960	5,296	5,655	38.8%
Milk (thousand liters)	N'dama	19,232	21,868	24,867	28,276	32,153	36,561	90.1%
	Zebu/Gobra	695	721	748	777	806	836	20.4%
	Commercial	246	471	902	1,727	3,305	6,326	2469.9%
	Total	20,173	23,548	27,488	32,088	37,456	43,724	116.7%
Manure (tonnes)		160,106	160,106	163,484	166,933	170,454	174,050	11.0%

Products	Sub-system	Base year 2022	2023	2024	2025	2026	2027	% Change
Draught power (thousand days)		5,603	5,603	5,733	5,866	6,002	6,141	12.2%

Gross Domestic Product (GDP) contribution

The contribution of cattle products (beef, milk, manure and draught power) to GDP in The Gambia is projected to increase by 4%, from GMD 4,182 million in 2022 to GMD 4,347 million in 2027 (Table 6). While there is a projected increase in beef, milk and manure contribution between 2022 and 2027, the value of draught power is projected to witness a decline of 21% within the same period. The value of beef is projected to increase from GMD 689 to GMD 723 million, a 5% increase compared to the 379 million GMD increase in the value of milk from commercial production systems. The value of draught power is projected to be 53% of cattle's overall contribution to GDP, although it will decrease from GMD 2,917 million to GMD 2,301 million by 2027.

Table 6: Total cattle GDP contribution projected for five years under WI scenario (in million GMD)

Products		Base year 2022	2023	2024	2025	2026	2027	% Change
Beef	N'dama	677	678	680	682	684	686	1.4%
	Zebu/Gobra	12	12	12	12	13	13	5.1%
	Commercial	0	0	1	3	9	25	13707.5%
	Total	689	696	702	709	716	723	5.0%
Milk	N'dama	527	585	650	721	800	889	68.6%
	Zebu/Gobra	17	17	18	18	19	19	14.3%
	Commercial	1	3	11	35	115	380	38902.9%
	Total	545	647	769	913	1,084	1,288	136.3%
Manure		31	32	32	33	34	35	13.1%
Draught power		2,917	2,782	2,653	2,530	2,413	2,301	-21.1%
Overall total		4,182	4,214	4,247	4,280	4,314	4,347	4.0%

Source: The Gambia LMP analysis

3.10 Complementary conditions required for success of LMP actions

- The extension system needs to advance toward providing consistent and intensive extension services to the farmers.

- Conducive policies, regulations, and incentive regimes for private investment in extension, feed, breeding, animal health services, commercial dairy and beef and milk processing and marketing.
- Favourable weather conditions.
- Donors and development partners to follow through on their commitment.
- Collection and processing of milk in the country are improved.
- Good governance and monitoring and evaluation framework for the impact of interventions.

3.11 Gender and social inclusion implications for cattle value chain development

Most cattle in The Gambia are owned by men (84.6%). However, there are marked differences in ownership patterns at the regional level, with women owning about 25% of all cattle in the LRR. (Source: National Livestock Census 2016). Women own cows, received as dowry, and these cows are kept and managed throughout by male herders. Herders use milk produced by those cows as payment for herding wages. Despite the ownership of cattle being dominated by men, generally, milk (and milk products) produced in the traditional extensive system is mostly managed by women who are responsible for its collection, storage, processing, and utilization at the household level (for domestic consumption) and sale in the open market.

When intervention measures are implemented, there will be increases in cattle population and meat and milk production. The involvement of women farmers in milk production, both commercially and at smallholder levels, will increase for N'dama and Zebu/Gobra. The availability of affordable meat will greatly benefit women and households in improving maternal and childhood nutrition. With the increased access to animal-source foods (more meat and protein and other nutrients and micro-nutrients), more women, children, and other vulnerable groups, nutritional, economic, and social status are expected to be improved. Moreover, an increased number of commercial dairy animals translates to increased availability of milk. Driven by the normative ideas of masculinity and femininity associated with the interactions with cattle in The Gambia, men are normally responsible for milking cattle. At the same time, women are responsible for selling the milk and milk products from the farmgate to the consumers. Manure is another economically viable product to explore. Anecdotal evidence from farmers (informants from discussions amongst workshop participants) points to the likelihood of sales from manure being more

profitable than sales from livestock. Moreover, farmers are already cognizant of the value of using manure in their vegetable gardens and the profits from its sales.

3.12 Conclusions

The cattle sector, comprising both meat and dairy, plays a significant role in the livelihood of producers in The Gambia as well as in the economic development of the country. The sector, which employs a significant number of people, is a vital source of GDP, income, and food for many individuals and households, probably contributing significantly to poverty reduction and nutrition security in the country. With growing urbanization and an increase in population and income, it is projected that the demand for meat and dairy products will increase. Therefore, producers in the cattle value chain can take advantage of this growing demand to increase their incomes and well-being. It also presents several opportunities for marginalized people in the value chain, particularly women, to increase their participation in the value chain through engaging in more productive and income-generating activities instead of being confined to the lower-income-generating roles they currently play in most livestock value chains, including cattle. The government has intervened in various ways through many projects and programs, all targeted at helping farmers take advantage of the many opportunities the sector brings. However, this has been inadequate over the years. Challenges such as disease outbreaks, shortage of feed and fodder, fewer marketing opportunities and penetration rate, among others, still limit the growth of the cattle value chain in The Gambia. These, coupled with other socioeconomic challenges, still make it difficult for the sector to see the needed boost to meet the rising demand for meat and milk from cattle.

To improve the cattle value chain to provide the needed economic development to farmers and the economy, there is the need to focus on addressing the challenges affecting the value chain in the areas of feed, animal health, marketing, and research, among others, in all production zones and across all breeds, indigenous and crossbreed. Notably, the proposed interventions in feed improvement and animal health need to be specific to each production zone to benefit all value chain actors. Focusing on genetic improvement and promoting animal breeding activities, investing in research and extension, delivering animal health services, and processing and marketing are essential in bringing the needed benefits.

The Gambia's economy will see much-needed growth when additional investments are made in addressing the challenges identified above in the cattle value chain. These will increase the population of both crossbreed and indigenous cattle by 11% between 2022 and 2027,

positively impacting both meat and milk production by 38.8% and 116.7%, respectively. Not only will this help reduce the difference between domestic meat and milk consumption and production, but it will also increase livestock GDP by 4%- and improve farmers' income.

4 Small Ruminant value chain roadmap (2023 to 2027) - goat/sheep

4.1 A summary of results and conclusions from the 15-year livestock sector strategy (LSS)

Rearing of small ruminants is widespread in all regions under extensive and subsistence-oriented production systems. Intensive small ruminant and poultry production systems have recently evolved and are proliferating in the peri-urban areas and around the growth centers. The challenges facing small ruminant production in The Gambia are similar to those challenges in cattle production: poor feeding, low productivity for local breeds of goats, diseases, and marketing challenges. Thus, recommendations similar to those for cattle address the challenges of poor feeding in small ruminants. Likewise, for animal genetics, recommendations include efforts to reverse the erosion of indigenous goat genetic resources together with conservation, utilization, and development of WAD goats and Djallonke sheep (the indigenous breed) through broadening, strengthening, and sustaining the breeding program being implemented by DLS and WALIC; bio-morphometric and molecular characterization of the WAD goats and Djallonke sheep as well as phenotypic their characterization. In animal health, implementation of the National Strategy for the Control and Eradication of PPR in The Gambia was recommended in addition to the improvements in the delivery of general animal health services, as noted above for cattle. To address the challenges in marketing, the development of improved market infrastructure for small ruminants, together with the construction of a modern abattoir and meat processing plants in the Western Region, was recommended. In the Central and Eastern regions, it was recommended that women engaged in small ruminant production should be supported and encouraged to form producer associations/marketing cooperative societies and work closely with the National Livestock Owners Association (NaLOA). In addition, a program for building modern slaughterhouses and slabs in rural areas should be initiated.

The foresight analysis indicated that:

- The production of goat meat is projected to increase from 1,125 tonnes to 1,483 and 3,581 tonnes under BAU and WI scenarios, respectively, representing growth of 31.8% and 218.3% by 2027. Likewise, Sheep meat production is projected to increase from 504 tonnes to 640 and 1,748 tonnes under BAU and WI scenarios, respectively, representing 26.9% and 246.7% growth by 2027.
- Without any intervention (BAU scenario), The Gambia may not be able to meet the future domestic demand for meat from sheep and goats from domestic production. Production in 2037/38 under a BAU is only projected to be 2,150 tonnes, far below the projected demand o 4,683 tonnes.
- With interventions, The Gambia may meet and exceed the projected domestic demand for sheep and goat's meat in 2037/38 with a projected production of 5,329 tonnes.

4.2 Five-year LMP vision for the small ruminant meat value chain

The five-year small ruminant meat value chain improvement interventions vision is to increase the production of goat meat and mutton to address a projected gap between domestic consumption and production. Goat meat and mutton production in The Gambia are projected to grow by 54 and 59 %, respectively, in the coming five years to 2027. The contributions of goat meat and mutton to the GDP are projected to increase by GMD 46 million and 32 million from 2023 to 2027- equivalent to 18 and 19 % increases, respectively

4.3 Description of the small ruminant production systems

Small Ruminants play an important role in the livelihood of the rural populations in The Gambia. They are raised to generate income and meet the nutritional requirements of rural families. They are also sold to meet family needs and fulfill the socio-cultural obligations of the owners. Small ruminants are easier to sell than larger animals and serve as ready sources of income for purchasing food during lean periods. The precarious and erratic nature of rainfall, coupled with the concomitant crop failures observed in recent years, is forcing the farmers to rely more on small ruminants to meet the food and other requirements of the families. Furthermore, given the prolific nature and short generation interval of small ruminants, they likely contribute significantly to the enhancement of food security and poverty alleviation in rural communities. For these reasons, the ownership of sheep and goats is widespread in all regions.

The National Livestock Census Report 2016 confirmed that in The Gambia, there are 172,662 and 328,336 sheep and goats, respectively. With 60,927 sheep, the Upper River Region (URR) has 35.9% of the National Sheep Flock. Similarly, with a population of 85,447 or 26.2% of the caprine population, the URR has the highest population of the species when compared to all other regions in the country.

The productivity of small ruminants under the traditional system is low owing to inadequate nutrition, poor management practices, and high mortality rates due to frequent disease outbreaks. Unlike cattle, more sheep and goats are sold each year off-rates of 23.6 % and 25%, respectively, were recorded. The production of sheep and goat meat was estimated at 550 and 1,028 tonnes, representing 0.3 and 0.6 kg per inhabitant, respectively (Bahta et al, 2022).

The production systems are primarily extensive and traditional, so productivity is generally low. Domestic demand for sheep and mutton is larger than the domestic supply. As a result, the country relies heavily on imports. The cited low productivity is due to several challenges requiring appropriate policies and strategies to ensure the subsector's growth. Addressing these challenges will improve the sub-sector's performance with potential contributions to food and nutrition security and employment creation.

Although extensive systems predominate, intensive production systems (using zero grazing) produce fattened rams targeting the "Tobaski" (local name for the Muslim feast of "Eid UL Adha") market are becoming more common. Commercial sheep fattening schemes targeting this niche market have mushroomed countrywide. In the Western Production zone, specialized commercial farms using breeds such as "Ladoum", "Troibirr", "Puelpuel" and crosses of Djallonke sheep and other exotic breeds are now very important.

At the National Livestock Show and "Tobaski" Ram Sale in 2017, a total of 33,090 "Tobaski" Rams were presented for sale to the public at the Livestock Show Ground in Abuko (Loum, 2019). The rams presented for sale originated from the regions within the country and countries in the sub-region (the Republics of Senegal, Mali, and Mauritania).

In 2019, 57 ram fattening schemes, mostly owned by women's groups and individuals, were established with 1,310 rams. More than 900 rams were sold, and GMD 4, 443,116 was generated from the sales of the rams.

4.4 Opportunities, challenges and strategies

Rapid urbanization and population growth have resulted in an increased demand for red meat that is partly met through importing slaughter stock from neighboring countries. However, in the long term, the need to sustainably satisfy this demand (and to ease pressure on the natural resources imposed by animals) will require the adoption of intensification. Successful approaches to intensifying livestock production have already been tried and tested in The Gambia. They include ram fattening schemes and the establishment of compost pens for cattle for improved meat, milk, manure production, and draught power. Thus, these activities and their needed technical, financial, and institutional support for their widespread dissemination constitute the core of the sub-sector policy strand for the 2017/2026 Agriculture and Natural Resource (ANR) policy.

Meeting demand for red meat will come through increased productivity of the livestock subsector rather than increased animals. It follows that priorities include genetic improvement of the indigenous breeds of cattle and small ruminants, improvement of management practices, and the delivery of veterinary services to increase productivity and efficiency of production.

The challenges for the red meat value chain are not dissimilar to the constraints facing the dairy sector and thus are not repeated here. To address these challenges[6], development strategies and investments are needed that target production regions and species that have the potential to generate significant economic and social gains without causing irreparable damage to the environment and natural resources.

4.5 Investment scenarios analysed

Consistent with analyses discussed above for cattle, the investment analysis examines two scenarios (BAU and WI) and their implications for goat and sheep productivity and incomes, and goat and sheep meat, milk, and skin production and the contributions of the goat and sheep sub-sector to GDP. This allows comparison of alternatives for the livestock planning unit, decision-makers in the country: farmers and new goat and sheep keepers, the government, private investors, and development partners (donors) in the medium-term or 5-year roadmaps for The Gambia.

[6] See Bahta et al(2022c)

4.6 Overall LMP targets under the intervention scenario

The goat population in The Gambia is projected to increase by 27.6% within the 5 years, from 367,126 in the LMP base year (2022) to 468,556 in 2027 (Table 7). Among the three production zones, the population of goats is projected to increase by the same (27.6%) within the 5 years. In terms of animal numbers, more goats are produced in the Eastern production zone, followed by the Central and Western. This is due to the greater abundance of feed, making the Eastern production zone an ideal location for small ruminant production. The population of goats is projected at 243,764, 123,824, and 100,969 for Eastern, Central, and Western production zones, respectively. The female-owned sub-system dominates goat production for all three production zones compared to the small (1-10 ownership) sub-system. Both small and female-owned sub-systems are projected to increase by 27.6% between 2022 and 2027 under all production zones (Table 7).

Table 7: Number of goats projected for 2023 to 2027

Production zone	Sub-system	Goat population WI scenario						% Change
		Base year 2022	2023	2024	2025	2026	2027	
Western	Small (1-10)	38,765	38,765	38,765	38,765	38,765	49,475	27.6%
	Female Owned	40,347	40,347	40,347	40,347	40,347	51,494	27.6%
	Total	79,112	79,112	79,112	79,112	79,112	100,969	27.6%
Central	Small (1-10)	47,539	47,539	47,539	47,539	47,539	60,674	27.6%
	Female Owned	49,480	49,480	49,480	49,480	49,480	63,150	27.6%
	Total	97,019	97,019	97,019	97,019	97,019	123,824	27.6%
Eastern	Small (1-10)	93,588	93,588	93,588	93,588	93,588	119,444	27.6%
	Female Owned	97,408	97,408	97,408	97,408	97,408	124,319	27.6%
	Total	190,995	190,995	190,995	190,995	190,995	243,764	27.6%
Grand total population (The Gambia)		367,126	367,126	367,126	367,126	367,126	468,556	27.6%

Source: The Gambia LMP analysis

The total sheep population is projected to increase by 28% within the 5 years, increasing from 191,540 in 2022 to 244,459 in 2027 under an investment scenario (Table 8). Most of the goat population is expected to be in the Eastern production zone and least in the Western production zone. The population of goats in the Eastern production zone is projected to be twice the population of goats in both the Western and Central zones combined in 2027. Among the three breeding systems of sheep production in The Gambia, the female-owned (Djallonke) dominates and is projected to outweigh the Djallonke and the Sahelian under all production systems. In 2027, the sheep population in the female-owned systems is projected

at 78,044, 47,604, and 40,572 for Eastern, Central, and Western production zones, respectively (Table 8).

Table 8: Number of sheep projected for 2023 to 2027

Production zone	Breed/sub-system	Sheep population WI scenario						% Change
		Base year 2022	2023	2024	2025	2026	2027	
Western	Djallonke	14,138	14,845	15,587	16,367	17,185	18,044	28%
	Sahelian	2,786	2,925	3,071	3,225	3,386	3,555	28%
	Female Owned (Djallonke)	14,865	15,609	16,389	17,208	18,069	18,972	28%
	Total	31,789	33,379	35,047	36,800	38,640	40,572	28%
Central	Djallonke	17,722	18,608	19,538	20,515	21,541	22,618	28%
	Sahelian	944	991	1,041	1,093	1,147	1,205	28%
	Female Owned	18,633	19,565	20,543	21,570	22,649	23,781	28%
	Total	37,299	39,164	41,122	43,178	45,337	47,604	28%
Eastern	Djallonke	58,159	61,067	64,120	67,326	70,693	74,227	28%
	Sahelian	3,143	3,300	3,465	3,638	3,820	4,011	28%
	Female Owned (Djallonke)	61,150	64,207	67,418	70,789	74,328	78,044	28%
	Total	122,452	128,574	135,003	141,753	148,841	156,283	28%
Grand total population (The Gambia)		191,540	201,117	211,173	221,731	232,818	244,459	28%

Source: The Gambia LMP analysis

Total goat meat production is projected to increase from 1,125 MT in the base year to 1,736 MT in 2027, a 54% increase within the period under an intervention scenario (Table 9). Most of the goat meat in 2027 is projected to come from the Eastern production zone, followed by the Central production zone, and least in the Western production zone. Goat meat from the Eastern production zone is more than the combined production from the other two zones though its percentage change in production (51%) will be less than the Central (58%) and the Western (60%). In all three production zones, the contribution of female-owned systems to total goat meat production in The Gambia is projected to be more than small systems, though by a small quantity. For example, in the Eastern production zone, goat meat from the female-owned system is projected to be 469 MT compared to 450 MT contribution from small-owned in 2022 (Table 9).

