

Ethiopia livestock master plan

Roadmaps for growth and transformation



A contribution to the Growth and Transformation Plan II (2015-2020)

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Developed by the LMP team for the Ministry of Agriculture, Livestock Resources Development Sector

August 2015

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Editing, design and layout—ILRI Editorial and Publishing Services, Addis Ababa, Ethiopia.

Cover picture: ILRI/ Steve Mann and Zerihun Sewunet

ISBN 92-9146-425-2

Citation: Shapiro, B.I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset, G. and Mechal, H. 2015. *Ethiopia livestock master plan*. ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI).

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Contents

Tables	v
Figures	viii
Acronyms	ix
Acknowledgements	1
Contributors	3
Executive summary	5
Introduction	9
Livestock sector analysis results	10
Cow dairy development roadmap (2015/16–2019/20)	17
Vision	17
Overall target	17
Improved family dairy (IFD) production in the MRS	17
Specialized dairy production systems	25
Conclusions	32
Red meat /milk and cattle feedlot systems development roadmap (2015/16–2019/20)	35
Vision	35
Overall targets	35
Improved traditional red meat-milk production	35
Specialized cattle feedlots	43
Conclusions	48
Poultry development roadmap (2015/16–2019/20)	51
Vision	51
Overall target	51
Moving traditional (scavenging) family poultry to improved (semi-scavenging) family poultry system	51
Specialized poultry production	56
Conclusions	63
Livestock feed, production and extension	67
Introduction	67
Current situation	67
Future situation	70
Feed challenges and strategies to transform the livestock sector	70
GTP I and implementation status	73
Current ministry feed strategy	74
LMP/GTP II and feed requirements and strategies for the six targeted VCs	74

Ministry feed and livestock production extension	76
Forage-livestock production research gaps	76
Livestock health	79
Introduction	79
Current situation	79
Strengths	81
Future livestock health strategy for the GTP II	82
Research	88
Conclusion	89
Improving animal genetics (2014/15–2019/20)	91
Introduction—GoE objectives and GTP II targets	91
Current performance of genetic resources in Ethiopia	92
Livestock genetic resources, potential and yield gap	92
Challenges and strategies	97
Strategies to meet targets	99
Research on genetic improvement of livestock	100
Conclusion	100
Institutions and policy environment for the implementation of the livestock master plan	103
Background and justification	103
Objectives	104
Methodology and approach	104
Inventory of current livestock policy and institutional issues and gaps	104
Cross-cutting institutional and policy issues	112
Land policy	112
Conclusion	112
Overall conclusions	115
Annex I: Disease prioritization based on the LSIPT tool	123
References	127

Tables

Table 1: Projected national meat production-consumption balance with combined investment interventions in 2028; with poultry interventions to increase chicken meat	12
Table 2: Increase in number of crossbred cattle in IFD systems in the MRS zone during the GTP II	17
Table 3: Expected increase in total cow milk production from the IFD system during the GTP II (in million litres)	18
Table 4: Households involved in AI and synchronization activities during the GTP II	20
Table 5: Total recurrent and investment costs for breed improvement activities in the MRS system through crossbreeding using AI and synchronization (in ETB millions)	21
Table 6: Investment cost to improve feeding and health in the MRS (in ETB millions)	21
Table 7: Additional recurrent costs to improve feeding and health (paid by IFD farmers) (in ETB millions)	21
Table 8: Total investment costs related to IFD production (in ETB millions)	22
Table 9: Total recurrent costs related to IFD production (paid by IFD farmers) (in ETB millions)	22
Table 10: GDP contribution of IFD system (in ETB millions)	23
Table 11: Household level estimates of annual benefits and costs due to investment in AI and synchronization services in mixed livestock production systems (MRS and MRD)	23
Table 12: Increase in the number of small and medium specialized dairy units during the GTP II	25
Table 13: Annual increase in the number of dairy cattle in the specialized dairy systems	25
Table 14: Contribution of the specialized dairy system to national milk production (in million litres)	26
Table 15: Estimate of forage seed and land needed for forage production to improve small specialized dairy farm units	27
Table 16: Estimate of medium dairy farms involved in forage production outsourcing agreements over the five-year GTP II period	28
Table 17: Estimate of forage seed and land for forage production in specialized medium dairy farms over the five-year GTP II period	28
Table 18: Additional concentrate feed demand (in thousand tonnes) for the specialized dairy system	28
Table 19: Investment in forage production and trade promotion	29
Table 20: Recurrent costs in the specialized dairy system for the promotion of forage production and trade (in ETB millions)	29
Table 21: Investment cost estimates for milk processing facilities	29
Table 22: Total investment cost of improving the specialized dairy system (in ETB millions)	30
Table 23: Total recurrent cost of improving the specialized dairy system (in ETB millions)	30
Table 24: Milk GDP contribution of the small and medium specialized dairy system (in ETB millions)	30
Table 25: Farm level estimates of annual benefits and costs due to investment interventions in specialized dairy	31
Table 26: Cow milk production and consumption (in million litres)	33
Table 27: Annual increase in the number of cattle in the ITMM cattle system (in thousands)	36

Table 28: Annual increase in the number of sheep in the ITMM-sheep system (in thousands)	36
Table 29: Annual increase in the number of goats in the ITMM-goat system (in thousands)	36
Table 30: Annual increase in the number of camels in the ITMM-camel system	36
Table 31: Contribution of cattle in ITMM to national red meat production (in tonnes)	36
Table 32: Contribution of sheep in ITMM to national red meat production (in tonnes)	37
Table 33: Contribution of goats in ITMM to national red meat production (in tonnes)	37
Table 34: Contribution of camels in ITMM to national red meat production (in tonnes)	37
Table 35: Contribution of cattle in ITMM to national milk production (in million litres)	37
Table 36: Contribution of goats in ITMM to national milk production (in million litres)	37
Table 37: Contribution of camels in ITMM to national milk production (in thousand litres)	37
Table 38: Investment in young and adult stock mortality in ITMM in the LG (in ETB thousands)	40
Table 39: Rangeland rehabilitation public investment cost estimate (in ETB thousands) (CRGE 2011)	40
Table 40: Investment in young and adult mortality in the MRS and MRD (in ETB thousands)	40
Table 41: Investment costs for pasture land improvement and seed production (in ETB thousands)	40
Table 42: Total investment and recurrent costs for the ITMM production system (in ETB millions)	41
Table 43: Red meat production for the baseline year (2015) and 2020 with red meat intervention (in tonnes)	41
Table 44: Total red meat in ITMM by species—cattle, sheep, goats, and camels (in tonnes)	42
Table 45: Livestock GDP for baseline year (2015) and 2020 with red meat intervention (in ETB millions)	42
Table 46: Number of cattle units in the specialized cattle feedlot system	43
Table 47: Contribution of the specialized cattle feedlot system to national meat production (in tonnes)	44
Table 48: Contribution of the specialized dairy production system to national meat production (in tonnes)	44
Table 49: Projected number of cattle fattened by the commercial small-and medium-sized cattle feedlots	45
Table 50: Estimated amount of additional concentrate feed needed for additional animals going to beef feedlot by the year 2020	46
Table 51: Estimated amount of ingredients (bran, molasses, and oilcake) comprising concentrate feed	46
Table 52: Investment in slaughterhouse establishment through PPP	46
Table 53: Incentives for investment in flour and oilseed mills by private sector paid by GoE	46
Table 54: Change in beef production from specialized cattle feedlot for the baseline year (2015), to 2020 beef feedlot intervention	47
Table 55: Livestock GDP for baseline year (2015) and 2020 with interventions on specialized cattle feedlots	47
Table 56: Total red meat production by species (thousand tonnes)	49
Table 57: Number of hens in TFP and day-old chicks (DOCs) in IFP subsystems 2015–2020 (in millions)	51
Table 58: Number of IFP-keeping households by production typology zone	52
Table 59: Chicken meat production from IFP and TFP (in thousand tonnes)	52
Table 60: Egg production from IFP and TFP (in millions)	52
Table 61: GDP contributions from IFP (in ETB millions)	55
Table 62: Number of DOCs in specialized poultry subsystems (in millions)	56
Table 63: Number of units and average flock size of enterprises operating specialized poultry layers and poultry broilers)	56
Table 64: Chicken meat production from specialized poultry layers and broilers (in thousand tonnes)	56
Table 65: Egg production from specialized layers (in millions)	57
Table 66: Total chicken, meat and egg (specialized poultry, IFP and TFP) production	57
Table 67: Five-year investment and recurrent costs to create the IFP system and expand specialized poultry	60

Table 68: Detailed investment costs for the private sector in chicken meat and egg processing	61
Table 69: IFP and specialized poultry producer recurrent costs (in ETB) (paid by producers)	61
Table 70: GDP contributions from specialized poultry layer and broiler (in ETB millions)	62
Table 71: GDP contributions from poultry (in ETB millions)	64
Table 72: Potential feed resource availability and quality in Ethiopia (Tolera et al. 2012)	68
Table 73: Feed resources available annually in highland and lowland areas (Mengistu 2012)	68
Table 74: Main assumptions and usable biomass production per agro-ecological zone	69
Table 75: Feed balances for the different livestock production systems under different climatic conditions (LSA report)	69
Table 76: Livestock numbers and feed requirements in 2028 per livestock production systems under a business as usual scenario (no policy/technology intervention) (LSA report 2014)	70
Table 77: GTP I production targets achieved between 2009/10–2012/13 (MoA report)	73
Table 78: GTP I production targets for 2013/14, 2014/15	73
Table 79: Additional resources (in ETB) required for livestock feed development (2015/16–2019/20)	77
Table 80: Increase in number of crossbred cattle in IFD systems in the MRS zone during the GTP II	91
Table 81: Annual increase in number of crossbred dairy cattle in specialized dairy systems	91
Table 82: Number of local hens in TFP and improved poultry DOCs in IFP subsystems 2015–2020 (in millions)	91
Table 83: Number of crossbred poultry DOCs in specialized poultry subsystems (in millions)	92
Table 84: Livestock genetic resource and expected yield and other parameters under different production systems	92
Table 85: Key demographic and production parameters in different poultry production systems	93
Table 86: Comparative production of cattle in east African countries	94
Table 87: Review of current policy constraints and proposed actions in animal health services	104
Table 88: Current dairy policy and institutional constraints	106
Table 89: Current poultry policy constraints and proposed actions in the poultry sector	107
Table 90: Current policy constraints in the hides and skins sector	108
Table 91: Current policy constraints and proposed actions for live animals and meat	109
Table 92: Current policy constraints and proposed actions for lowland areas of Ethiopia (pastoral and agro-pastoral systems)	110
Table 93: Current policy constraints and proposed actions for breed improvement	111
Table 94: Major technology interventions proposed for the GTP II by production zone and number of farm households expected to adopt the interventions	118
Table 95: Total investment cost	118
Table 96: Diseases ranked in descending order based on the degree of impact on the attributes of household density, VC, and intensification pathways.	123
Table 97: Summary of scores on the impact of animal diseases (by species) on household, value chain and intensification	124