Table 9: Change in goat meat production under the with intervention scenario

Production zone	Breed/sub-system	Goat meat production (tones)						% Change
		Base year 2022	2023	2024	2025	2026	2027	
Western	Small (1-10)	113	113	113	113	113	181	60%
	Female Owned	118	118	118	118	118	189	60%
	Total	231	231	231	231	231	370	60%
Central	Small (1-10)	139	139	139	139	139	219	58%

	Female Owned	145	145	145	145	145	228	58%
	Total	284	284	284	284	284	447	58%
Eastern	Small (1-10)	299	299	299	299	299	450	51%
	Female Owned	311	311	311	311	311	469	51%
	Total	610	610	610	610	610	919	51%
Grand total production (The Gambia)		1,125	1,125	1,125	1,125	1,125	1,736	54%

Source: The Gambia LMP analysis

Under the intervention scenario, total meat from sheep is projected to increase by 59%, from a base year production of 504 MT to 803 MT in 2027 (Table 10). Like goat meat production, most of the sheep meat is projected to come from the Eastern production zone, followed by the Central and least in the Western production zone. Total sheep meat from the Eastern zone is projected to be almost twice as much as the total contribution from the other two production zones combined. In all three sub-systems, the female-owned system is projected to contribute more sheep meat than the Djallonke and the Sahelian. Though the Central production zone is projected to produce the least sheep meat, its percentage change in meat production is projected to be higher (94%) compared to the Western (60%) and Eastern (51%) within the period (Table 12).

Table 10: Change in mutton production under the with intervention scenario

Production zone	Breed/sub-system	Mutton production (tones)						% Change
		Base year 2022	2023	2024	2025	2026	2027	
Western	Djallonke	33	36	40	44	48	53	62%
	Sahelian	14	15	16	18	19	21	55%
	Female Owned (Djallonke)	35	38	42	46	51	56	62%
	Total	81	89	98	108	119	131	60%
Central	Djallonke	35	40	46	52	60	68	95%
	Sahelian	3	4	4	5	5	6	79%
	Female Owned	37	42	48	55	63	72	95%
	Total	75	86	98	112	128	146	94%
Eastern	Djallonke	162	176	191	207	225	244	51%
	Sahelian	16	17	19	21	23	25	60%
	Female Owned (Djallonke)	170	185	201	218	237	257	51%
	Total	348	378	410	446	484	526	51%
Grand total production (The Gambia)		504	553	607	666	731	803	59%

Source: The Gambia LMP analysis

4.7 Small ruminant improvement interventions

Feed improvement interventions:

The cattle meat and dairy feed improvement interventions listed under the cattle meat and milk improvement section also apply to sheep and goats. However, the feed interventions critical to the sheep and goats are:

- Sensitize farmers to grow fodders and fodder trees as fences and hedges to supplement sheep and goats and enhance feed availability during the dry season
- Promote collecting, preserving, and enhancing crop residues, including appropriate farmer training.
- Encourage commercial sheep and goat farms to establish intensive feed gardens using fodder legumes such as *Cajanus Cajan*, *Leucaena*, *Moringa*, and other palatable species in the forested areas.
- Encourage commercial sheep and goat farms that practice zero-grazing schemes by providing subsidies.
- Improve availability and access to agricultural byproducts (cakes, bran, etc.) and raise awareness of the importance of the byproducts of cottage edible oil industries for the livestock sector.
- Train farmers on the construction of small houses for small ruminants. Farmers can construct these houses using locally available materials. Providing farmers with manuals on constructing these small sheep and goat houses can speed up adoption.

Health improvement interventions:

The cattle health service improvement interventions listed under the cattle meat and milk improvement section also apply to sheep and goats. However, the health improvement interventions specific to the sheep and goats are:

- Conduct routine mass vaccinations against PPR and Pasteurellosis. It is targeted to raise the percentage of sheep and goats vaccinated to 80% by the end of five years of the LMP period (2026/27).
- Conduct routine deworming campaigns. It is targeted to raise the percentage of sheep and goats covered under the routine deworming campaign to 60% by the end of the five years (2027).

Genetic improvement interventions:

- Develop a breeding policy for sheep and goats in the coming three years.
- Provide matching grants of US$2000 as seed capital for establishing private breeding farms, which will develop new and improving existing sheep and goat breeds and perform multiplication and distribution of the breeds.
- Encourage commercial sheep and goat farms that practice zero-grazing schemes by providing subsidies.
- Start one community-based local sheep and goat breed improvement scheme
- Sensitize small ruminant owners about the culling of unproductive animals, selection, and retaining good breeding rams and bucks in the flock.
- Strengthen the existing local breed improvement research being carried out by WALIC by providing adequate resources for purchasing additional rams/ewes, training livestock technicians, Geneticists, and equipment.
- Strengthen livestock farmers' associations such as GILMA.

Research and extension improvement interventions:

The cattle research and extension service improvement interventions listed under the cattle meat and milk improvement section also cater to sheep and goats. Additional research and extension improvement interventions specific to sheep and goats are:

- Coordinate and facilitate financial support, training opportunities, and the necessary equipment for WALIC to expand its local sheep and goat improvement program.
- Provide farmers with intensive and consistent training on improved sheep and goat management practices. The proportion of farmers getting intensive and consistent training will reach 50% by the end of the LMP period (2027).

Marketing and processing improvement interventions:

- Construct adequate marketing facilities at the level of the weekly markets at Sare ngai, Sare Bojo, Brikamaba, Wasu, Jareng, Samitenda, Farafeni, Bureng, Kerr pateh, Ndugukebbeh, Fass Njaga Choi, Panchang with fencing livestock holding ground, watering facilities, sheds, toilets and loading rams.
- Form small ruminant owner's cooperatives. The cooperatives can be provided with weighing scales to facilitate the marketing of sheep and goats.

- Improve the infrastructure at the veterinary stations in Yorro Beri Kunda (YBK), Sololo, and Basse.
- Construct two more terminal markets in the coming five years
- Promote the use of appropriate transportation facilities for animals from primary to terminal markets and enforce the use of refrigerated transport facilities for meat transportation.
- Perform a feasibility study within two years to construct tannery and assess the potential market for the processed hides and skins.

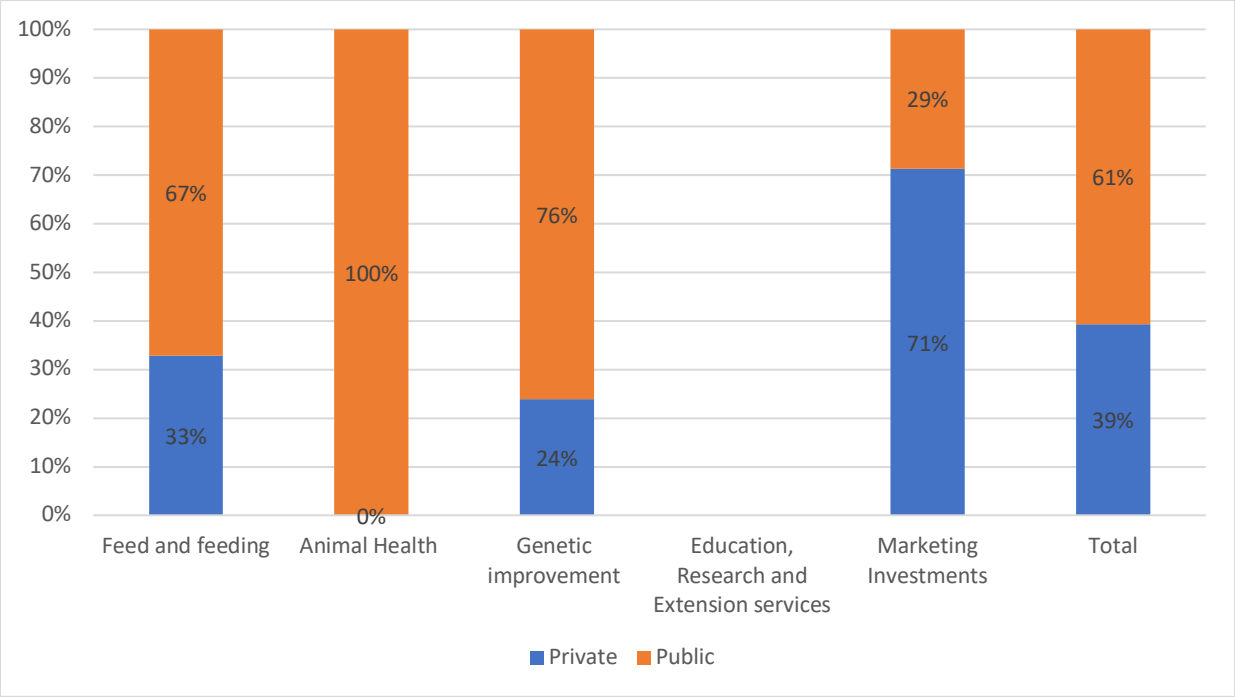
4.8 Investment budget

The total investment in the small ruminant value chain is US$1.5 million (Table 11). Feeds and feeding account for the highest proportions of the investments, followed by marketing and genetic improvement. The private sector and other sources will account for 39% of the investment, while the public sector will account for 61% (Figure 7). Twenty-four percent of the investments are planned for the first year and under 20% in each of the remaining four years, except for marketing investments, where the private sector will shoulder most of the cost (71%). The public sector will bear the highest share of the costs for other categories of interventions (67% to 100%) (Figure 7). Interventions that account for the biggest share of the budget include the construction of five slaughterhouses and five modern meat stalls and the provision of a 40% subsidy on the cost of the establishment of commercial sheep and goat farms that practice zero-grazing schemes.

Table 11: Small ruminants roadmap investment cost by intervention areas

	Total	Private	Public	Share of investments by category
Feed and feeding	625,000	205,000	420,000	40%
Animal Health	135,616	0	135,616	9%
Genetic improvement	335,345	80,000	255,345	22%
Education, Research and Extension services	0	0	0	0%
Marketing Investments	454,385	324,385	130,000	29%
Total	1,550,346	609,385	940,961	100%

Figure 7: Small ruminant investment proportion by intervention areas and source of funding.



4.9 Impacts of interventions

- **Return on investment (ROI) over 20 years**

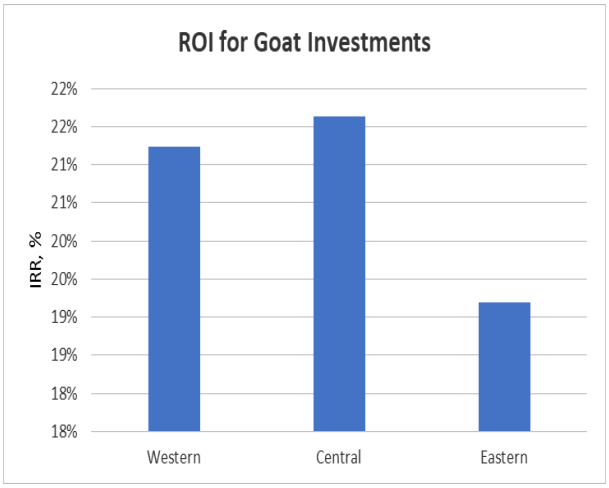
An ROI analysis for the small ruminant sector was conducted over a 20-year period due to the long-term growth of livestock investments. Since there is no one-size-fit-for-all in terms of the duration impacts will be realized from livestock interventions and a lack of synchronization of the listed interventions, a longer time of 20 years is chosen. The livestock sector in The Gambia is still evolving, and it is believed that at this time, the necessary resources would have been gathered for the implementation of the interventions and a better adoption by farmers for the intended benefits to be realized. The three production zones are projected to achieve an internal rate of return (IRR) of 19 to 22% under an investment scenario (Figure 8, frame 1). The Central zone is projected to achieve a higher IRR because it experiences higher current mortalities compared to the other zones. Hence the adoption of vaccination will result in a larger reduction in mortality rates.

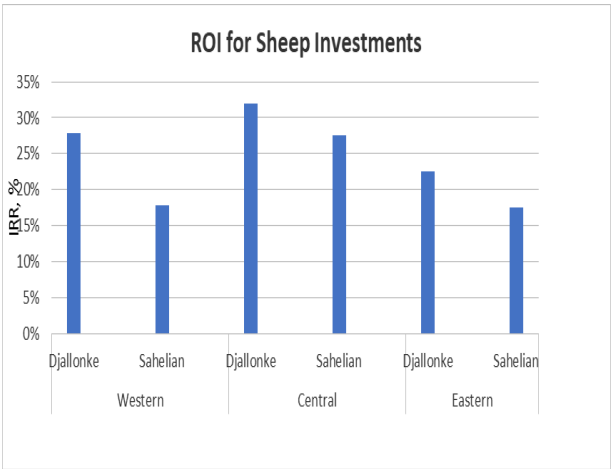
Similarly, a higher IRR is observed among both Djallonke and Sahelian sheep farmers in the Central zone compared to the Western and Eastern zones. The Central zone is projected to record an IRR of 32% and 28% for Djallonke and Sahelian systems, respectively (Figure 8,

frame 2). The Eastern zone will, however, record the least IRR of 23% for the Djallonke system and 17% for the Sahelian system compared to the Western zone's 28% for the Djallonke system and 18% for the Sahelian system under a 20-year investment period. Though the NPV for all production zones are positive, the Central production zone is projected to have the biggest NPV for all breeds showing a larger returns to investing in sheep production in that production zone compared to the others.

The projections suggest that investments in small ruminant interventions, sheep will be financially viable, with larger rates of return for the Central zone and for Djallonke sheep.

Figure 8: IRR values for Goat and Sheep Investments over 20 years.



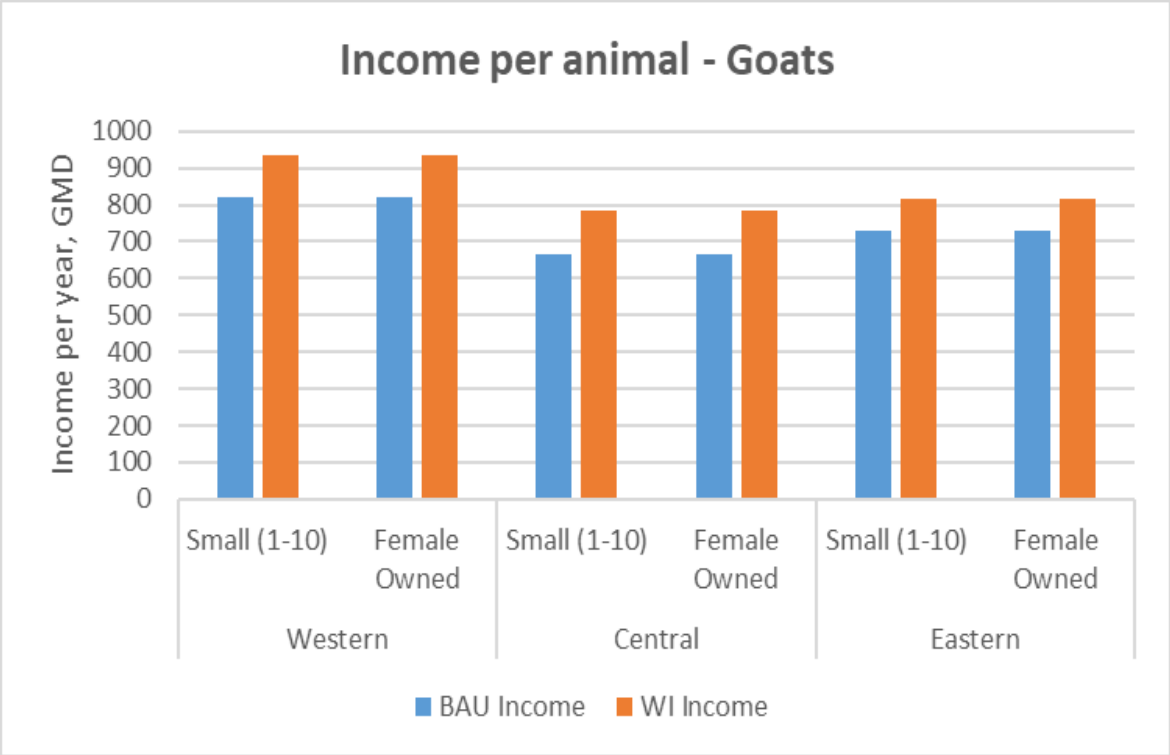


- **Projected Increases in Income per Animal in 15 Years**

Figure 9 shows the projected income per goat after 15 years under both BAU and WI scenarios. The Western production zone is projected to record the highest income per animal, followed by the Eastern production zone and the least by the Central production zone. The income per animal for female-owned and small farms with fewer than ten goats is

GMD 937 under a WI scenario and GMD 822 under a BAU scenario. Likewise, the income per animal for both female-owned and small farms with fewer than ten goats is GMD 814 under a WI scenario and GMD 728 under the BAU scenario in the Eastern production zone. In the Central production zone, income per animal is projected at GMD 786 under a WI scenario, which is GMD 151 less than that of the Western production zone and GMD 28 less than the income per animal in the Eastern production zone (Figure 9).