Figures

Figure 1: Production and consumption requirement projections from 2013 to 2028, with and without investment interventions.	6
Figure 2: Production and consumption trend and production-consumption balance for cow milk over the GTP II period of 2014/15–2019/20 (in million litres).	25
Figure 3: GTP targets for production, projected consumption, and production-consumption balance for cattle meat in thousand tonnes)	40
Figure 4: GTP targets for production, projected consumption, and production-consumption balance for sheep meat in thousand tonnes)	41
Figure 5: GTP targets for production, projected consumption, and production-consumption balance for goat meat in thousand tonnes)	41
Figure 6: GTP targets for production, projected consumption, and production-consumption balance for camel meat in thousand tonnes)	41
Figure 7: Production-consumption balance for chicken meat (2015–2020) (in thousand tonnes).	56
Figure 8: Production-consumption balance for eggs (2015–2020) (in million numbers).	56
Figure 9: GTP targets for production, projected consumption, and production-consumption balances for milk from various animal types, and combined milk (2015–2020), (in million litres).	111
Figure 10: GTP targets for production, projected consumption, and production-consumption balances for meat from all livestock types and combined meat (in thousand tonnes), and eggs, (in millions for), (2015–2020)	112

Acronyms

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
AGP-LMD	Agricultural Growth Program-Livestock Market Development
ALive	African Partnership for Livestock Development
AI	Artificial insemination
ATA	Agricultural Transformation Agency
ATVET	Agricultural Technical Vocational and Educational Training College
AU-IBAR	African Union Inter-African Bureau for Animal Resources
BMGF	Bill & Melinda Gates Foundation
CAHW	Community animal health worker
CBPP	Contagious bovine pleuropneumonia,
CCPP	Contagious caprine pleuropneumonia
DFATD	Department of Foreign Affairs, Trade and Development (formerly the Canadian International Development Agency (CIDA)).
CIRAD	<i>Centre de coopération internationale en recherche agronomique pour le développement</i>
CRGE	Climate Resilient Green Economy
CSA	Central Statistics Agency of Ethiopia
CSO	Civil society organization
DA	Development agent
DOC	Day-old chick
DM	Dry matter
EAFPA	Ethiopian Animal Feed Producers Association
ECF	East Coast fever
EIAR	Ethiopian Institute of Agricultural Research
EIDP	Elemtu Integrated Dairy Development
EMDIDI	Ethiopian Meat and Dairy Industry Development Institute
ESAP	Ethiopian Society of Animal Production
ESGPIP	Ethiopian Sheep and Goat Productivity Improvement Program
EVA	Ethiopian Veterinary Association
FAO	Food and Agricultural Organization of the United Nations
FMD	Foot and mouth disease
GDP	Gross domestic product
GoE	Federal Democratic Republic of Ethiopia
GTP	Growth and Transformation Plan
HPAI	Highly pathogenic avian influenza
ICARDA	International Center for Agricultural Research in the Dry Areas
IAR	Former Institute of Agricultural Research
IFD	Improved family dairy
IFP	Improved family poultry
IGAD	Intergovernmental Authority for Development

IIED	International Institute for Environment and Development
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Project
IRR	Internal rate of return
ITMM	Improved traditional red meat-milk
LG	Lowland grazing zone
LIP	Livestock Investment Plan
LITS	Livestock identification and traceability system
LMP	Livestock master plan
LRDS	Livestock Resources Development Sector, Ministry of Agriculture
LSA	Livestock sector analysis
LSD	Lumpy skin disease
LSIPT	Livestock Sector Investment and Policy Toolkit
LVC/PPD	Livestock Value Chain through public private dialogue in Ethiopia Project
MoA	Ministry of Agriculture
LSM	Livestock State Ministry, Ministry of Agriculture
MRD	Highland mixed crop-livestock rainfall deficient zone
MRS	Highland mixed crop-livestock rainfall sufficient zone
NAHDIC	National Animal Health Diagnostic and Investigation Center
NAIC	National Artificial Insemination Centre
NGO	Non-governmental organization
NVI	National Veterinary Institute
NRM	Natural resource management
OARI	Oromia Agricultural Research Institute
OIE	World Organisation for Animal Health
PFE	Pastoralist Forum Ethiopia
PPP	Public-private partnership
PPR	Peste des petits ruminants (goat plague)
Prime	Pastoralist Areas Resilience Improvement and Market Expansion (project funded by USAID)
PVS	Performance of Veterinary Services
ROI	Return on investment
RVF	Rift Valley fever
SGP	Sheep and goats pox
SMS	Subject matter specialist
SPS	Sanitary and phyto-sanitary
TB	Tuberculosis
TFP	Traditional family poultry
TAD	Transboundary animal disease
USAID	US Agency for International Development
VC	Value chain
VS	Veterinary services
VSD	Veterinary Services Directorate, Ministry of Agriculture
YASM	Young and adult stock mortality
WTO	World Trade Organization

Acknowledgements

The development of the Ethiopia livestock master plan (LMP) was undertaken by the newly established Livestock Resources Development Sector (LRDS) or Livestock State Ministry (LSM) of the Federal Republic of Ethiopia, Ministry of Agriculture (MoA), with technical support from the International Livestock Research Institute (ILRI). Initial activities were supported by the Improving the Productivity and Market Success of Ethiopian Farmers project (IPMS) supported by the Government of Canada. The current phase was supported by the Bill & Melinda Gates Foundation (BMGF).