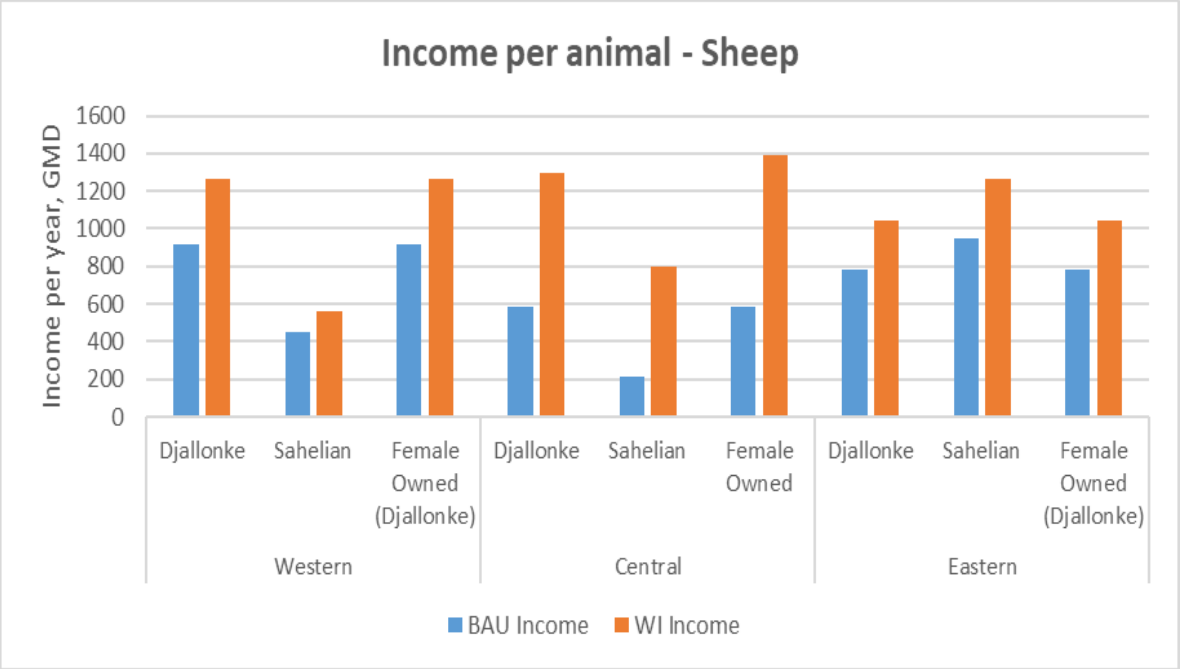
Figure 9: Projected annual income per goat in GMD for BAU and WI scenarios in 15 years (by 2037).



Source: LSIPT results

The annual income per sheep under both BAU and Wi scenarios is projected to be higher than for goats for the three production zones. The Central production zone will record the highest annual income per sheep for female-owned and Djallonke systems under a WI scenario compared to the Western zone's female-owned and Djallonke systems given the same investment scenario (Figure 10). Interestingly, the income per sheep in a WI scenario is more than twice that for female-owned and Djallonke systems in a BAU scenario. Investment in interventions will result in a slight increase in income per sheep under a Sahelian system in the Western production zone (Figure 10).

Figure 10: Projected annual income per sheep in GMD for BAU and WI scenarios in 15 years (by 2037)



Source: LSIPT results

- **Meat Production**

Goat and sheep meat in Gambia is projected to increase substantially when the proposed interventions outlined in the previous sections are implemented. Total meat production from these two species is projected to increase from 1,629 MT in the base year (2022) to 2,539 MT in 2027, a 56% increase (Table 12). The Eastern zone is projected to produce more goat and sheep meat (958MT in 2022 to 1,445MT in 2027) than the Central and Western zones. The analysis projects an increase in goat meat production from 1,125 MT in 2022 to 1,736 MT in 2027, a 54% increase. In the Eastern production zone, goat meat is projected to experience a 51% increase from 610 MT to 919 MT, although the increase will be lower than in other zones.

Sheep meat is projected to increase from 504 MT in 2022 to 803 MT in 2017, a 59% increase. Production in the Eastern zone is projected to increase by 51% from 348MT to 526MT. In contrast, sheep meat production in the Central zone is projected to experience a larger increase (94%) compared to the Western zone (Table 12).

Total manure production from sheep and goats is projected to increase from 52,475 thousand MT to 67,653 thousand MT between 2022 and 2027. Most of the manure in 2027 will come from goats (50,619 thousand MT)— about three times the amount from sheep.

Table 12: Change in goat meat, mutton and other products under the with intervention scenario

Products	Production zone	Production (in MT)						% Change (Base year to 2027)		
		Base year 2022			2027					
		Goats	Sheep	Total	Goats	Sheep	Total	Goats	Sheep	Total
Meat (MT)	Western	231	81	312	370	131	501	60%	60%	60%
	Central	284	75	359	447	146	593	58%	94%	65%
	Eastern	610	348	958	919	526	1,445	51%	51%	51%
	Total	1,125	504	1,629	1,736	803	2,539	54%	59%	56%
Manure (000' MT)	The Gambia	39,276	13,199	52,475	50,619	17,035	67,653	29%	29%	29%

Source: The Gambia LMP analysis

- **Gross Domestic Product (GDP)**

Investments will increase the contribution of goats and sheep to GDP from GMD 429 million in 2022 to GMD 507 million in 2027 (Table 13). Most of the contribution in 2027 will come from goat meat, which is 60% larger than the contribution from sheep. In the Eastern production zone, which produces more goat and sheep meat, the overall contribution is projected to increase from GMD 255 million to GMD 286 million between 2022 and 2027. The Central production zone is projected to have the largest increase in GDP contribution, followed by the Western production zone, although the absolute magnitude of the contribution is far less than for the Eastern production zone.

The contribution to GDP from manure from both goats and sheep is projected to increase by 31% from 2022 to 2027. Contribution from manure from both goats and sheep is projected to increase by 31% respectively between 2022 and 2027.

Table 13: Change in contribution to GDP of goat and sheep products under the with intervention (in million GMD)

Products	Production zone	GDP (in million GMD)						% Change (Base year to 2027)		
		Base year 2022			2027					
		Goats	Sheep	Total	Goats	Sheep	Total	Goats	Sheep	Total
Meat	Western	55.33	26.72	82.05	69.05	31.58	100.63	25%	18%	23%
	Central	66.07	25.41	91.48	78.39	41.80	120.19	19%	65%	31%
	Eastern	142.93	112.12	255.04	163.85	122.27	286.12	15%	9%	12%
	Total	264.32	164.25	428.57	311.29	195.65	506.95	18%	19%	18%
Manure	The Gambia	25.08	19.46	44.53	32.82	25.55	58.37	31%	31%	31%

Products	Production zone	GDP (in million GMD)						% Change (Base year to 2027)		
		Base year 2022			2027					
		Goats	Sheep	Total	Goats	Sheep	Total	Goats	Sheep	Total
All products	The Gambia	553.72	347.95	901.68	655.41	416.86	1,072.27	18%	20%	19%

Source: The Gambia LMP analysis

4.10 Complementary conditions required for success of investments

- The Livestock Department and The Gambia Forest Department, which are in the ministry of Agriculture of The Gambia, need to have synchronized plans and targets to ensure the sustainable use of communal grazing lands and forests.
- Vaccination of sheep and goats for important diseases needs to be consistent and timely pursuit.
- Schemes that can support the emerging commercial sheep and goat farms need to be developed.

4.11 Gender and social inclusion implications for small ruminant value chain development

Women play a major role in small ruminant (sheep and goats) production, mainly as smallholders. The overwhelming majority of farmers involved in goat production are women and youth mainly reared under the extensive production system, but also in small-scale intensive and semi-intensive production systems in some cases. Women own the overwhelming majority of goats in the country - 68%. Most farmers keep sheep and goats under the traditional mixed farming systems where local breeds move in flocks and graze on grasses and shrubs in the locality. In contrast, a minority of farmers practice a market-oriented system (involving feedlots for sheep fattening). According to the DLS Activity Report for 2019, 57 ram fattening schemes, mostly owned by women's groups and individuals, were established in 2019, and a total of 1,310 were fattened and sold in the "Tobaski "market.

Few farmers practice supplementary feeding, particularly for lactating ewes and fattening stock. An increase in women-owned sheep and goats population, especially goats, would mean an increase in women and youth's access to financial resources since goats are easily

converted into cash which is most likely to be spent on things that improve the quality of life for themselves and their families.

4.12 Conclusions

Closing the gaps between domestic consumption and domestic meat production requires significant improvements in many aspects of small ruminant production: feed, animal health, genetics, marketing and processing, and research and extension. Feed improvement through growing fodders and fodder trees as fences and hedges in the backyard, improving the availability and access to agricultural by-products, among others; conducting routine mass vaccinations and deworming against major diseases and pests in relation to animal health improvement; and the host of other interventions will improve animal productivity and population, which will, in turn, increase the production of meat from sheep and goats. The goat and sheep populations are each projected to increase by about 28% between 2022 and 2027. Much of the goat and sheep population will be from the Eastern production zone, whose livestock population is more than twice that of the Western and Central. Investments to implement the proposed interventions in the small ruminant sub-sector are projected to result in a substantial increase in meat production from both sheep and goats. Total meat from both species is projected to increase by 56% by 2027 with proposed investments with a somewhat larger proportional increase for sheep (but a smaller absolute increase). For both species, most of the meat is projected to come from the Eastern zone, where the concentration of small ruminants is high. This translates into higher production of manure from goats and sheep in 2027. With these investments, it is projected that the overall contribution of meat from small ruminants to GDP will increase by 18%, from an initial GMD 429 million in 2022 to GMD 507 million in 2027.

The analysis suggests that government invests in feed, animal health, extension, research, and other important components of the small ruminant value chain. Because the availability of feed is a major problem facing the sector, more effort should be targeted at broadening and updating the inventory of feed and fodder resources to cover all production zones and ensure that farmers are sensitized to focus more on increased fodder production and the adoption of other improved feeding practices. With an enhanced policy environment, many other aspects of the small value chain can be improved.

5 Chicken value chain roadmap (2023 to 2027)

5.1 A summary of results and conclusions from the 15-year livestock sector strategy (LSS)

Traditional backyard poultry is widespread in all regions, with most households in rural and peri-urban areas keeping some birds for domestic consumption and sale at village and weekly markets. The production system practiced is mainly extensive, and women are heavily involved. Recently, commercial poultry production systems have also evolved and are proliferating in the peri-urban areas and around the growth centers. The major challenges affecting the poultry subsector include dependence on imported feeds whose prices are affected by currency fluctuations and that lack quality assurance; non-availability of day-old chicks, as there is only one known breeder, which results in dependence on imports from Senegal; recurrent disease outbreaks, particularly New Castle Disease (NCD) and the occurrence of emerging diseases such as Highly Pathogenic Avian Influenza (HPAI); and inefficient marketing system due to reasons including poor linkages of producers to the markets; flooding of the local markets with cheap imports; poor infrastructure including lack of storage facilities which causes significant post-harvest losses through spoilage.

Proposed interventions to address the challenge of feeds include expansion of training of women and youth farmers on the (a) formulation of simple feed rations using locally available feed resources, (b) feed supplementation and simple management practices; (c) building of low-cost housing using locally available materials; and (d) crop residue conservation techniques for feed use. In breeding, documentation of information on good mothering ability in local chickens by researchers would facilitate possible breed improvement; conservation of indigenous local chicken breeds such as "Firgi" and "Tunguneh"; and re-introduction of affordable local incubators and the cockerel exchange program at the community level. To address the challenge of diseases, vaccination campaigns against NCD were recommended together with the promotion of better management practices (housing, health, and feed packages); training women and youth on poultry vaccination and deworming for wider and better coverage; and sensitizing farmers about disease outbreak reporting, emergency preparedness, and control measures. To address challenges in marketing, the set of interventions that were recommended included conducting sensitization campaigns and promotion of marketing of poultry and poultry products during livestock shows and fairs; organizing Poultry Field and Market Days to coincide with sociocultural events/celebrations;

using other market outlets such as "Loumos" (weekly market), emphasizing and encouraging marketing at the village level.

Results of foresight analysis indicated that:

- Without additional investments (BAU scenario), chicken meat production is projected to increase only 43% from 2022 to 2037, but with investments, growth would be considerably higher.
- The current gap between domestic and domestic production for chicken meat is projected to persist and widen under the BAU scenario. With investments, domestic production is projected to equal domestic consumption between 2032 and 2037.
- Without additional investments, egg production is expected to increase only 71% from 2022 to 2037, but with investments, this production increase is projected to be much larger (more than 600%).
- As for chicken meat, the current gap between domestic and domestic production for eggs is projected to persist and widen under the BAU scenario. With investments, domestic production is projected to equal domestic consumption between 2031 and 2036.

5.2 Five-year LMP vision for the chicken value chain

The vision is to increase the income and nutritional security of chicken producers and all other individuals in the country by raising chicken meat and egg production. The backyard indigenous chicken (BIC) and specialised commercial chickens (SCC) populations are projected to increase by 25% and 331%, respectively, which would significantly increase meat production by 135% for BIC and 421% for SCC over the five-year LMP period (2023/24 to 2028/29). Similarly, egg production in the country is projected to increase by 25% and 218% for the BIC and SCC, respectively. It is also projected that the combined GDP contribution of the poultry sector will increase by 244% during the LMP implementation period.

5.3 Investment scenarios analysed

As with other livestock species, two investment scenarios are examined for chicken and eggs. The two investment scenarios are business as usual (BAU) and with additional investment (WI). These scenarios are assessed for their implications on productivity, farmers' income, chicken meat and egg production, and contribution to GDP. The WI scenario increases farmers' income, chicken meat and egg production, and contribution to GDP through assumed

increases in the number and productivity of chickens. In the case of commercial layers and broilers, the WI scenario primarily targets increasing the number of chickens and complementary input and service improvements. The WI scenario in the case of back-yard chicken, on the other hand, focuses mainly on increasing the productivity per bird of egg and meat production.

5.4 Description of the Chicken Production Systems in The Gambia

Traditional poultry production is the predominant chicken production system in The Gambian farming system. It is extensive and birds are poorly housed, fed, and provided with little or no veterinary healthcare. Small flocks (10 to 15 birds) that are mostly owned and managed by women and children are kept in the back-yard of their owners' households. They are confined during the night in kitchens or locally made shelters to minimize predation, whereas during the daytime, birds are left to scavenge in the back-yards, and supplementary feeds such as millet, coos, brans, and household leftovers are provided in the evenings when they return to the households. The poultry flocks are made up of local breeds that are low producers of meat and eggs compared to exotic breeds. However, the birds are hardy and relatively easy to convert to cash or slaughter for home consumption, and for this reason, they serve as a ready source of income and protein for many households in rural communities.

According to the National Livestock Census (2016), there were 937,951 chickens in The Gambia. Out of these, 94.5 % were produced using the extensive free range traditional/back-yard system, whereas 5.5 % were from intensive/commercial farms. Results of the Census indicate that 67 % of chickens were owned by women.

Almost every Gambian family in the rural areas owns chickens. Commercial farmers keep improved breeds - both broilers and layers. All commercial farmers use complete feeds. Almost all forms of complete poultry feeds are imported into the country.

5.5 Chicken overall LMP targets under the intervention scenario

The total commercial chicken population is projected to increase under the with investment scenario by 331% over five years. In contrast, BIC hens are projected to increase by 25% in the same period (Table 14). The most commercial chicken population is projected to come from broilers, with an estimated 64% of the commercial chicken population in 2027. The broiler population is projected to increase by 438% compared to 218% for the layer population over the five years.

projected to increase by 438% compared to 218% for layer population over the 5-year period.

Table 14: Number of back-yard indigenous and commercial chicken projected for 5 years

Chicken systems	Unit	Base year 2022	2023	2024	2025	2026	2027	% Change
BIC hens number	Numbers	88,108	92,072	96,216	100,545	105,070	109,798	25%
Layers	Numbers	112,755	142,071	179,010	225,552	284,196	358,087	218%
Broilers	Numbers	119,113	166,758	233,461	326,845	457,583	640,616	438%
Total commercial chicken	Numbers	231,868	308,829	412,470	552,397	741,779	998,703	331%

BIC: back-yard indigenous chicken, Source: The Gambia LMP analysis

Over the five years, chicken meat is projected to increase by 315% by 2027 (Table 15). Meat from commercial chickens is projected to make up about 79% of the total projected chicken meat in 2027. Broiler meat is projected to make up most of the projected meat from commercial chickens (95%) in 2027, whereas meat from BIC would make up only 21% of the total meat projected to be produced in 2027. Although commercial meat production is projected to increase by 421%, meat from BIC will witness 135% over five years.

On the other hand, total egg production is projected to increase by 197% over five years (Table 15). Much of this increased egg production is projected to come from commercial layers, with 95.6% of the total egg production in 2027. Egg from BIC is projected to increase by 25%, from 2,643 thousand eggs in 2022 to 3,294 thousand eggs in 2027.