Many individuals, institutions and agencies contributed to the realization of this plan. It was developed under the auspices of H.E. Tefera Derbew, Federal Minister of Agriculture with support of H.E. Gebregziabher Gebreyohannes, the State Minister for livestock at the MoA. The inspiration and initial impetus for the plan came from H.E. Wondirad Mandefro, State Minister for agriculture at the MoA.

ILRI director General Jimmy Smith and BMGF country representative Haddis Tadesse, as well as ILRI's Iain Wright and Azage Tegegne provided necessary support to help drive the LMP to fruition.

Windy Wilkins of the BMGF deserves a special note of appreciation. Windy saw the value of carrying out this exercise to help the new LRDS in the production of a livestock roadmap and increase the planning capacity of the MoA.

We had the good fortune to call on very competent and hard-working professionals to be members of the LMP team, including:

Getachew Gebru, animal scientist, *co-founder and director, MARIL-Ethiopia*

Solomon Desta, rangeland economist, *co-founder and director, MARIL-Ethiopia*

Asfaw Negassa, agricultural economist, ILRI

Kidus Nigussie Brook, animal scientist, senior dairy expert, MoA

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Henok Mechal, agricultural economist, marketing specialist, Ethiopian Meat and Dairy Industry Development Institute (EMDIDI), Ministry of Industry

The work of the LMP team was assisted by many people (see the list below of those who contributed to the expert consultations, provided technical advice and validated the results of the livestock sector analysis (LSA)). In addition to those listed, we appreciate in particular the work of the following groups and individuals.

The LMP technical advisory committee:

Bewket Seraw, director, Animal Health Directorate, LSM, MoA

Tadesse Sori, director, Animal Production and Feed Directorate, LSM, MoA

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Edmealem Shitaye, livestock expert, Food and Agricultural Organization (FAO) - Ethiopia and subsequently the Intergovernmental Authority for Development (IGAD)

Berhanu Gebremedhin, agricultural economist, LIVES Project, ILRI

Eden Getachew, acting livestock director, Agricultural Transformation Agency (ATA), MoA

We acknowledge the African Partnership for Livestock Development (ALive), under the aegis of the African Union Inter-African Bureau for Animal Resources (AU-IBAR), which brought together specialists from the *Centre de coopération internationale en recherche agronomique pour le développement* (CIRAD), the International Institute for Environment and Development (IIED), FAO and the World Bank to develop the set of analytical tools employed in this report: the Livestock Sector Investment and Policy Toolkit (LSIPT). The LMP team benefitted from training support provided by Cees de Haan, retired chief livestock officer of the World Bank, and Celine Dutilly of CIRAD. Without the LSIPT and these individuals, the LMP would have been impossible.

Special mention is made of the three value chain (VC) experts who contributed to the VC mapping and price analysis in their respective areas of expertise:

Mergia Bekele — dairy, poultry

Getachew Legese — live animals and meat, hides and skins, policy

Belachew Hurrissa — dairy, live animals and meat, policy

Finally, I want to acknowledge the strong support provided by the LMP program coordinators, Hiwot Yerga Bela-chew and Marthe Giday and the editorial inputs of James Stapleton and colleagues in ILRI's communications and knowledge management team.

On behalf of the partners, the Livestock Resources Development Sector, MoA and ILRI, as well as the LMP team, I sincerely thank all these dear friends and colleagues for their invaluable contributions to the success of this work.

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Eshete Dejen	FAO
Getachew Gebru	ESAP
Wondwosen Asfaw	EVA
John Woodford	LVC-PPD
Tesfaye Rufael	NAHDIC
Desalegn Begna	OARI
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Sintayehu Alemayehu	PRIME/USAID
Kassa Bayou	AGP-LMD

Executive summary

Over the last 20 years, the Federal Government of Ethiopia (GoE) has prioritized the transformation of the agricultural sector. This approach has been adopted in the current 2010–2015 Growth and Transformation Plan (GTP I) and its successor, the 2015–2020 GTP II. Yet, the absence of clear roadmaps to develop the livestock sector has persistently hindered successful implementation of these previous investment plans. Detailed inter-disciplinary research has revealed the potential benefits of a comprehensive livestock master plan (LMP) in Ethiopia.

The LMP sets out investment interventions—better genetics, feed and health services, which, together with complementary policy support—could help meet the GTP II targets by improving productivity and total production in the key livestock value chains for poultry, red meat-milk, and crossbred dairy cows. If the proposed investments—of 7762 million Ethiopian birr (USD 388.1 million), 57% and 43% from the public and private sectors respectively—were successfully implemented, they could eliminate poverty in approximately 2.36 million livestock-keeping households, helping family farms move from traditional to improved market-oriented systems and adding to agricultural GDP.

Beyond this impact on rural people, the anticipated transformation of the livestock sector has the potential to impact positively on urban dwellers through lower animal product prices, increased job opportunities, and an enhanced supply of agricultural inputs for industrial production. The success of the LMP is critical to the achievement of food and nutrition security at household, sectorial and national levels.