Table 15: Production of chicken eggs and meat from back-yard indigenous and commercial chicken projected for 5 years

	Chicken systems	Unit	Base year 2022	2023	2024	2025	2026	2027	% Change
Meat	BIC	MT	455	540	641	760	902	1,070	135%
	Layers	MT	61	76	96	121	153	193	218%
	Broilers	MT	713	998	1,397	1,956	2,738	3,833	438%
	Total commercial	MT	773	1,074	1,493	2,077	2,891	4,026	421%
	Overall	MT	1,228	1,614	2,134	2,837	3,793	5,096	315%
Eggs	BIC	Thousands	2,643	2,762	2,886	3,016	3,152	3,294	25%
	Layers	Thousands	22,421	28,251	35,596	44,851	56,512	71,205	218%
	Overall	Thousands	25,064	31,013	38,482	47,867	59,664	74,499	197%

BIC: back-yard indigenous chicken, Source: The Gambia LMP analysis

5.6 Opportunities, challenges and strategies

There is a very high demand for eggs and poultry, particularly in the urban and peri-urban areas, and this is satisfied mainly through imports. However, most consumers prefer chicken produced through the traditional extensive (back-yard) system with the belief that they are organic and taste better.

The challenge to traditional back-yard poultry production is centered around the dependence on indigenous chicken breeds that are not very productive, high mortality rates when outbreaks of Newcastle Disease (NCD) and other poultry diseases occur, poor management practices, inadequate access to balanced feeds and veterinary services. The biggest challenge for the commercial poultry sector is the dependence on imported feed and other production inputs and inadequate access to credit.

Strategies for strengthening the performance of the poultry subsector should include the following:

- Upscaling the NCD Vaccination Campaigns to include back-yard poultry farmers to reduce mortality and morbidity during outbreaks.
- Train women farmers on the provision of better management practices (housing, health, and feed packages) for poultry.
- Introduce the provision of hygienic shelters made from locally available materials.
- Sensitize back-yard poultry farmers on disease outbreak reporting, emergency preparedness, and control measures to take when outbreaks occur.
- Promote feed supplementation and improved housing to enhance the capacity of farmers to produce greater numbers of chicks and eggs for sale and domestic consumption.
- Carry out Sensitization campaigns and promote marketing of poultry and poultry products during livestock shows and other events.
- Encourage the usage of other marketing outlets such as "Loumos" (weekly market) to market poultry and poultry products.

5.7 Improving Back-yard indigenous chicken (2023 to 2027)

- **Targets for Back-yard indigenous Chicken**

As stated in the previous section, the BIC hen population will increase by 25% under an investment scenario, and meat from BIC will increase by 135% during the five years (Table

16). Eggs from BIC will increase by 25% over the period, which suggests investments will benefit the farmers and households who focus on BIC production.

Table 16: Number of chickens and chicken eggs and meat production in Back-yard indigenous chicken projected for 2022 to 2027.

Chicken systems	Unit	Base year 2022	2023	2024	2025	2026	2027	% Change
BIC hens number	Numbers	88,108	92,072	96,216	100,545	105,070	109,798	25%
BIC meat production	MT	455	540	641	760	902	1,070	135%
BIC egg production	Thousands	2,643	2,762	2,886	3,016	3,152	3,294	25%

BIC: back-yard indigenous chicken, Source: The Gambia LMP analysis

- **Challenges for back-yard indigenous chicken production in The Gambia Country**

There is a very high demand for eggs and poultry, particularly in the urban and peri-urban areas, and this is satisfied mainly through imports. However, a significant proportion of the population prefers chicken produced through the traditional extensive (back-yard) system with the belief that they are organic and taste better.

The challenge to traditional back-yard poultry production is centred around the dependence on indigenous chicken breeds that are not very productive, high mortality rates when outbreaks of Newcastle Disease (NCD) and other poultry diseases occur, poor management practices, inadequate access to balanced feeds and veterinary services.

Strategies for strengthening the performance of the poultry subsector include the following actions:

- Upscale the NCD Vaccination Campaigns to include back-yard poultry farmers to reduce mortality and morbidity during outbreaks.
- Train women farmers on the provision of better management practices (housing, health, and feed packages) for poultry.
- Introduce the provision of hygienic housing made from locally available materials.
- Sensitise back-yard poultry farmers on disease outbreak reporting, emergency preparedness, and control measures to take when outbreaks occur.

- Promote feed supplementation and improved housing to enhance the capacity of farmers to produce greater numbers of chicks and eggs for sale and domestic consumption.
- Implement sensitization campaigns that promote poultry and poultry product marketing during livestock shows and other events.
- Encourage the usage of other marketing outlets such as "Loumos" (weekly market) to market poultry and poultry products.

- **Back-yard indigenous chicken (BIC) improvement priority interventions and targets**

Feed and feeding intervention:

- Enact regulations and acts that discourage the export of brans and oil seed cakes outside the country within three years.
- Sensitize and train farmers on utilizing and feeding locally available feed supplements, brans, and oil seed cakes to the back-yard chicken. It is targeted that the number of back-yard chicken farmers that supplement their birds with locally available feed supplements, brans, and oil seed cakes will increase to 15% in five years (2023-2027).
- Advise farmers on different possible ration formulas, which can constantly evolve with the dynamic nature of the locally available feed base. Back-yard chicken ration formulas can be produced using locally available feeds, and farmers will be sensitized.

Health interventions:

Many of the health service improvement interventions listed under the cattle meat and milk improvement intervention section also apply to other livestock species, including chickens. The following interventions are specific to the chicken sector:

- Increase the number of vaccinated back-yard chickens against Newcastle and Fowl Pox to 65% by the end of 2027. By 2022 the total number of back-yard indigenous chickens vaccinated against the priority diseases (Newcastle and Fowl Pox) is about 86,500, i.e., about 8.6% (DLS, 2020).
- Increase the percentage of farmers applying internal and external parasite treatments to 65% by the end of 2027. Currently, the practice of applying internal and external parasite treatments to back-yard indigenous chickens is rare.

- Facilitate animal medication access by creating additional veterinary outlets (pharmacies) and cold storage facilities for vaccines.
- Train farmers on biosecurity measures.

Genetic improvement:

- Develop a back-yard indigenous chicken breeding policy in the coming two years.
- Establish a back-yard indigenous chicken breed improvement program and distribute improved indigenous cocks. In five years of the LMP period, it is targeted to start the pilot phase and distribute improved indigenous cocks to farmers for pilot research work.
- This and the below are projected outcomes from investments, not actions.

Table 17: Projected increase in the number of backyard chickens and percent growth rate in the BAU and with additional investment (WI) scenario

Scenarios	Backyard chicken number in different scenarios		population growth rate
	2022 (Base year)	2027	2022 to 2027
Business as usual (BAU)	1,117,173	1,250,222	2.28%
With additional investment (WI)	1,117,173	1,392,202	4.5%

Source: LSIPT results

The extension and research improvement interventions listed under the cattle meat and milk improvement section also cater to different livestock species, including chicken. Additional extension-related interventions that are specific to chicken are:

- Increase the number of farmers that are receiving intensive and continuous chicken improvement trainings (training, exchange visits, farmer advisory services, practical demonstrations) to 20,000 (about 50% of back-yard chicken farmers) by the end of the five years (2027). Currently, very few farmers get back-yard indigenous chicken improvement training.
- Develop back-yard indigenous chicken improvement training manuals in the coming two years and encourage farmers also to engage in the commercial production of indigenous chicken.

Marketing and processing interventions:

- Establish ten indigenous chicken producers' cooperatives and a federation.

- **Impacts of interventions on BIC**

Production impacts

Meat production from BIC is projected to increase by 135% over five years (Table 16). Similarly, the proposed interventions are projected to increase egg production from BIC by 25 in 2027. The increase in meat and eggs from BIC is projected to result from the increase in the population of BIC hens by 25% within the period based on the assumed impact of the interventions described in the previous section.

GDP impacts

The adoption of the proposed interventions is projected to increase the contribution of BIC to GDP. The total contribution of BIC to GDP is projected to increase significantly from GMD 51 million in 2022 to GMD 157 million in 2027 (Table 18). Much of this contribution will come from increased chicken meat, for which a 253% increase is projected. The contribution of BIC egg to GDP is projected to increase much less: 32%.

Table 18: Changes in GDP contribution of the back-yard indigenous chicken for 2022 and 2027 (in Million GMD)

Products	2022	2027	Change in %
Meat GDP contribution	41	144	253%
Eggs GDP contribution	10	14	32%
Total BIC GDP contribution	51	157	208%

BIC: back-yard indigenous chicken, Source: The Gambia LMP analysis

5.8 Scaling up Specialized Commercial Chicken production (2023 to 2027)

- **Specialized Commercial Chicken (SCC) Targets**

The total population of both layers and broilers is projected to increase by 331%, from 231,867 in 2022 to 998,703 in 2027. The broiler population, which makes up 64% of the total projected population in 2027, is expected to increase by 438%, and the layer population is projected to increase by 218% over the five years (Table 19). An increase in animal numbers is projected to increase total SCC meat production from 773 MT to 4,026 MT, a 421% increase. Broiler meat, which is projected to form the majority of the total chicken meat from SCC, is projected to increase by 438% compared to a 218% increase for layers. Eggs are projected to increase by 218%, from 22.4 million to 71.2 million.

Table 19: Increase in number of chicken and chicken eggs and meat production in SCC systems

Chicken farm types	Unit	Base year 2022	2023	2024/25	2025/26	2026/27	2027	% Change
Layers	Numbers	112,755	142,071	179,010	225,552	284,196	358,087	218%
Broilers	Numbers	119,113	166,758	233,461	326,845	457,583	640,616	438%
Total	Numbers	231,867	308,829	412,470	552,397	741,779	998,703	331%
Layers - meat	MT	61	76	96	121	153	193	218%
Broilers - meat	MT	713	998	1,397	1,956	2,738	3,833	438%
Total - meat	MT	773	1,074	1,493	2,077	2,891	4,026	421%
Layers - eggs	Thousands	22,421	28,251	35,596	44,851	56,512	71,205	218%

SCC: specialized commercial chicken, Source: The Gambia LMP analysis

- **Challenges for commercial chicken production in The Gambia**

The constraints/challenges facing both layer and broiler producers are very similar. They are associated with difficulties importing day-old chicks and feed, frequent disease outbreaks, and inadequate market infrastructure. Commercial farmers depend on imported feeds and day-old chicks, making them vulnerable to currency fluctuations and price hikes. Cheaper imported eggs and broilers are distorting the market and putting heavy pressure on local producers.

Strategies for strengthening the performance of the commercial chicken subsector include the following:

- Discourage export of locally produced chicken feed ingredients
- Encourage the establishment of parent-stock farms
- Strengthen the commercial chicken feed, day-old chick, and other inputs quality control/regulation system.

Priority interventions in the Specialized Commercial Chicken (SCC) Value Chain

Feed and feeding interventions

- Strengthen the Food Safety and Quality Authority (FSQA) to improve its capacity to regulate the quality of feeds and feed ingredients. The FSQA can also closely work with the locally available feed quality laboratories.
- Prepare commercial chicken feed quality standards within two years

- Encourage and support farmers to grow maize and soybean with or without irrigation for use as a chicken feed ingredient
- Encourage contract farming between feed millers/processors and cereal farmers by holding matchmaking events.
- Encourage the importation of maize for poultry feed to decrease pressure on indigenous maize production used for human consumption. Also, encourage the importation of other poultry feed ingredients such as soybean, minerals, vitamins, and pre-mixes.
- Improve the utilization of the installed capacity of the existing five commercial chicken feed processing plants and establish additional chicken feed processing plants as required.
- Establish silos for both imported and locally produced chicken feed ingredients and processed chicken feeds in PPP mode in five years
- Conduct additional research on alternative feed ingredients for poultry production.

Table 20: Projected annual feed requirement estimates for the commercial chicken in The Gambia in the coming 5 years[2]

	Farming systems	Commercial chicken annual feed requirement estimates (in tons)	
		2022 (Bas year)	2027
Annual feed requirements	Layers	3,270	10,385
	Broilers	1,787	9,609
	Total	5,057	19,994

Source: LSIPT result and own calculation

Health interventions

- Sensitize indigenous and commercial chicken farmers to vaccinate all their birds against NCD, Gumboro, fowl pox, and Marek's to mitigate the risk of cross infections.
- Train all commercial farmers and traders on biosecurity measures.

Genetic improvement interventions

- Establish one commercial chicken parent stock farm with subsidies from the government within three years.
- Increase the number of hatcheries. Currently, there is demand for about 0.8 million day-old chicks (DOC) per year. The number of hatcheries needs to be increased to meet the expected DOC demand of about 4 million per year (about 3.8 million broilers and 0.2 million layers DOC) by 2027.
- Promote contracts between hatcheries and parent stock farmers.

Table 21: Projected estimate of increase in the number of commercial farms and chicken per farm size under the additional investment scenario

Number of commercial farms and farm sizes	Farming systems	2022 (Bas year)	2027
Commercial chicken farm sizes (in birds)	Layer	1,000	2,000
	Broiler (per cycle)	500	1,000
Number of commercial chicken farms (in number)	Layer	113	179
	Broiler	238	641

Source: LSIPT results and own calculation

Table 22: Projected estimate of increase in the number of commercial chickens and percent growth rate in the BAU and with additional investment scenarios

Scenarios	Farming systems	Commercial chickens in different scenarios		Commercial chicken population annual growth rate in different target years and scenarios
		2022 (Bas year)	2027	2022 to 2027
Business as usual (BAU)	Layer	112,755	126,183	2.28%
	Broiler	119,113	133,298	2.28%
	Total	231,868	259,481	2.28%
With additional investment (WI)	Layer	112,755	358,087	26.00%
	Broiler	119,113	640,616	40.00%
	Total	231,868	998,703	34.00%

Source: LSIPT results

Table 23: Projected estimate of increase in the number of commercial day old chick demand in the with additional investment (WI) scenario

Scenario	Farming systems	Commercial day-old chicks (DOC) in different years	
		2022 (Bas year)	2027
Annual DOC demand in the WI scenario (in birds)	Layers[7]	75,170	238,725
	Broilers[8]	714,678	3,843,696
	Total	789,848	4,082,421

Source: LSIPT results

Extension and research interventions

The extension and research improvement interventions listed under the cattle meat and milk improvement section also cater to different livestock species, including chicken. An additional extension-related commercial chicken-specific intervention is::

[7] To do the DOC estimates for layers, the total population of layers in the 5thyear and the production cycle per year of about 0.7 cycles/year was used

[8] To do the DOC estimates for broilers, the total population of broilers in the 5th year and the production cycle per year of about 6 cycles/year was used

- Support private extension service providers by encouraging veterinary and livestock experts and subsidizing the establishment cost of veterinary pharmacies and input shops. These can serve as veterinary and extension service provision posts.

Marketing and processing interventions

- Develop the appropriate acts and regulations in the coming two years to regulate the import of eggs.
- Promote and support the establishment of cold storage rooms (preferably with solar power) and the development of cold-chain transportation facilities by subsidizing the private sector.
- Promote and support the formation of commercial chicken producer groups/ associations. Strengthen the existing commercial feed producer's association.
- Support contracts between groups of producers and buyers.
- Create platforms for chicken, egg, and chicken input producers and buyers to improve the chicken value chain.

• Impacts of interventions on SCC chicken

Production

Total meat production from broilers and chickens is projected to increase by 421% by 2027 with the implementation of the interventions proposed in the previous section. Most of the meat is projected to come from broilers, with an increase of 428% between 2022 and 2027, compared to an increase of 218% for meat from layers (Table 19). This projected increase in broiler meat production is due to the projected increases in demand due to population increase, urbanization, and higher incomes. Similarly, egg production by layers is also projected to increase by 218 within the LMP period. This projected increase in meat and egg production will be due to the 331% increase in the population of broilers and layers during the period (Table 19).

Income per bird

Results of the analysis reveal a substantial increase in income per bird that will accrue to females that raise birds under the back-yard system when the proposed interventions on the different components of the value chain are adopted. The women in the back-yard system will witness an increase in their income per bird from GMD 582 in 2022 to GMD 2,357 in 2037,

a 305% increase (Table 24). With most women involved in this type of production system, it is important that the needed investments are made to empower women and help transform the sector to improve livelihoods.

Table 24: Annual income per animal in GMD for BAU and WI scenarios in 15 years (by 2037)

Chicken production sub-system	Backyard chicken income per bird (in GMDs)		
	Base year 2023	WI scenario 2037	% Change
Backyard (Female Owned)	582	2,357	305%

Source: LSIPT results

GDP contribution

The contribution of meat and eggs from SCC to the country's GDP is projected to increase by 360% and 197% between 2022 and 2027 (Table 25). About three-quarters of the higher GDP contribution in 2027 is projected to come from increased meat production. However, the total GDP contribution from SCC is projected to increase from GMD 31.5 million to GMD 127 million in five years, about a 300% increase. This will further contribute substantially to the overall contribution of livestock to agricultural GDP and national GDP estimates.

Table 25: GDP contribution from Specialized commercial chicken system 2022 and 2027 (in 10^6 GMD)

Products	2022 (Base year)	2027	Change in %
SCC meat GDP contribution	20.5	94.2	360%
SCC egg GDP contribution	11.0	32.8	197%
Total contribution	31.5	127.0	303%

SCC: Specialized commercial chicken, Source: The Gambia LMP analysis

5.9 Investment budget

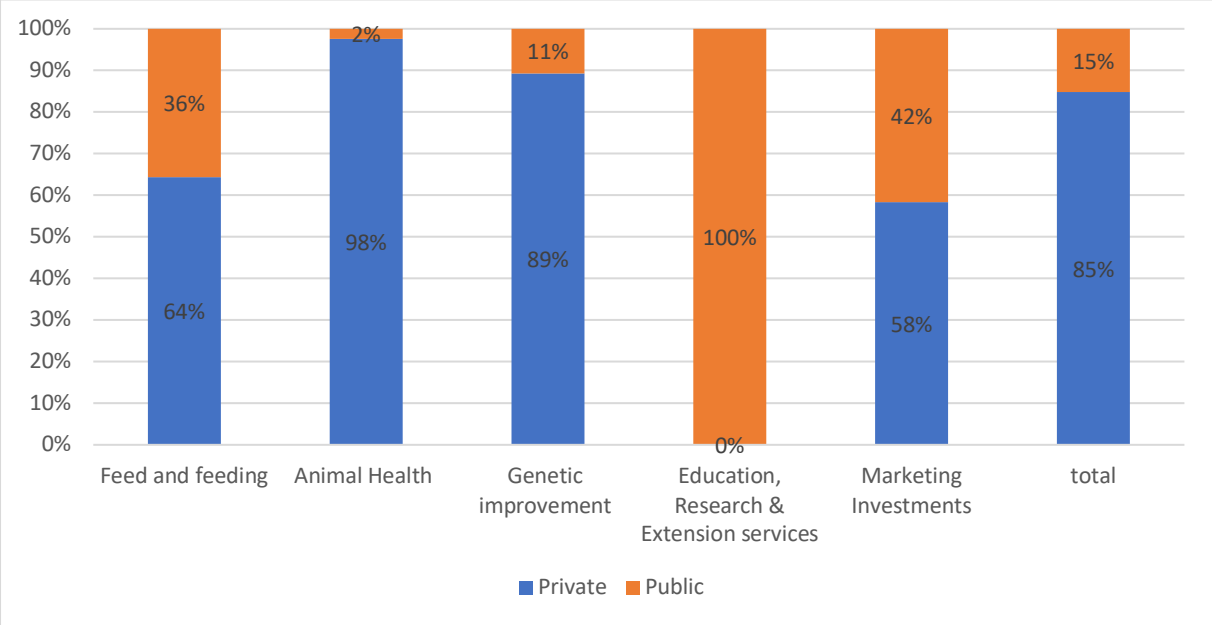
Total investments in chicken meat and eggs are about US$5.7 million during the five years of the livestock master plan. Animal health accounts for the largest share of the investment (54%) (Table 26). Most investments are expected from the private sector (Figure 11). The annual level of investments is planned to rise steadily from about US$840,000 in the first year to US$1,450,000 in year five (Annex Table 8). Specific interventions accounting for the largest share of the total investments include supporting the adoption of the practice of applying internal and external parasite treatments by 65%, increasing the number of hatcheries and hatchery capacity to meet the expected DOC demand of about 4 million, increasing the number of vaccinated back-yard chickens against Newcastle and Fowl Pox to 65)" and

promoting the establishment of cold storage and purchase of cold transportation facilities by subsidizing the private sector (Table 26).

Table 26: Chicken roadmap investment cost by intervention areas (USD)

	Total	Private	Public	Share of investments by category
Feed and feeding	995,000	639,500	355,500	18%
Animal Health	3,076,830	3,001,830	75,000	54%
Genetic improvement	860,000	768,000	92,000	15%
Education, Research & Extension services	50,000	0	50,000	1%
Marketing Investments	690,000	402,000	288,000	12%
Total	5,671,830	4,811,330	860,500	100%

Figure 11: Chicken investments by intervention areas and source of funding.



5.10 Impact of chicken improvement interventions on the total chicken meat and egg production and GDP contribution

- **Total Chicken Eggs and Meat production**

Additional investments in the proposed chicken improvement interventions in both the back-yard and the specialized commercial systems are meat and egg production from the base year. Total chicken meat is projected to increase by 315% within five years from an initial 1,228MT to 5,096MT (Table 27). The majority of this is projected to come from chicken in the SCC,

whose contribution will be 3.8 times more than the contribution from BIC. While meat from the SCC system is projected to increase by 421%, that of BIC will increase by 135% within five years. On the other hand, total egg production resulting from investments in chicken improvement interventions is projected to increase by 197%. Like meat production, the majority of this is projected to come from the SCC system, with a contribution that is about 22 times more than that of the BIC system. This is due to the increased animal population that will result from the additional investments in the interventions.

Table 27: Total chicken meat and eggs production estimates in the with additional investment scenario

Products	Unit	2022 (Base year)	2027 in the WI scenario	% Change
Total chicken meat from the back-yard indigenous systems	MT	455	1,070	135%
Total chicken meat from SCC system	MT	773	4,026	421%
Total chicken meat production	MT	1,228	5,096	315%
Total eggs from back-yard indigenous systems	Thousands	2,643	3,294	25%
Total eggs from SCC Layers	Thousands	22,421	71,205	218%
Total egg production	Thousands	25,064	74,499	197%

SCC: Specialized commercial chicken, Source: The Gambia LMP analysis

- **Total Chicken GDP Contribution**

It is projected that an increase in meat and egg production from both BIC and SCC systems resulting from additional investments in chicken improvement interventions will increase the contribution of chicken to GDP. Total GDP contribution of chicken meat and eggs from both systems is projected to increase by 244%, from GMD 82.70 million in 2022 to GMD 284.47 million in 2027 (Table 28). contribution from BIC to GDP will increase by 208% over the period compared to 303% for SCC, though, in terms of magnitude, the contribution of BIC will be more than that of SCC in 2027.

Table 28: Estimate of total chicken meat and eggs GDP contribution in the with additional investment scenario (in Million GMD)

Products	2022 (Base year)	2027 in the WI scenario	Change in %
Back-yard indigenous chicken meat and eggs GDP contribution	51.21	157.49	208%
Specialized chicken meat and eggs GDP contribution	31.5	127.0	303%
Total GDP contribution of chicken meat and eggs	82.70	284.47	244%

Source: The Gambia LMP analysis

Return on investment

Similar to the back-yard indigenous system, the returns on investment under the specialized commercial chicken system indicate that investing in either layer or broiler production is expected to be financially viable. The 20-year NPV analysis for the layer production (GMD 4.8 million) and broiler production (GMD 776 thousand) are both positive, suggesting that the discounted present value of future cash flows related to investment in both production systems will be positive and hence attractive.

5.11 Complementary conditions required for success of investments

- **Making land and finance available for investors in the commercial chicken system**

- Ensure strong quality control of processed chicken feed and feed ingredients, and other chicken inputs
- Do more research on back-yard indigenous chicken to improve their productivity while keeping their merits

5.12 Gender and social inclusion implications for chicken value chain development

In the Gambia, traditional/backyard poultry production predominates in all production zones. Most households in rural and peri-urban areas keep some birds for domestic consumption and sale at the village level and weekly markets. Often the Small flocks of backyard poultry are owned and managed by women and children. Poultry production in the Gambia for both exotic and local breeds is constrained by the lack of balanced poultry feed and the high cost of feed, poor housing, and diseases, especially New Castle Disease (NCD), which has extremely high mortality and morbidity rates (almost 100%).

Enhancing productivity in backyard poultry activities through improved animal health, particularly vaccination against NCD, and improvement in poultry housing and feeding will play an important role in the economic empowerment of women and youth due to increased earnings from sales of birds and eggs. The enhanced availability of chicken meat and eggs will contribute to better nutrition for all, especially women and children. Due to the prominent role of women and youth in poultry activities, the delivery of extension messages and other interventions should actively target them to have a higher chance of success.

The scope for leveraging the poultry value chain to address the challenges of widespread poverty and poor nutrition among vulnerable groups such as women in the Gambia is big owing to a huge market for poultry and poultry products considering the tourist industry, which includes both the formal and informal sectors Hotels and the fast-growing bed and breakfast providers in private properties.

5.13 Conclusions

As significant as poultry is to the majority of households in the Gambia, and the growing interest in commercial poultry production, the number of constraints identified in the areas of feed, animal health, provision of services, and marketing, among others, are limiting the benefits that poultry provides to individuals, households, and the economy. Poultry, particularly traditional back-yard chicken, forms a major part of the diet of most Gambian homes and is significant in serving as a source of investment for meeting other household demands. It is one of the main agricultural activities for women and other vulnerable groups in The Gambia. Still, little attention has been given to its improvement compared to the other species though some strides have been made. With the demand for both chicken meat and eggs projected to increase due to factors such as urbanization, population growth, and increase in incomes, there is the need to focus on interventions that will improve the industry in the areas of feed quality and quantity, animal health, provision of support services such as extension and veterinary, marketing, processing, research, genetic improvement, and access to credit by farmers.

The proposed improvement intervention requires private and public investment to ensure that the sector is given appropriate attention and support. Promotion of biosecurity measures at the individual, household, community, regional and national levels are needed in animal health improvement. The availability and quality of feeds, strengthening poultry producers' associations, and improving processing facilities, are some of the interventions needed to support the growth of the layer and broiler chicken population. With the much-needed investments in the areas mentioned, it is projected that both BIC and SCC populations will increase by 25% and 331%, respectively, which will significantly increase meat production by 135% for BIC and 421% for SCC over the five years. Egg production from BIC is also projected to increase by 25%, while that of SCC will increase by 218% and a combined GDP contribution of 244% over the period. These increases will positively impact the livelihoods of women poultry farmers.

6 Complementary and the added value of the LMP to the livestock budget planning of the government of The Gambia

The Gambia LMP was prepared to complement the budget and livestock planning process. The following section discusses the complementarities of the Gambia LMP with the National Development Plan (NDP), Agriculture and Natural Resource Policy (ANRP), and the Gambia National Agricultural Investment Plan (GNAIP. The Gambia livestock budget is analysed to highlight the added value of the LMP, then discusses any overlaps in livestock budget and LMP strategies and activities so that the Ministry of Agriculture or Animal Production Department can rationalize the budget allocated towards livestock sector and, where necessary, to improve the implementation potential of investment.

6.1 The Gambia Livestock Master Plan (GLMP)

The Gambia LMP, which includes LSA, LSS, and the investment roadmaps, has been produced through a quantitative analysis using a herd and economic sector model (HESM) developed by experts from the ministry of agriculture department and ILRI team. The HESM developed in the LSA and LSS made possible the elaboration of the detailed five-year investment plans, which make up the livestock value chain roadmaps, with each roadmap having focused interventions, investment budget activity and time plans. As explained in the introduction to the LSA, the objective of the Gambia LMP is to provide quantitative and evidence-based justification for greater public and private funding of sector investments. The LSS analysis resulted in recommended and prioritized livestock value chains and investment interventions with the most potential to further modernize the sector. The recommended investments have been chosen based on an analysis of the returns on investment (ROIs) in additional combined technology and policy options. The LSS foresight or future impact analysis resulted in investment roadmaps for dairy, red meat, and chicken.

Summary of total LMP budget

Table 29 presents the consolidated budget for the dairy and beef, small ruminants, and poultry value chains. Implementation of the proposed interventions in the GLMP in the first five years will cost about US$44.2 million, with the public and private sectors contributing US$ 33.2

million and 11.0 million, respectively. Investments in animal health will account for 35% of the investments, closely followed by education, research, and extension services (33%).

Table 29: consolidated budget for the LMP priority livestock value chains

Overall	Total	Private	Public	Share of investments by category
Feed and feeding	5,991,880	3,239,190	2,752,690	14%
Animal Health	15,579,265	3,538,649	12,040,616	35%
Genetic improvement	4,475,316	1,204,486	3,270,831	10%
Education, Research and Extension services	14,559,051	2,000,000	12,559,051	33%
Marketing Investments	3,587,473	976,385	2,611,088	8%
Total	44,192,985	10,958,709	33,234,276	100%

6.2 Value addition of the LMP process

The priority livestock value chains of the Gambia LMP are cattle, sheep and goats, and poultry. In preparing the LMP, the animal husbandry department and ILRI team of experts tried not to duplicate the strategies covered in the NDP and ANRP.

In the LMP, the prioritized set of livestock roadmaps recommended are three and are somewhat differently focused: cattle (N'dama, Zebu/Gobra and commercial dairy), small ruminants (Djallonke, Sahelian and Female Owned (Djallonke)) and poultry (layer, broiler, local and improved backyard chicken. The choice of the recommended livestock value chains in the LMP is well explained, as well as the contribution of the livestock sector to the country's development objectives.

The LMP adds a more detailed quantitative analysis of the current state of the livestock sector and proposes future investment interventions which could help achieve the country's development objectives and the NDP and ANRP targets.

In the LMP, the HESM was used to do the following additional quantitative analyses:

- Projecting the future demand for the priority livestock products and setting production targets to meet this future demand
- Identifying the challenges and opportunities faced in achieving the targets

- Making the links between the interventions chosen and their impacts on LMP and livestock development in the country
- Calculating the expected returns from proposed investments (ROIs) in alternative interventions to achieve the targets
- Calculating the intervention impacts on the country's development goals: country's income growth (GSDP), employment, farmer investment
- Specifying the additional investments (public-private partnership) required to implement the interventions and reach the LMP targets
- Identifying the complimentary success factors needed to achieve the projected impacts
- Identifying policy changes needed to achieve the technology results to be combined with the technology interventions

In the LSS, future demand growth was determined by rates of change in human population and urbanization and per capita income and the income elasticities of demand for the various livestock food products. However, no projection has been made to prepare the government's 2022/23 livestock budget and set the targets in the NDP and ANRP. In the LSS/investment roadmaps, the following measures were taken to ensure that the targets and results of the projections were reliable:

- Several sessions of virtual meetings and in-country visits for data collection were undertaken, in which the LMP team cross-checked the data and model results.
- Estimates of technical productivity parameters, population numbers and economic and financial data, as well as information on the opportunities, challenges and interventions used to specify the HESM model, were collected from published literature and cross-checked by experts from different organizations working in the livestock sector in the Gambia.
- One-on-one consultations and group-level technical discussions were held to get expert agreement on all data and parameters and to ensure realistic model projections and results.
- Data projections were made using the HESM and sensitivity analysis was carried out to identify critical data and parameters impacting the targets and projections of results.
- The experts further cross-checked and validated model results at several virtual stakeholder workshops, where the NTT and external experts representing

government departments, research and the private sector attended. All parameters, projections and results were endorsed.

- Some of the more important examples of the added value of the Gambia LMP is that LMP has analyzed details of the livestock sector of the Gambia before proposing any investment. The LMP analysed the impacts of recommended interventions on gender, by focusing on value chains that women are engaged currently in the Gambia and provides strategies and activities for institutionalizing gender and social inclusion sensitive interventions. The LMP, besides presenting impacts of interventions, projected demand requirements, base year, and projected impacts of interventions on mean household income and GDP. The LMP presents the base year and projected impacts of interventions on HH income (or poverty reduction), GDP (or national income), food and nutritional security, surplus production for exports, income for investment generation, etc. Three livestock production zones were identified and considered in the LMP to contextualize the different opportunities, challenges, and interventions.
- The base year and projected impacts of interventions on GDP or national income growth. GDP contributions are also disaggregated by value chains, agroecological zones, species, breed, and herd size. This disaggregation helps to prioritize value chains, species and breeds, as well as allocation of funding. In the NDP and ANRP, the projected impacts of interventions are not available. Impacts of interventions on livestock population, household income, and GDP can be traced from animal to production zone/national level in the LMP. Furthermore, since the uptake of the proposed investment interventions could be limited by the availability of input resources, especially feed and land, an analysis of feed balance was done to see the potential increase in milk, meat, and egg production, given the limitation of land and feed resources.
- The LMP complements the NDP and ANRP because those do not project the impacts of interventions. Furthermore, because the uptake of the proposed investment interventions could be limited by the availability of input resources, especially feed and land, an analysis of feed balance was done to see the potential increase in milk, meat and egg production given the limitation of land and feed resources.

6.3 The Gambia Livestock Perspective Plan (Summary of Existing Agric./Livestock Plans).

The livestock sector in The Gambia does not have a /standalone sectoral strategic plan or policy. However, the policy environment for the Livestock Subsector is anchored on two policies that are closely interlinked in terms of Visions and Objectives:

a) The National Development Plan (NDP) (2018-2021)
b) The Agriculture and Natural Resources Policy (ANR) (2017-2026)
c) The Gambia national agricultural investment plan (GNAIP) (2019-2026)

The policy objectives of the NDP were the creation of "a modern, sustainable and market-oriented agriculture and livestock sector for increased food and nutrition security, income and nutrition security, employment generation, poverty reduction, and economic transformation". This policy document set the following targets for the livestock sector that were to be met within three years:

Increase cattle production by 8%, Sheep by 5%. Goats by 11% Backyard Poultry by 8% and Commercial Poultry by 6%.

The ANR 2017-2026 was developed with a significant departure from the development emphasis of the last twenty years and is founded on a vision for creating "a marketed-led commercialized, efficient, competitive and dynamic ANR sector in the context of sustainable development".

The Policy is guided by the over-arching objective of maximization of poverty reduction and enhancement of food, income and nutrition securities through the optimal utilization of the resources of the sector consistent with safeguarding the integrity of the environment.