Development of the LMP

Using the most recently available data, from 2013, the Livestock State Ministry (LSM) and the International Livestock Research Institute (ILRI) employed the Livestock Sector Investment and Policy Toolkit (LSIPT) to develop herd and sector models and a baseline assessment of the current state of agricultural development in Ethiopia. This was used to assess the potential long-term, 15–20 years, impact of proposed combined technology and policy interventions, referred to as the livestock sector analysis (LSA).

The LSA results then formed the basis for the development of the GTP II livestock targets and the Ethiopia livestock master plan (LMP) for 2015–2020. The LMP is a series of five-year development implementation plans or ‘roadmaps’, to be used to implement the GTP II.

The LSA and LMP interventions were tested using the sector model measures of GoE livestock development and policy objectives for the GTP I and GTP II. The GTP objectives employed to assess the investment interventions of the Ethiopia LMP were to:

- Reduce poverty;
- Achieve food and nutritional security;
- Contribute to economic growth (GDP);
- Contribute to exports and foreign exchange earnings; and
- Contribute to climate mitigation and adaptation.

Using indicators for the above objectives, three key livestock value chains—poultry, crossbred dairy cow, and red meat-milk (from indigenous cattle, sheep, goats, and camels)—were identified in the LSA as potentially contributing to the long-run development of the sector. The LMP, therefore, comprises two sub-value chains for each value chain: smallholder family and commercial specialized production systems. These six sub-value chains are found in one or more of the three major production typology zones of Ethiopia, officially categorized by the Ministry of Agriculture (MoA): lowland grazing (LG including both pastoral and agro-pastoral systems), highland mixed crop-livestock rainfall deficient (MRD) and highland mixed crop-livestock rainfall sufficient (MRS).

Crossbred dairy cow development

The projected increase in national cow milk production, as a result of the proposed interventions, during the GTP II period (2015–2020) is 93%, a surplus of 2501 million litres over projected domestic consumption requirements. This production increase would make it possible to meet the milk production targets in the GTP II phase, exceeding the growing domestic demand for milk by 47%. This surplus of milk could then be substituted for imported milk products and used domestically for new or additional industrial uses (e.g. in the baking industry), or exported as milk powder or UHT to raise foreign exchange earnings.

Red meat-milk and feedlot development

The proposed combined interventions for red meat-milk production on family farms and among pastoralists and agro-pastoralists, as well as feedlot development, would result in a 52% increase in total red meat production.

Production would grow from 1.275 to 1.933 million tonnes between 2015 and 2020. This would not, however, meet expected consumption growth of 58% by 2020 (to 2.008 million tonnes), leaving a 7% deficit (187,000 tonnes) in the 2015–2020 red meat production and consumption balance. Given the rapidly growing population and increasing incomes in Ethiopia, such projected deficits would put upward pressure on red meat prices and make it very difficult to meet the GTP II red-meat export goals.

Furthermore, meeting poverty reduction goals was shown not to be compatible with large reductions in cattle numbers, as called for in the draft Climate Resilient Green Economy (CRGE) Livestock Investment Plan of the GoE. That said, the annual growth rate in the cattle population could be substantially reduced if the projected productivity increases were realized; but this may still require substantial incentives for farmers to reduce cattle numbers in household herds.

Poultry development

Successful poultry interventions would allow the sub-sector to move to improved family poultry with semi-scavenging crossbreds and for substantial increases in the scale of specialized layer and broiler operations. Such a transformation would contribute considerably to reducing poverty and malnutrition among rural and urban poor, as well as increasing national income.

Projected annual chicken meat and egg production in Ethiopia would rise to 164,000 tonnes and 3.9 billion respectively, a 247% increase in chicken meat production by 2020. This would bring the production-consumption surplus for chicken meat from 18,000 to 102,000 tonnes between 2015 and 2020. The combined interventions would also result in an 828% increase in chicken egg production, bringing the egg surplus to 3.1 billion eggs during the GTP II period.

Such accomplishments would enable Ethiopia to meet the chicken meat and egg demand for its growing population, and produce a very significant surplus for domestic industrial use or export. The surplus eggs could be processed into egg powder and used domestically for new or additional industrial uses (e.g. in the baking industry), or be exported to generate foreign exchange earnings.

Meat production-consumption balance

Perhaps most importantly, the growth of the poultry sub-sector would enable Ethiopia to close the projected total national meat production-consumption gap. This would also make it possible to meet the CRGE target of increasing the share of chicken meat to total meat consumption from the current 5% to 27% by 2030, but only if chicken is substituted for red meat coming from larger high-emitting ruminants.

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

Priority investment interventions

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

- Improvement of cattle dairy through breeding interventions, combining artificial insemination using exotic semen with oestrus synchronization in MRS dairy systems and in peri-urban milk sheds throughout Ethiopia;
- Improvement of productivity of local breed animals (cattle, sheep, goats, and camels) for meat and milk through investments in genetic selection (recording schemes, etc.) and in animal health to reduce young and adult stock mortality, and by implementing critical vaccinations and parasite control programs;
- Increase of public investment in rehabilitating range and pasture lands to improve feeding and animal management to complement genetic and health improvements;
- Promotion of the importation and dissemination of improved semi-scavenging poultry breeds by the private sector and/or through public-private partnerships (PPPs), combined with the improved capacity of private animal health services to provide critical vaccines, in tandem with the continued promotion by the GoE extension services of improved feeding; and
- Increase of specialized commercial production units and—where conducive agro-ecological and market conditions prevail—consequent increases in animal numbers for all three commodities, and the adoption of appropriate genetic, health and feed technologies.

Complementary policy interventions

- The introduction of policy measures to rationalize public and private sector roles in veterinary service provision, leading to the transition to the private provision of clinical services, wherever feasible, and to public oversight and quality regulations;
- The promotion of the establishment of more private-sector flour and oil mills to encourage the production of additional feeds from agro-industrial by-products by introducing protective policies against flour and cooking oil imports;
- The promotion of land leasing, including land under irrigation, for animal production and the provision of tax incentives and subsidized leasing rates to private entrepreneurs;
- The promotion of feed efficiency through the removal of the double-imposition of VAT and excessive customs duties (currently 53%) on feed mill ingredients, as well as the introduction of quality control measures;
- The promotion of exports to more remunerative markets through the introduction of a practical and affordable system of animal identification and traceability, as well as food safety and animal health programs through the monitoring of abattoirs and disease surveillance;

- The promotion of substantial private investment in livestock product transformation through high value-added processing; and
- The enabling of agribusiness investment through the streamlining of regulations and procedures in order to attract and maintain substantial levels of private investment.

Introduction

Ethiopia livestock master plan and livestock sector analysis

The development of the Ethiopia LMP was undertaken by the newly created LRDS of the MoA, with technical support from the International Livestock Research Institute (ILRI). The work was funded by the BMGF, with supplementary contributions from ILRI and Canadian Department of Foreign Affairs, Trade and Development (DFATD).

To effectively launch and carry out its work within the context of the coming Growth and Transformation Plan II (GTP II), the new LSM requires a vision and strategy of what can and needs to be accomplished to develop the sector, along with realistic action plans and ‘roadmaps’, built on a factual baseline, realistic targets and priority interventions. The LSM refers to these roadmaps as the livestock master plan. The LMP is also needed to inform other GoE policymakers, as well as investors involved in livestock development, on the current status of the sector and the potential of future priority investment options for poverty reduction and economic growth.

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

The LMP, undertaken by the authors of this reports, is based on a 15-year sectorial analysis (2013–2028) to inform the development of the plan. The elaboration of the LSA entailed creating a livestock sector model and then carrying out a quantitative analysis of the present technical performance of the sector and the economic contribution of potential interventions to households, VCs, the livestock sub-sector, the agricultural sector, and the national economy. A set of quantitative tools from the Livestock Sector Investment and Policy Toolkit (LSIPT) were used to carry out the sector analysis. This toolkit was developed by a group of international agencies¹ under the aegis of ALive at AU-IBAR. The LSA and LMP are based on available data from field surveys and published literature, as well as expert opinions, validated through consistency tests. The development of the LMP entailed regular and open consultations with relevant technical experts, partners and other stakeholders to help ensure ownership by all relevant livestock sector stakeholders.

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

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

Livestock sector analysis results

What do the LSA results mean for LMP and thus the GTP II?

The GTP objectives for livestock include to:

- Reduce poverty;
- Achieve better food security;
- Contribute to national income growth;
- Contribute to exports and foreign exchange earnings; and
- Contribute to climate mitigation and adaptation.

If no investment is made in raising livestock productivity, the LSA projections for the year 2028 show a deficit of 53% for all meat (1.332 million tonnes) and 24% for cow milk (1987 million litres) due to exploding demand (as a result of rapid population growth and rising per capita income) (see Figure 1, Panels C and D). The LSA seeks to identify the species and interventions which would erase these deficits and should thus be prioritized for investment in the GTP II.

The LSA results show there were about 11.4 million livestock producing households in Ethiopia in 2013 (Central Statistics Agency (CSA) of Ethiopia, 2013). Cattle were found to be the dominant species² in 70% to 90% of livestock producing households, depending upon production zone, and thus cattle dominate smallholder income generation and meat-milk production in all production zones—lowland and highland (MRS, MRD and LG³), as well as in specialized commercial scale production systems. Moreover, as of 2013, cattle were found to account for about 72% of the meat and 78% of the milk produced annually. Cattle thus play a dominant role in producing smallholder income and in meeting domestic meat and milk consumption requirements. Furthermore, based on potential returns per Ethiopian birr invested (internal rate of return, IRR) in available technologies (genetic, feed, and health), the LSA results show investment in cattle productivity in all the production zones has high potential to reduce poverty, contribute to national income growth, meet future domestic consumption requirements, and increase meat and milk exports and foreign exchange earnings.

Red meat-milk improvement (cattle, sheep, goats, and camels)

The LSA results show that broad-based improvements in animal health services and genetics for cattle, and other major red-meat producing species in Ethiopia (sheep, goats, and camels), could be achieved, when combined with improved feeding and better management practices:

2 A livestock species is classified as dominant if more than half of the household income from livestock comes from that species.

3 According to the MoA typology of production zones:

MRS is the highland mixed crop-livestock moisture sufficient systems zone.

MRD is the highland mixed crop-livestock moisture deficient systems zone.

LG is the lowland grazing systems zone (both pastoral and agro-pastoral systems).