The ANR recognizes that the continued growth and expansion of the livestock industry will depend on the availability of a quality, reliable and inexpensive supply of animal feed and feed supplements. Thus, further efforts in diversifying the rudimentary feed industry are being undertaken to sustain the comparative and competitive advantage in producing meat, eggs and milk for domestic consumption and expanded export.

The ANR Policy (in conformity with the LMP) reiterates that satisfying the increased demand for animal products and easing pressure on natural resources imposed by animals will require the adoption of intensification. Thus, both propose the upscaling of intensification, such as ram fattening schemes and the establishment of compost pens for improved meat, milk, manure production, and draught power. Thus, these activities and their needed technical,

financial and institutional support for their widespread dissemination constitute the core of the sub-sector policy strand for the ANR 2017-2026 policy. The mentioned activities, among others, include the following:

- Improvement of the feeding systems for cattle, small ruminants, and poultry by increasing the availability of high-quality forage, conserving and feeding cereal crop residues.
- Improvement of the genetic potential of local species (cattle, small ruminants, and poultry) through selection (open nucleus breeding systems), crossbreeding and importing exotic genetic material.

Analysis of technical feasibility and financial profitability of intensification of enterprises so that husbandry practices needed to advance the industry can be formulated for dissemination by the extension services. The LMP investment road map contributes relevant information about the feasibility and cost-effectiveness of the intensification approaches being promoted by the ANR Policy

The Gambia National Agricultural Investment Plan II (GNAIP II)

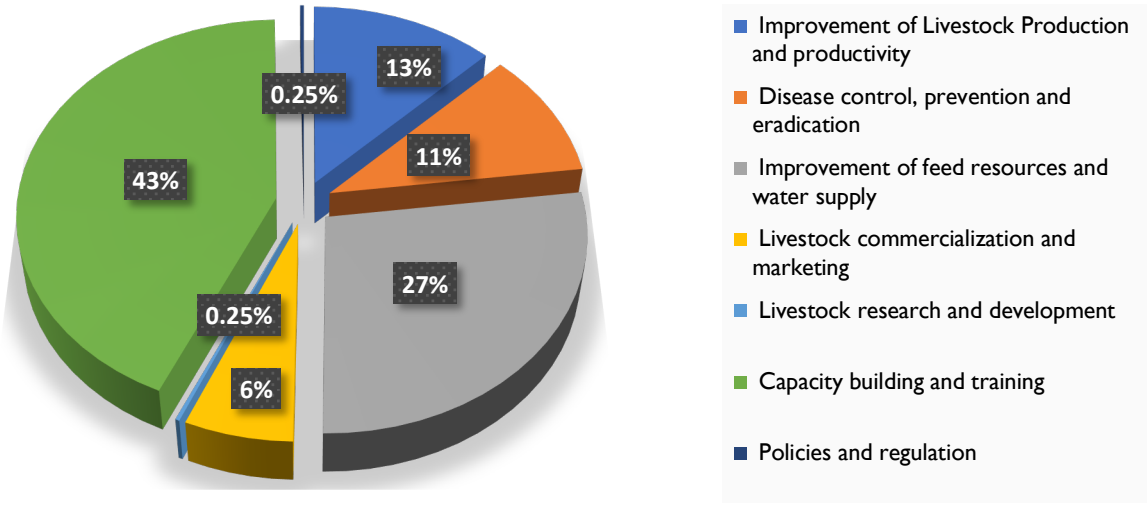
The Gambia Agriculture Investment Plan (GNAIP) II constitutes the main investment framework for agricultural development in The Gambia in the medium term (2019-2026). The GNAIP aims to increase food and nutrition security at the household level, including for vulnerable households, through increased ANR productivity based on sustainable use and management of natural resources in support of national goals of poverty reduction and improved livelihood. The GNAIP II constitutes six priority axes: 1. Production and value chain promotion on food crops and vegetable sub-sector; 2. Production and value chain promotion on livestock husbandry and pastoralist sub-sector; 3. Production and value chain promotion in the fishery and aquaculture sub-sector; 4. Production and value chain promotion in the forestry and environment sub-sector; 5. Food and nutrition security, resilience, and social protection; and 6. Promote good governance of the whole agriculture and natural resources sector. Priority axes 1-4 include capacity building, youth employment and women empowerment, climate change adaptation, and regional trade promotion, while the 6th includes Institutional capacity, steering and coordination, monitoring and evaluation, and communication.

Table 30: Estimated GNAIP-NFS Cost by priority intervention area

Strategic Axis Component	Cost (US$ Million)	%
Program 1: Production and value chain promotion on food crops and vegetable sub-sector	161.47	44.19
Program 2: Production and value chain promotion on livestock husbandry and pastoralist sub-sector	59.48	16.28
Program 3: Production and value chain promotion on fisheries and aquaculture sub-sector	75.55	20.67
Program 4: Production and value chain promotion on forestry and environment sub-sector	9.13	2.5
Program 5: Food Security, Nutrition, Resilience, and Social Protection	49.76	13.62
GNAIP Coordination, Monitoring, and Evaluation	10	2.74
Total base cost	365.42	100
Contingency - 5%	18.271	5
Total Cost	374.22	102.41

The total budget of the GNAIP II for 2019 – 2026 is estimated at US$374.22 million, of which the base cost is US$356.40 million (Table 30). This budget comprises five main programs and the GNAIP Coordination, Monitoring, and Evaluation. The budget allocated for the production and value chain promotion of Livestock husbandry and pastoralist is US$59.48 million, which is about 16.69% of the total GNAIP II budget (Table 30) and 135% of The Gambia LMP budget (Table 29). The principal livestock activities budgeted in GNAIP II and their share within the total livestock budget are shown in (Figure 12). Capacity building and extension, animal health, and feed are allocated with about 81% of the total livestock GNAIP II budget. This corresponds with the Gambia LMP budget allocation, which has allocated about 82% of the budget to education and extension, animal health, and feed improvements (Table 29).

Figure 12: The GNAIP II budget proportion for the main components of to livestock sector.



6.4 Budget of the Ministry of Agriculture and Department of Livestock Services for Fiscal Year 2022

The total recurrent budget allocated to the Ministry of Agriculture for the Fiscal Year 2022 was D215 million out of which D9.5 million (4.4%) was allocated to the Department of Livestock Services under the subheading Livestock Production and Productivity. However, the nomenclature of the subheading is misleading as almost the entire budget is for administrative purposes with the major expenditure items being travel expenses, maintenance of vehicles, conferences and seminars and purchase of fuel and lubricants.

A total of D282,862 (or 1.2% of the entire Development Budget for the country) was allocated to the Ministry of Agriculture for the Fiscal Year 2022. (Ministry of Finance and Economic Affairs, 2023).

The reason for the low levels of allocation of funds to the Ministry of Agriculture and its Departments may be attributable to the fact that most of the development/technical work they conduct are funded by projects and the funds are managed by Central Projects Coordinating Unit (CPCU) of the Ministry of Agriculture.

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8 Annexes

Annex Table 1: Cattle production system- average productivity parameter

Cattle parameters		Production zones/systems						
		Western		Central		Eastern		Urban and per-urban dairy
		N'dama	Zebu/Gobra	N'dama	Zebu/Gobra	N'dama	Zebu/Gobra	Small
I. Age class structure (percent)								
Female	Juvenile	9%	8%	9%	6%	9%	7%	14%
	Sub-adult	22%	16%	23%	15%	22%	13%	19%
	Adult	41%	36%	42%	28%	40%	30%	44%
Male	Juvenile	9%	8%	9%	6%	9%	7%	12%
	Sub-adult	12%	16%	11%	15%	13%	13%	3%
	Adult	7%	15%	6%	30%	8%	30%	7%
II. Demography								
Reproduction								
	Parturition rate (/year)	0.48	0.52	0.49	0.51	0.49	0.52	0.70
	Rate of net prolificacy	1	1	1	1	1	1	1
	% of females at birth	50%	50%	50%	50%	50%	50%	50%
Mortality (%)								
Female	Juvenile	16%	22%	16%	25%	17%	25%	10%
	Sub-adult	6%	8%	6%	7%	6%	8%	5%
	Adult	3%	5%	3%	4%	3%	6%	3%
Male	Juvenile	16%	22%	16%	25%	17%	25%	10%
	Sub-adult	6%	8%	6%	7%	6%	8%	5%
	Adult	3%	5%	3%	5%	3%	6%	3%
Offtake (%)								
Female	Juvenile	0%	0%	0%	0%	0%	0%	1%
	Sub-adult	2%	0%	2%	0%	2%	0%	3%
	Adult	3%	0%	3%	0%	3%	0%	8%
Male	Juvenile	10%	0%	12%	0%	8%	0%	30%
	Sub-adult	15%	0%	20%	0%	10%	0%	60%
	Adult	25%	0%	30%	0%	20%	0%	10%
III. Production								
Live weight (kg/animal)								
Female	Juvenile	59	77	50	65	50	65	50
	Sub-adult	155	200	150	195	150	195	120

Cattle parameters		Production zones/systems						
		Western		Central		Eastern		Urban and per-urban dairy
		N'dama	Zebu/Gobra	N'dama	Zebu/Gobra	N'dama	Zebu/Gobra	Small
	Adult	225	293	215	270	208	280	250
Male	Juvenile	62	81	52	68	52	68	65
	Sub-adult	158	205	156	200	156	200	120
	Adult	300	390	295	380	295	380	300
Meat								
	Dressing percentage (%)	47%	50%	47%	50%	47%	50%	50%
Financial price of offtake (/animal)								
Female	Juvenile	6,000	10,000	5,000	8,000	5,000	8,000	10,000
	Sub-adult	20,000	33,000	18,000	30,000	18,000	30,000	33,000
	Adult	20,000	33,000	18,000	30,000	18,000	30,000	33,000
Male	Juvenile	7,000	12,000	6,000	10,000	6,000	10,000	12,000
	Sub-adult	25,000	42,000	22,000	33,000	20,000	37,000	42,000
	Adult	35,000	58,000	30,000	47,000	28,000	50,000	58,000
Milk (liter)								
	Length of milking period (days)	305	305	305	305	305	305	300
	Milking quantity per day (liter/cow)	1.1	2.2	1.1	2.2	1.1	2.2	8.0
	Production (liters)	335.50	671.00	335.50	671.00	335.50	671.00	2400.00

Annex Table 2: Goat production system- average productivity parameter

Goat parameters		Production zones/sub-systems					
		Western		Central		Eastern	
		Small (1-10)	Female Owned	Small (1-10)	Female Owned	Small (1-10)	Female Owned
I. Age classes structure (%)							
Female	Juvenile	14%	14%	15%	15%	15%	15%
	Sub-adult	14%	14%	15%	15%	15%	15%
	Adult	44%	44%	47%	47%	47%	47%
Male	Juvenile	13%	13%	14%	14%	14%	14%
	Sub-adult	9%	9%	8%	8%	8%	8%
	Adult	6%	6%	2%	2%	2%	2%
II. Demography							
Reproduction							

Goat parameters		Production zones/sub-systems					
		Western		Central		Eastern	
		Small (1-10)	Female Owned	Small (1-10)	Female Owned	Small (1-10)	Female Owned
	Parturition rate (/year)	1.25	1.25	1.25	1.25	1.25	1.25
	Rate of net prolificacy	1.25	1.25	1.25	1.25	1.25	1.25
	% of females at birth	50%	50%	50%	50%	50%	50%
Mortality (%)							
Female	Juvenile	40%	40%	43%	43%	42%	42%
	Sub-adult	15%	15%	15%	15%	16%	16%
	Adult	9%	9%	9%	9%	6%	6%
Male	Juvenile	40%	3%	43%	42%	42%	42%
	Sub-adult	15%	15%	15%	15%	16%	16%
	Adult	9%	9%	9%	9%	6%	6%
Offtake (%)							
Female	Juvenile	2%	2%	2%	2%	2%	2%
	Sub-adult	5%	5%	5%	5%	5%	5%
	Adult	11%	11%	9%	9%	12%	12%
Male	Juvenile	15%	15%	16%	16%	15%	15%
	Sub-adult	40%	40%	60%	60%	60%	60%
	Adult	65%	65%	90%	90%	90%	90%
III. Production							
Live weight (kg/animal)							
Female	Juvenile	5	5	5	5	5	5
	Sub-adult	10	10	10	10	10	10
	Adult	25	25	25	25	25	25
Male	Juvenile	6	6	6	6	6	6
	Sub-adult	12	12	12	12	12	12
	Adult	20	20	20	20	20	20
Meat							
	Dressing percentage (%)	55%	55%	55%	55%	55%	55%
Financial price of off taken (/animal)							
Female	Juvenile	2,500	2,500	1,700	1,700	2,500	2,500
	Sub-adult	3,000	3,000	2,500	2,500	3,000	3,000
	Adult	3,000	3,000	3,000	3,000	3,000	3,000
Male	Juvenile	2,000	2,000	2,000	2,000	2,000	2,000
	Sub-adult	2,500	2,500	2,500	2,500	2,500	2,500
	Adult	3,500	3,500	3,500	3,500	3,500	3,500
Milk (liter)							
	Length of milking period (days)	127	127	127	127	127	127
	Milking quantity per day	0.1	0.1	0.1	0.1	0.1	0.1

Goat parameters		Production zones/sub-systems					
		Western		Central		Eastern	
		Small (1-10)	Female Owned	Small (1-10)	Female Owned	Small (1-10)	Female Owned
	(liter/reproductive female)						
	Production (liters)	8.23	8.23	8.23	8.23	8.23	8.23

Annex Table 3: Five-year investment budget of cattle

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Feed											
Demarcate, map, and Gazette grazing areas and stock routes and establish local conventions				17,500	17,500	17,500	17,500	17,500	87,500	100 %	0%
Sensitize and train farmers on the prevention and control of bushfires				10,000	10,000	10,000	10,000	10,000	50,000	100 %	0%
Train farmers on use of intensive feed gardens & establishment of own pastures using grasses like adropogon gayanas, Panicum, Brachiaria species and fodder trees to supplement selected milking cows.										100 %	0%
Construction of access / slipways in areas where riverbanks are high in the Eastern production zone (20 @ US$20,000 - 30000) construct 4 /year	Count	20	20,000	80,000	80,000	80,000	80,000	80,000	400,000	100 %	0%
Construction of boreholes for herd owners. A total 70 in five years of the LSS duration.	Count	70	11,134	155,876	155,876	155,876	155,876	155,876	779,380	50%	50%
Develop low-lying areas (manmade and natural depressions) for water harvesting (Area for 1 unit=10,000m^2 and cost for dam liners=US$3.1) Encourage development partners (NGOs) to support this activity.	Count	40	40,000	320,000	320,000	320,000	320,000	320,000	1,600,000	70%	30%
Sensitization campaigns on harvesting of green feeds during the wet season and conserve them for use in the dry season.			10,000	10,000	10,000	10,000	10,000	10,000	50,000	100 %	0
Sensitization campaigns on collection, preservation, and				10,000	10,000	10,000	10,000	10,000	50,000	100 %	0%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
utilization of locally produced crop resides.											
Improve the availability of dairy farming professionals by increasing accessibility of long-term training (50 Diploma holders).	Count	50 diploma holders	6,000	60,000	60,000	60,000	60,000	60,000	300,000	50%	50%
Provision of long-term financial loans for commercial dairy farms to establish and operate the farms (Government to provide 30% guarantee fund to the banks)	Count	30 farmers	35,000/ farmer	210,000	210,000	210,000	210,000	210,000	1,050,000	70%	30%
Supporting establishment of a fodder and fodder seed producers' association (covering some of the operational cost for the first 2 years plus capacity building)	association	1	5,000	0	0	5,000	0	0	0	100 %	0
Animal Health											
Vaccination against CBPP: increase coverage from the current 75% to about 80% in the coming five years and to keep it constant till the end of 2037. (Vaccination twice each year)	Heads of cattle vaccinated	5% more cattle	0.64	18,551	18,949	19,355	19,770	20,194	96,819	0%	100%
Vaccination against HS, BQ and LSD: increase from the current coverage to about 80%	Heads of cattle vaccinated			20,000	20,000	20,000	20,000	20,000	100,000	0%	100%
Vaccination coverage against CBPP, HS, BQ, LSD, and Anthrax and chemoprophylaxis against tick-borne and blood parasitic infectious diseases maintained at the current rate of about full coverage	Heads of cattle vaccinated / treated	100 % of the herd in commercial farms		10,000	10,000	10,000	10,000	10,000	50,000	0%	100%
Increase the rate of external parasite treatment to 30% of herds up from the baseline coverage of 15% and the rate of endoparasite treatment to 40% up from 25%	Heads of cattle treated			10,000	10,000	10,000	10,000	10,000	50,000	0%	100%
Strengthen the Veterinary Council to enable it to effectively monitor and regulate				50,000	20,000	20,000	20,000	20,000	130,000	100 %	0%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
importation, distribution, and use of veterinary drugs.											
Strengthen Livestock Training School of the Gambia College of Agriculture through capacity building of trainers, provision of materials and equipment				30,000	20,000	20,000	20,000	20,000	110,000	100 %	0
Revise the current curriculum used to train livestock technicians				30,000					30,000	100 %	0
Establish additional 5 veterinary pharmacies and drug outlets in the regions	Number of vet pharmacies and drug outlets established	5		50,000	50,000	50,000	25,000	25,000	200,000	30%	70%
Strengthen the existing six regional veterinary stations through infrastructure improvement and provision of equipment				1,200,000	840,000	600,000	600,000	600,000	3,840,000	100 %	0
Infrastructure improvement, provision of equipment and hiring of personnel for the open positions in the existing 53 veterinary sub-stations				530,000	530,000	530,000	530,000	530,000	2,650,000	100 %	0
Establish 10 new veterinary sub-stations in the first five years (2023/24-2027/28)				200,000	200,000	200,000	200,000	200,000	1,000,000	100 %	0
Strengthen the disease surveillance and monitoring system by improving staff capacity through training				15,000	10,000	10,000	10,000	10,000	55,000	100 %	0
Build the capacity of existing 82 sanitary defense committees and raise their number to 120	Count			15,000	10,000	10,000	10,000	10,000	55,000	100 %	0%
Improve the capacity of the existing six regional veterinary laboratories in through infrastructure improvement, provision of equipment, staffing, and staff capacity development				1,200,000	840,000	600,000	600,000	600,000	3,840,000	100 %	0%
Genetic improvement											
Produce a cattle breeding policy for the Gambia				20,000						100 %	0%
Sensitize herd owners on the selection and retention of good	% of herd	60%		15,000	15,000	15,000	15,000	15,000	75,000	50%	50%