- Increasing productivity of local breed animals in all production typology zones through health interventions to reduce young and adult stock mortality (YASM), other critical diseases like foot and mouth disease (FMD) through vaccinations, and parasite control (endo and ecto-parasites);
- Improving grazing lands (pasture and range) for more and better feed production; and
- Improving the reproductive and weight gain performance of ruminants, through better provision of animal health services and more and better feed.

But, even with these interventions, the projected red-meat deficit will be 7% or 187,000 tonnes in 2028 (Table I and Figure I, Panel A). Therefore, only investing in cattle improvement (or other red meat species) is not sufficient to eliminate the projected overall meat consumption deficit for 2028 or reach the GTP II goals for meat production. The LSA results show it is profitable to invest in cattle improvement in all production zones, as well as sheep in the MRS, goats in the MRD, and camels and goats in the LG. However, investment in poultry improvement is the key to erasing the meat deficit.

Poultry improvement

According to the LSA findings, the transformation of both traditional backyard family poultry and massive expansion of specialized commercial scale broiler and layer units will be necessary to close the future projected gap in total meat consumption requirements. It will be essential to transform traditional backyard family poultry that relies on indigenous scavenging chickens into a market-oriented improved family poultry (IFP) system with semi-scavenging crossbred chickens. When combined with supplemental feeding and adequate health services, this would greatly increase the genetic potential for both eggs and meat. Moreover, the number and size of specialized commercial scale broiler and layer units will need to be substantially increased.

Success will also require complementary interventions, including the allocation of sufficient land for poultry feed production (especially maize and soybean) and the effective encouragement of increased private investment in the poultry sector — particularly day-old chick (DOC) and pullet production, and meat and egg processing.

Poultry improvement impact on meat production-consumption balance

The LSA results show that successful investment in poultry improvement could lead to an overall surplus of all meat production over projected consumption requirements by 2028. As shown in Table I, the expected all-meat surplus in 2028 is projected to be about 11% or 320,000 tonnes (also see Figure I, Panel C).

Table 1: Projected national meat production-consumption balance with combined investment interventions in 2028; with poultry interventions to increase chicken meat

Animal product	National production		National consumption		Production - consumption balance (+/-) (thousand tonnes)	Production deficit (-) or surplus (+) as a percentage (%) of consumption
	(thousand tonnes)	(%)	(thousand tonnes)	(%)		
With combined interventions						
Beef	2081	64%	2302	79%	-221	-10%
Mutton	216	7%	183	6%	33	18%
Goat meat	218	7%	183	6%	35	19%
Camel meat	100	3%	134	5%	-34	-25%
All red meat	2614	81%	2801	96%	-187	-7%
Chicken meat	619	19%	112	4%	507	453%
All meat	3233	100%	2913	100%	320	11%

Source: LSA

The surplus chicken meat produced (about 507,000 tonnes in 2028, or a surplus of 453%, Table 1 and Figure 1, Panel B) could then enable Ethiopia to meet its domestic consumption requirement for all meat. If chicken meat could substitute for domestic red meat consumption, this would enable the exportation of beef, mutton and goat meat to raise foreign exchange earnings, in line with GoE meat export policy. However, tastes and preferences for local chicken, known locally as 'doro', would have to be modified through the promotion of exotic chicken meat and changes in cuisine.

The surplus of eggs produced (about 88 billion by the year 2028, or a surplus of 9046%) would more than meet domestic needs, (Figure 1, Panel E). The surplus would then need to be processed into egg powder and used domestically for new or additional industrial purposes (e.g. in the baking industry), or could be exported as egg powder to raise foreign exchange earnings.

Cow milk improvement

In the case of cow milk, the LSA results show that a future milk surplus could be realized through investment in better genetics, feed and health services, improving both traditional dairy farms and commercial-scale specialized dairy production units. The investment interventions proposed to improve cattle milk production and the VC would transform family dairy farms in the highland moisture sufficient production zone from traditional to market-oriented improved family dairy (IFD) systems. These proposed interventions would also vastly increase the commercial-scale specialized dairy units as well as improve milk production from indigenous (or local) cattle breeds.

The LSA results show increasing the contribution of all types of cow dairy farms to national milk production could be brought about by:

- Raising the genetic potential of local breeds for significantly higher milk production through crossbreeding with exotic dairy breeds using AI and synchronization in the MRS, and in the dairy sheds and peri-urban areas in the MRD;
- Improving the productive, reproductive and weight gain performance of crossbreeds, through enhanced provision of animal health services and better feed;
- Providing policy support to make land available to investors for forage seed and production, and promoting and enforcing outsourcing of forage production contracts;
- Increasing dairy cattle productivity of local breed cows in all production typology zones (MRS, MRD and LG) through health interventions to reduce YASM, coupled with improving grazing land (pasture and range) for more and better feed production;

- Organizing producer cooperatives for milk collection and marketing;
- Encouraging private sector investment in milk processing;
- Improving the specialized dairy production systems through better genetics, feed and health services, while expanding the number of the specialized units to increase the number of dairy cows;
- Promoting forage and fodder production and trade, and the production of supplemental concentrates; and
- Encouraging agro-processing of oil crops and use of by-products for animal feed.

If the proposed investment interventions are successfully put in place, the LSA results project a 29% surplus of 2.4 billion litres of milk by 2028 (Figure 1, Panel D).

Thus, these results suggest that the GTP II should not just endorse the substitution of imported dairy products, particularly milk powder, but the creation and promotion of new value-added milk exports to raise foreign exchange earnings. The production of value-added products for export would most likely begin with powdered milk and long shelf-life products like UHT, but could later be expanded to include diversified products, such as cheeses, yogurt, ice cream, etc.