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
breeding bulls and heifers in local herds and castration, fattening, and sale of unproductive males including animals with defects	owners										
Expand the N'Dama breeding program being conducted by WALIC; produce and distribute elite breeding bulls to farmers through Gambia Indigenous Livestock Multipliers Association (GILMA).	% of farmers with access to elite N'dama breeding bull/semen	5%		125,000	125,000	50,000	0	0	300,000	100%	0%
Strengthen the capacity of WALIC by coordinating and facilitating funds for construction of more barns, purchase of more animals, and improved research and training facilities. Also, provision of enhanced laboratory and storage facilities and equipment to expand the laboratories' capacity to include handling of breeding materials and activities.				300,000	150,000	150,000	175,000	200,000	975,000	100%	0%
Construct one AI center which will produce semen straws from elite N'Dama bulls and exotic/exotic-cross breed bulls.				0	375,000	87,000	50,000	75,000	587,000	100%	0%
Construct one liquid nitrogen storage facility within five years				298,986	298,986	0	0	0	597,971	50%	50%
Train and equip 100 AI technicians.	Count of AI technicians			25,000	25,000	25,000	25,000	25,000	125,000	100%	0%
Subsidize private AI service providers to help them expand their AI service to more livestock producers	Count of AI service providers			0	100,000	150,000	175,000	175,000	600,000	100%	0%
Education, Research and Extension services											
Develop livestock extension policy, guidelines, and legal framework for extension services				30,000	0	0	0	0	30,000	100%	0%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Strengthen the capacities of the livestock research section of the NARI (National Agricultural Research Institute) by improving the research facilities and staffing with livestock researchers and scientists to make it able to conduct livestock research.				440,000	190,000	140,000	100,000	100,000	970,000	100%	0%
Coordinate and facilitate the provision of financial support, necessary equipment, and training opportunities to the staff of WALIC to expand its local cattle improvement program and other research				1,460,875	876,525	292,176	146,088	146,088	2,921,751	100%	0%
Strengthen public livestock extension service delivery in terms of mobility				1,230,000	170,000	170,000	170,000	170,000	1,910,000	100%	0%
Strengthen DLS and other stakeholders' livestock data collection tasks by providing appliances and gadgets, capacity building and training on data collection (methods and tools) and analysis				50000	10,000	10,000	10,000	10,000	90,000	100%	0%
Provide incentives, career progression opportunities, and scholarships to staff at NARI, WALIC and DLS to improve their retention				500,000	500,000	500,000	500,000	500,000	2,500,000	100%	0%
To upgrade the four training centers and four demonstration units for full capacity utilization				738,460	318,460	318,460	318,460	318,460	2,012,300	100%	0%
Promote private veterinary and extension service providers by subsidizing veterinary and livestock experts to establish veterinary pharmacies and input shops that can provide farmers with veterinary and extension services				2,000,000	200,000	-	-	-	2,200,000	50%	50%
Support the emergence of private livestock extension service providers by subsidizing the private extension service providers				1,500,000	300,000	-	-	-	1,800,000	50%	50%
Increase the number of farmers that receive intensive and continuous cattle improvement training (training, exchange visits, farmer advisory services, Practical demonstrations) to 3000 farmers				15,000	15,000	15,000	15,000	15,000	75,000	100%	0%
Marketing											

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Marketing infrastructure improvement in primary (Sare Ngai, Sare Bojo, Brikamaba, Wasu, Jareng, Samitenda, Farafeni, Bureng, Kerr pateh, Ndugukebbeh, Fass Njaga Choi, Panchang) and terminal markets (Abuko, Brikama) including fencing of holding ground, provision of watering facilitates, sheds, office, and toilets, and loading ramps, slaughter slabs, meat stalls, and cold storage facilities, weighing scale will be done for 2 terminal and 10 primary markets within five years.				-	388,772	388,772	388,772	388,772	1,555,088		
Strengthen the newly established livestock market information system and sensitize users about it				15,000	15,000	15,000	15,000	15,000	75,000	100%	0%
Subsidize cooperatives to re-introduce specialized vehicles for transportation of live animals and animal products and enforce the use of refrigerated transport facilities for meat transportation				240,000	0	0	0	0	240,000	100%	0%
Perform capacity buildings for livestock market management committees				10,000	10,000	10,000	10,000	10,000	50,000	100%	0%
Support the establishment of at least one marketing cooperative for each of the different commodities (dairy, live animal and meat, poultry) within five years.				15,000	15,000	15,000	15,000	15,000	75,000	100%	0%
Encourage private actors ready to establish small-scale milk processing plants	Number of small-scale milk processing plants launched	5		20,000	20,000	20,000	20,000	20,000	100,000	0%	100%
Support private actors to establish modern abattoirs	Number of modern	2		0	50,000	0	0	50,000	100,000	0%	100%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
	abattoirs										
Modernize the existing slaughterhouses	Number of slaughterhouses modernized	12		198,000	0	0	0	0	198,000	0%	100%
Establishing a tannery				0	0	50,000	0	0	50,000	0%	100%
Total annual budget				13,538,248	7,650,067	5,424,139	5,131,466	5,226,889	36,970,809	85%	15%

Activities timeline and sequencing: Gantt chart

Annex Table 4: Activity timeline

S/No	Investment Intervention	Activities timeline				
		2023	2024	2025	2026	2027
	Feed and feeding					
1	Review the existing forest regulations/acts within three years to make them accommodative of the pasturelands, rangelands, and forests and their sustainable utilization as a source of livestock feed.					
2	The Ministry of Agriculture should engage other relevant stakeholder (such as the Ministries of Local Government and Lands, Justice, Forestry and the Environment and Parks and Wild Life, Civil Society and Community Leaders) to update the Land Use Plan taking into consideration the urgent needs of the agriculture/livestock sector in the country.					
3	Demarcate, map, and Gazette grazing areas and stock routes within the first four years of the LSS.					
4	Sensitize and train farmers on the prevention and control of bushfires					
5	Promote regeneration of degraded rangelands					
6	Over-sowing of palatable feed species, including *adropogon gayanas, Panicum, and Brachiaria species.*					
7	Construction of access/slipways to rivers to the 20 of the areas that are currently has low access to animals.					
8	Construction of 70 boreholes with the contribution of herd owners.					
9	Develop 40 low-lying areas and improve harvest of water.					
10	Plant fodder tree species such as Pterocarpus Erinaceus, Leucocefala, Acacia Albida, and Leucaena in community forest parks, range lands, and around boreholes and slipways.					
11	Sensitize farmers to grow fodder and fodder trees as fences and hedges in the backyard and other areas to supplement cattle and enhance feed availability during the dry season.					
12	Sensitize farmers to supplement lactating cows with additional localy available concentrate feeds, salt and miniral lick. It is targeted to raise the proportion of cattle farmers that supplment their lactating cows with some form of concentrate feeds to 50% by the end of the five years of the LMP period (2027/28),					

S/No	Investment Intervention	Activities timeline				
		2023	2024	2025	2026	2027
13	Sensitize the use of leguminous plants, e.g., Pterocarpus erinaceous, Acacia albida (Faidherbia albida), Cajanus cajan, etc.					
14	Liaison with the National Seed Secretariat (NSS) to have a strong fodder seed quality regulatory department within the NSS.					
15	Sensitize farmers to harvest green feeds during the wet season and conserve them for use in the dry season during the rainy season.					
16	Sensitize farmers in collecting, preserving, and utilizing locally produced crop resides.					
17	Improve the availability of dairy farming and milk processing professionals by increasing the accessibility of long-term training on dairying and milk processing.					
18	Limit the export of processed feed ingredients and have a concessional supply for local livestock producers.					
19	Facilitate financial provision and long-term loan payment schemes to commercial dairy farms that want to establish and operate dairy farms.					
20	Support the establishment of a fodder and fodder seed producers' association by covering some of their operational cost for the first 2 years and providing trainings.					
21	Improve the linkages between associations in The Gambia with associations in other countries like Mali and Senegal.					
	Animal Health					
1	Vaccination of cattle for the priority diseases like CBPP, HS, BQ, and LSD will be done. The vaccine coverage of CBPP is targeted to increase from the current coverage of about 75% (DLS, 2020) to about 80% in the coming five years. The percent of cattle vaccinated against HS, BQ, and LSD is targeted to increase from current coverage of about null (DLS, 2020) to 30% by the end of five year (2027/28)).					
2	In commercial dairy farms, vaccination of cattle against CBPP, HS, BQ, LSD, and Anthrax and chemoprophylaxis against tick-borne and blood parasitic infectious diseases is expected to continue with the current rate of about full coverage.					
3	The curent levele of external and internal parasite treatment practices among N'Dama cattle owners is about 15% and 25%, respectively, using anti-parasite chemicals and anthelmintic (DLS, 2020). It is targeted to increase the rate of anti-parasite treatment to					

S/No	Investment Intervention	Activities timeline				
		2023	2024	2025	2026	2027
	30% and anthelmintic use to 40% by the end of the five year (2023-2027).					
4	Strengthen the Veterinary Council within four years to make it able to effectively monitor and regulate the importation, distribution, and use of veterinary drugs.					
5	Ensure the availability of sufficient vaccines and medicines in the country.					
6	Strengthen Livestock Training School of the Gambia College of Agriculture through capacity building of trainers, provision of teaching materials, equipment, and protective clothing for trainees, and provide laboratories and practical facilities and equipment throughout the LMP duration.					
7	Revise the current curriculum used to train livestock technicians (within two years).					
8	Train veterinarians and livestock technicians to scale up their capacity and increase their contribution to the improvement of extension and veterinary service delivery.					
9	Establish additional five veterinary pharmacies and drug outlets in the regions; in the five years (2023-2027) of the LMP duration.					
10	Strengthen the existing six regional veterinary stations by improving the infrastructures and providing equipment within 5 years.					
11	Improve infrastructures, provide equipment and hire experts on open positions for the existing 53 veterinary sub-stations.					
12	Establish 53 new veterinary sub-stations (one more for every district) within five LMP years (2023-2027).					
13	Strengthen the disease surveillance system by improving staff capacity with training and the monitoring system.					
14	There are curently 82 farmers sanitary defense committees. It is recommended to build the capacity of existing sanitary defense committees and raise their number to 120 by the end of the LMP period (2027).					
15	Improve the capacity of the existing six regional veterinary laboratories in the coming 5 years by improving infrastructure, equipment, staffing, and staff capacity.					
16	Improve the facilities and train laboratory technologists and technicians of the central veterinary laboratory at Abuko.					
	Genetic improvement					
1	Produce cattle breeding policy within two years.					

S/No	Investment Intervention	Activities timeline				
		2023	2024	2025	2026	2027
2	Sensitize herd owners on the selection and retention of good breeding bulls and heifers in the local herd. It is targeted to sensitize 60% of livestock farmers by the end of five years (2023-2027).					
3	The N'Dama breeding program being conducted by WALIC should be expanded and elite breeding bulls should be produced and distributed to farmers through Gambia Indigenous Livestock Multipliers Association (GILMA). It is targeted that 5% of cattle farmers in the country will have access to elite N'Dama breeding bulls/semen by the end of five years (2023-2027).					
4	Strengthen the capacity of WALIC by coordinating and facilitating funds for the construction of more barns, the purchase of more animals, and improved research and training facilities. Also, it is equally essential to provide enhanced laboratory and storage facilities and equipment to expand the laboratories' capacity to include handling of breeding materials and activities.					
5	Construct one AI center within the first five years of the LMP period. The AI centers will produce semen straws from elite N'Dama bulls and exotic/exotic-cross breed bulls.					
6	Construct one liquid nitrogen storage facility within five years.					
7	Train AI technicians. It is targeted to train 100 AI technicians within five years (2023-2027).					
8	Subsidize private AI service providers to help them expand their AI service to more livestock producers.					
	Education, Research and Extension services					
1	Develop livestock extension policy, guidelines, and legal framework for extension services within three years.					
2	Strengthen the capacities of the livestock research section of the NARI (National Agricultural Research Institute) by improving the research facilities and staffing with livestock researchers and scientists to make it able to conduct livestock researchs. The research institute must also collaborate with other research institutions like WALIC and others in the sub-region.					
3	Coordinate and facilitate the provision of financial support, the necessary equipment, and training opportunities to the staff of WALIC to expand its local cattle improvement program and other researches.					

S/No	Investment Intervention	Activities timeline				
		2023	2024	2025	2026	2027
4	Ameliorate mobility of the public extension service providers.					
5	Strengthen Department of Livestock Services (DLS) and other stakeholders' livestock data collection tasks by providing appliances and gadgets, in addition to capacity building and training on data collection (methods and tools) and analysis.					
6	NARI, WALIC, and DLS need to improve staff retention through incentives, career progression opportunities, and scholarships.					
7	Upgrade the existing training centers and demonstration units and utilize them to full capacity.					
8	It is targeted to improve the existing 53 veterinary sub-stations by improving their infrastructures, equipment, and staffing and construct additional 53 new veterinary sub-stations (one for every district) within five years (2023-2027) of the LMP period.					
9	Promote private veterinary and extension service providers by subsidizing veterinary and livestock experts to establish veterinary pharmacies and input shops that can provide farmers with veterinary and extension services.					
10	Support private extension service provider startups by subsidizing the private extension service providers.					
11	The public sector will regulate the private veterinarians and extension service providers and continue researching and providing public veterinary and extension services.					
12	NARI must collaborate with the University of The Gambia and other stakeholders in the livestock sector to ensure that training at the faculty of science produces graduates with skills that NARI and the country need.					
13	Promote adaptive research on the exotic breed and milk improvement along the value chain.					
14	It is targeted to increase the number of farmers that receive intensive and continuous cattle improvement training (training, exchange visits, farmer advisory services, Practical demonstrations) to 50% by the end of the LMP five years (2027).					
	Marketing Investments					
1	Upgrade 2 terminal and 10 primary markets by fencing of holding ground, provision of watering facilitates, sheds, office, and toilets, and loading ramps, slaughter slabs, meat stalls,					

S/No	Investment Intervention	Activities timeline				
		2023	2024	2025	2026	2027
	and cold storage facilities within five years (2023-2027).					
2	Strengthen the newly established livestock market information system and sensitize users about it (GLMA has established MIS)					
3	Subsidize cooperatives to introduce specialized vehicles for transportation of live animals and animal products					
4	Perform capacity buildings for market management committees					
5	Support the establishment of marketing cooperatives for each of the different commodities (dairy, live animal and meat, layers, broilers, and free-range chicken) within five years.					
6	Support cooperatives to improve the system of collection, transportation, and processing of livestock products					
7	Encourage and subsidize private actors to enable them establish small-scale milk processing plants. It is targeted that 5 small-scale milk processing plants will be established in five years (2023-2027).					
8	Promote private actors to establish 2 modern abattoirs within five years					
9	Support commercial dairy farms to enable the increase in the number of commercial dairy farms in The Gambia. It is targeted that an additional about 40 commercial dairy farms (with the current farm size of about 65 animals) will be established in five years (2023-2027).					
10	Modernize the 10 existing slaughterhouses in five years (2023-2027)					
11	Establishing a tannery					

Annex Table 5: Five-year investment budget of small ruminant improvement interventions

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Feed											

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Plant fodder trees (Pterocarpus Erinaceus, Leucocefala, Acacia Albida and Leucaena) in community forest parks, range lands, around boreholes and slipways and in the backyards of farmers;				10,000	10,000	10,000	10,000	10,000	50,000	50 %	50%
Promote the construction of small houses for small ruminants.	% of farmers with small houses for sheep and goats	Increase in percentage from 30% to 40%		15,000	15,000	15,000	15,000	15,000	75,000	100%	0
Sensitize farmers to grow fodders and fodder trees as fences and hedges in the backyard and other areas to supplement sheep and goats and enhance feed availability during the dry season.				15,000	15,000	15,000	15,000	15,000	75,000	100%	0
Train farmers (50% of beneficiaries being women and youth) in the collection, preservation, and enhancement of crop residues such as groundnut hay, maize stover, rice, millet bran, groundnut, sesame cake, and cotton seeds				15,000	15,000	15,000	15,000	15,000	75,000	100%	0
Train commercial sheep and goat farmers to establish intensive feed				10,000	10,000	10,000	10,000	10,000	50,000	100%	0%

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
gardens (starting from 625m2) using fodder legumes such as Cajanus Cajan, Leucaena, Moringa, and other palatable species on the forested areas											
Provide a 40% subsidy of the cost in the establishment of commercial sheep and goat farms that practice zero-grazing schemes (target=??? Farmers)				60,000	60,000	60,000	60,000	60,000	300,000	40%	60%
Improve availability and access to agricultural byproducts (cakes, bran, etc.) and raise awareness of the importance of the byproducts of cottage edible oil industries for the livestock sector											
Animal Health (The health service improvement interventions listed under the cattle meat and milk improvement intervention section also cater for sheep and goats. To avoid repetition, the list of health interventions that are depicted in the cattle section are not listed here again)											
Conduct routine mass vaccinations against PPR and Pasteurellosis.	% of animals vaccinated	80%		22,123	22,123	22,123	22,123	22,123	110,616	100%	0%
Conduct routine Deworming campaigns.	% of animals dewormed	60%		5,000	5,000	5,000	5,000	5,000	25,000	100%	0%
Genetic improvement											
Develop breeding policy of sheep and goats in the coming three years.				20,000					20,000	100%	0%
Provide matching grants of US$2000 to the seed capital	Number of farms			20,000	20000	20,000	20,000	20,000	100,000	100%	0%

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
in the establishment of private breeding farms which will undertake developing new and improving existing breeds, multiplication and distribution											
Support formation of 1 community-based local sheep and goats breed improvement scheme						20,345			20,345	100%	0%
Sensitize small ruminant owners on culling of unproductive animals, selection and retaining of good breeding rams and bucks in the flock				15,000	15,000	15,000	15,000	15,000	75,000	100%	0%
Strengthen the existing local breed improvement research being carried out by WALIC by providing adequate resources for purchasing additional rams/ewes, training livestock technicians, Geneticists, and equipment.				30,000	10,000	10,000	10,000	10,000	70,000	100%	0%
Strengthen livestock farmers' associations such as GILMA				10,000	10,000	10,000	10,000	10,000	50,000	100%	0%
Marketing											
Formation and capacity building of a small ruminant owner's cooperatives and				10,000	10,000	10,000	10,000	10,000	50,000	100%	0%

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
introduction of weighing scales to facilitate marketing of sheep and goats.											
Improve the infrastructure at the veterinary stations in Yorro Beri Kunda (YBK), Sololo, and Basse				40,000	10,000	10,000	10,000	10,000	80,000	100%	0%
Encourage online marketing to facilitate the marketing of sheep and goats and their products. Online marketing will require improved internet networking, faster internet, and reduced cost of data bundles.											
Construct 5 slaughterhouses and 5 modern meat stalls				64,877	64,877	64,877	64,877	64,877	324,385	0	100%
Overall budget				362,000	292,000	312,345	292,000	292,000	1,530,001		

Annex Table 6: Sheep production system- average productivity parameter

Sheep parameters		Production zones/sub-systems								
		Western			Central			Eastern		
		Djallonke	Sahelian	Female Owned (Djallonke)	Djallonke	Sahelian	Female Owned (Djallonke)	Djallonke	Sahelian	Female Owned (Djallonke)
I. Age classes Length (months)										
Female	Juvenile	9%	14%	9%	11%	15%	11%	9%	16%	9%
	Sub-adult	13%	9%	13%	13%	8%	13%	13%	10%	13%
	Adult	41%	39%	41%	51%	45%	51%	41%	47%	41%
Male	Juvenile	9%	14%	9%	10%	14%	10%	9%	15%	9%
	Sub-adult	11%	8%	11%	10%	7%	10%	12%	7%	12%
	Adult	16%	17%	16%	4%	11%	4%	16%	4%	16%
II. Demography										
Reproduction										
	Parturition rate (/year)	0.95	1.50	0.95	0.95	1.50	0.95	0.95	1.50	0.95
	Rate of net prolificacy	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
	% of females at birth	50%	50%	50%	50%	50%	50%	50%	50%	50%
Mortality (%)										
Female	Juvenile	30%	32%	30%	39%	44%	39%	27%	36%	27%
	Sub-adult	27%	29%	27%	35%	41%	35%	24%	32%	24%
	Adult	7%	7%	7%	9%	10%	9%	6%	8%	6%
Male	Juvenile	30%	32%	30%	40%	44%	40%	27%	36%	27%
	Sub-adult	27%	29%	27%	37%	41%	37%	24%	32%	24%
	Adult	7%	7%	7%	9%	10%	9%	6%	8%	6%
Offtake (%)										
Female	Juvenile	0%	5%	0%	0%	0%	0%	1%	3%	1%
	Sub-adult	5%	9%	5%	0%	3%	0%	7%	7%	7%

Sheep parameters		Production zones/sub-systems								
		Western			Central			Eastern		
		Djallonke	Sahelian	Female Owned (Djallonke)	Djallonke	Sahelian	Female Owned (Djallonke)	Djallonke	Sahelian	Female Owned (Djallonke)
	Adult	8%	17%	8%	0%	5%	0%	11%	14%	11%
Male	Juvenile	5%	5%	5%	8%	5%	8%	3%	13%	3%
	Sub-adult	15%	18%	15%	30%	15%	30%	15%	40%	15%
	Adult	20%	25%	20%	70%	35%	70%	30%	80%	30%
III. Production										
Live weight (kg/animal)										
Female	Juvenile	5	8	5	5	8	5	5	8	5
	Sub-adult	10	15	10	10	15	10	10	15	10
	Adult	22	35	22	22	35	22	22	35	22
Male	Juvenile	8	10	8	8	10	8	8	10	8
	Sub-adult	15	20	15	15	20	15	15	20	15
	Adult	35	40	35	35	40	35	35	40	35
Meat										
	Dressing percentage (%)	55%	55%	55%	55%	55%	55%	55%	55%	55%
Financial price of off taken (/animal)										
Female	Juvenile	3,500	5,000	3,500	3,000	4,000	3,000	2,800	4,000	2,800
	Sub-adult	5,500	6,500	5,500	5,000	6,000	5,000	4,800	6,000	4,800
	Adult	6,500	7,000	6,500	6,000	6,000	6,000	5,800	6,000	5,800
Male	Juvenile	3,500	5,000	3,500	3,000	4,000	3,000	2,800	4,000	2,800
	Sub-adult	5,500	7,500	5,500	5,000	6,000	5,000	4,800	6,000	4,800
	Adult	6,500	12,000	6,500	6,000	10,000	6,000	5,800	10,000	5,800

Annex Table 7: Production and reproduction parameters of the back-yard indigenous chickens

Parameters	Values
Average number of hens	2.2

Parameters	Values
Average number of cocks	0.6
Age of hens at the start of the laying period (months)	6.0
Duration of the laying period (months)	30
Age of layers at culling (months)	36.0
Age of cocks at culling (months)	48
Adult mortality (% per year)	42%
Number of eggs laid hen/year	60
Eggs sold or consumed on-farm (% eggs laid)	0.5
Eggs available for incubation	66
Egg fertility (%)	67%
Males hatched/year	22.1
Females hatched/year	22.1
Mortality in livestock production (% of birds that die before marketing)	60%
Age of males when sold (months)	4.0
Males raised/year	8.8
Females raised/year	8.8
Hens culled/year	0.8
Cocks culled/year	0.2
Number of females to keep for replacement/year	1.4
Number of males to keep for replacement/year	0.0
Males sold or consumed on-farm/year	8.8
Female sold or consumed on-farm/year	7.5
Average live weight of chickens (growers) sold (kg)	1.0
Average live weight of culled hens (kg)	1.2
Average live weight of culled cocks (kg)	1.5
Average dressing percentage	65%
Total number of birds present per hen	7.1
Total number of birds sold or consumed on-farm/year	17.2
Average live weight of birds sold or consumed on-farm	1.0
Animals sold or consumed on-farm/year/hens	7.84

Source: LSIPT data base

Annex Table 8: Five-year Chicken meat and egg production improvement investment costs

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Feed											
Enact regulations and acts that discourage the export of brans and oil seed cakes outside the country				10,000	10,000	10,000	10,000		40,000	100%	0%
Sensitize and train farmers on the utilization of bran and oil seed cakes as feed for backyard chicken.				10,000	10,000	10,000	10,000	10,000	50,000	100%	0%
Develop backyard chicken ration formulas based on the locally available feed bases, and sensitizing farmers on how to do the formulations and feeding				10,000	10,000	10,000	10,000	10,000	50,000	100%	0%
Encourage				15,000	15,000	10,000	10,000	10,000	60,000	70%	30%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
contracting of cereal farmers to produce feed ingredients for feed millers and processors farming by holding of match making events											
Encourage farmers to grow soybean for use as a chicken feed ingredient				50,000			50,000		100,000	100%	0%
Strengthen the Food Safety and Quality Authority (FSQA) to increase its capacity to regulate the quality of feeds and feed ingredients.				60,000	45,000	0	0	0	105,000	30%	70%
Prepare commercial chicken feed					20,000				20,000	100%	0%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
quality standards within two years.											
Encourage the importation of maize to reduce pressure on local maize production used for human consumption. Also, encourage the importation of other poultry feed ingredients such as soybean, minerals, vitamins, and pre-mixes.									-		
Establishment of silos for both imported and locally produced chicken feed raw materials and processed chicken feeds (PPP).	Number of silos established			30,000	20,000	10,000	0	0	60,000	20%	80%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Increase the utilized capacity of the existing 5 commercial chicken feed mills and supporting establishment of 5 to 10 new chicken feed mills through waiver of sales tax on equipment and raw inputs						200,000	200,000	100,000	500,000	0%	100%
Training and empowerment of farmer organizations to be aware of the indicators of feed quality.				5,000	5,000				10,000	100%	0%
Conduct additional research on alternative feed ingredients					25,000	25,000			50,000	100%	0%
Animal Health (The health service improvement interventions listed under the cattle meat and milk improvement intervention section also cater for different livestock species. To avoid repetition, the list of health interventions that are depicted in the cattle section but also cater chickens may not be listed here again)											

Investment Intervention	Unit and/or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Increase the number of vaccinated backyard chickens against Newcastle and Fowl Pox to 65%, up from 8.6% (86,600 chicken)				130,756	130,756	130,756	130,756	130,756	653,779	0	100%
Support adoption of the practice of applying internal and external parasite treatments by 65%, up from about null				111,717	236,073	436,495	658,835	904,931	2,348,051	0	100%
Facilitate easy access of medication to animals by the creation of veterinary outlets (pharmacies) and cold storage facilities for vaccines.									-		

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
Training farmers and traders on biosecurity measures.				10,000	10,000	10,000	-	0	30,000	100%	0%
Sensitize local chicken farmers to vaccinate all their birds against NCD, Gumboro, fowl pox, and Marek's to mitigate the risk of cross infections.				15,000	15,000	15,000			45,000	100%	0%
Genetic improvement											
Develop a local chicken breeding policy in the coming two years.				20,000					20,000	100%	0%
Start a local chicken breed improvement program in the coming three years through				20,000	20,000	20,000			60,000	100%	0%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
distribution of improved local cocks											
Subsidize establishment of one commercial chicken parent stock farm				20,000	10,000				30,000	40%	60%
Increase the number of hatcheries and hatchery capacity to meet the expected DOC demand of about 4 million (about 3.8 million broiler and 0.2 million layers DOC) by the end of year five				150,000	150,000	150,000	150,000	150,000	750,000	0	100%
Promote contracts between hatcheries and parent stock farmers.									-		
Education, Research and Extension services (The extension and research improvement interventions listed under the the cattle meat and milk improvement intervention section also cater for											

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
different livestock species. To avoid repetition, the list of extension and research interventions that are depicted in the cattle section but also cater chicken will not be listed here again)											
Increase the number of farmers that receive intensive and continuous chicken improvement training (training, exchange visits, farmer advisory services, practical demonstrations) to 50%				10,000	10,000			10,000	30,000	100%	0%
Develop training manuals in the coming two years and encourage farmers to engage in commercial production of local chicken				10,000	10,000				20,000	100%	0%
Marketing Investments											
Establish local chicken producer				15,000	15,000				30,000	40%	60%

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
s' cooperatives and a federation											
Address the problem of unfair competition from imported poultry products by developing the appropriate acts and regulations				10,000	10,000	10,000	10,000		40,000	40%	60%
Promote the establishment of cold storage and purchase of cold transportation facilities by subsidizing the private sector.				120,000	120,000	120,000	120,000	120,000	600,000	40%	60%
Promote and support the formation of commercial chicken producer groups/associations				10,000	10,000				20,000	100%	

Investment Intervention	Unit and/ or capacity	Quantity or number	Unit cost US$	Investment cost in US$						Budget source and amount in %	
				2023	2024	2025	2026	2027	Total	Public	Private
. Strengthen the existing commercial feed producer's association.											
Support contracts between groups of producers and buyers.											
Create platforms for chicken, egg, and chicken input producers and buyers in an effort to improve the chicken value chain.											
Overall budget				**842,473**	**881,828**	**1,142,251**	**1,359,591**	**1,445,687**	**5,671,830**		

Activities timeline and sequencing: Gantt chart

Annex Table 9: Intervention activity timeline and sequencing: Gantt chart

S/No	Investment Intervention	Activities timeline				
		2023	2024/25	2025/26	2026/27	2027
	Feed and feeding					
1	Enact regulations and acts that discourage the export of brans and oil seed cakes outside the country within 2 years.					
2	Sensitize and train farmers on the utilization of bran and oil seed cakes for the back-yard chicken.					
3	Farmers need to be advised on the different possible ration formulas. Back-yard chicken ration formulas will be produced using the locally available feed bases, and farmers will be sensitized.					
4	Strengthen the Food Safety and Quality Authority (FSQA) to improve its capacity to regulate the quality of imported feeds and feed ingredients.					
5	Prepare commercial chicken feed quality standards within two years					
6	Establish new one certified feed quality testing laboratory with a PPP approach in five years					
7	Encourage and support farmers to grow maize and soybean with or without irrigation for use as a chicken feed ingredient					
8	Encourage contract farming between feed millers/processores and cereal farmers.					
9	Encourage the importation of maize, soybean, minerals, vitamins, and pre-mixes.					
10	Establish … silos for both imported and locally produced chicken feed ingredients and processed chicken feeds in PPP mode in five years (2023-2027).					
11	Improve the capacity of the existing 5 commercial chicken feed processing plants and establish new 5 to 10 chicken feed processing plants with ranging capacities in five years.					
12	Conduct additional research on alternative chicken feed ingredients					
	Animal Health					
1	Vaccinate the back-yard chickens against Newcastle and Fowl Pox. The percent of back-yard chicken vaccinated against Newcastle and Fowl Pox diseases will reach 65% by the end of 2027.					

S/No	Investment Intervention	Activities timeline				
		2023	2024/25	2025/26	2026/27	2027
2	Treat back-yard chickens for internal and external parasites. It is targeted that the percent of farmers applying internal and external parasite treatments will increase to 65% by the end of 2027.					
3	Facilitate easy access of medication to animals by the creation of veterinary outlets (pharmacies) and cold storage facilities for vaccines.					
4	Train back-yard chicken farmers on biosecurity measures.					
5	Sensitize indigenous and commercial chicken farmers to vaccinate all their birds against NCD, Gumboro, fowl pox, and Marek's to mitigate the risk of cross infections.					
6	Train all commercial farmers and traders on biosecurity measures.					
	Genetic improvement					
1	Develop a back-yard indigenous chicken breeding policy in the coming two years.					
2	Start a back-yard indigenous chicken breed improvement program in the coming three years and start distribution of improved indigenous cocks. In five years of the LMP period, it is targeted to start the pilot phase and distribute improved indigenous cocks to farmers for pilot research work.					
3	Establish one commercial chicken parent stock farm with subsidies from the government within three years.					
4	Increase the number of hatcheries to meet the expected DOC demand of about 4 million (about 3.8 million broiler and 0.2 million layers DOC) by the end of the five year (2027). Currently, there is about 0.8 million annual day-old chick (DOC) demand.					
5	Promote contracts between hatcheries and parent stock farmers.					
	Education, Research and Extension services					
1	The number of farmers that are receiving intensive and continuous chicken improvement trainings (trainings, exchange visits, farmer advisory services, practical demonstrations) will reach about 20,000 by the end of the five year (2027). Currently, very few farmers get back-yard indigenous chicken improvement trainings.					

S/No	Investment Intervention	Activities timeline				
		2023	2024/25	2025/26	2026/27	2027
2	Develop back-yard indigenous chicken improvement training manuals in the coming two years.					
3	Support private extension service providers by encouraging veterinary and livestock experts and subsidizing the establishment cost of veterinary pharmacies and input shops which can serve as veterinary and extension service provision posts.					
	Marketing Investments					
1	Establish one indigenous chicken producers' cooperatives and a federation.					
2	Develop the appropriate acts and regulations in the coming two years to regulate the import of eggs.					
3	Promote and support the establishment of cold storage rooms and purchase of cold transportation facilities (preferably solar type) by subsidizing the private sector.					
4	Promote and support the formation of commercial chicken producer groups/ associations.					
5	Strengthen the existing commercial feed producer's association.					
6	Support contracts between groups of producers and buyers.					
7	Create platforms for chicken, egg, and chicken input producers and buyers to improve the chicken value chain.					

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