VCs targeted in the LMP roadmaps

Finally, based on the LSA results, the investments proposed in the LMP roadmaps include appropriate combinations of genetic, feed and health interventions and related policy support to improve livestock productivity and the performance of the VCs. The interventions are meant to transform traditional family farms into improved market-oriented systems, improving household incomes, food security, livestock product consumption and nutrition, and contributing to GDP. In addition, the LMP also recommends targeting specialized production systems in each VC (cow dairy farms, beef feedlots, and poultry broiler and layer units) as a way of increasing their contribution to national livestock production and GDP.

Finally, based on results of the LSA analysis, to reach the objectives and goals of the GTP II, the key VCs targeted in the LMP roadmaps are:

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

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

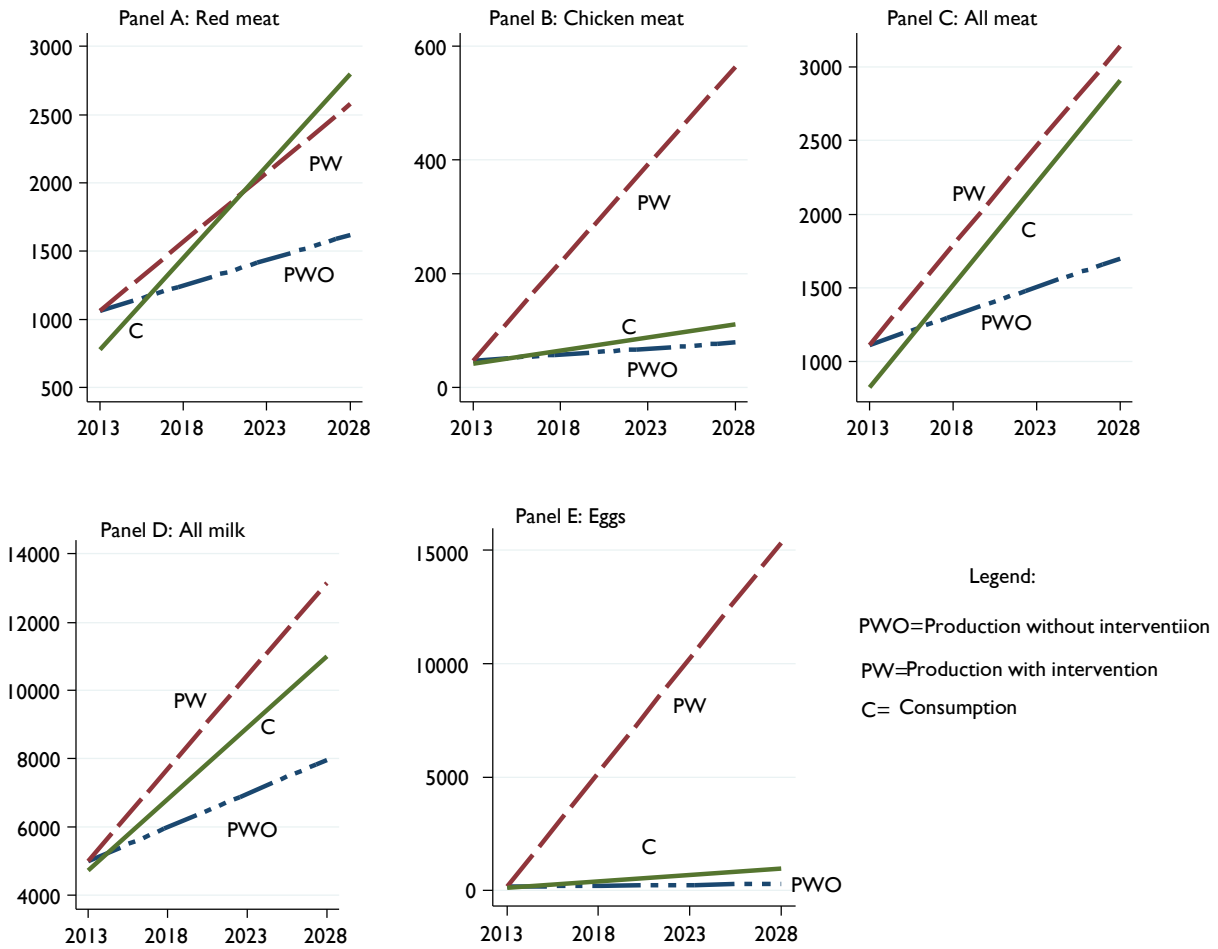
2. Poultry

- IFP in all production zones
- Specialized poultry — broilers and layers

3. Cow dairy

- IFD systems in the MRS, and in dairy sheds and peri-urban areas in the MRD
- Specialized dairy

Figure I: Production and consumption requirement projections from 2013 to 2028, with and without investment interventions.



Source: Based on LSA results.

Cow dairy development roadmap (2015/16–2019/20)

Cow dairy development roadmap (2015/16–2019/20)

Vision

By increasing the number and productivity of cattle through improvements in genetics, health and feeding, domestic cow milk production will increase by about 93% by 2020, consumption demand will be satisfied, and export of cow milk and milk products will begin.

Overall target

Raise total cattle milk production to 7967 million litres by 2020 through genetics, feed and health interventions to improve traditional family cow dairy production and expand and improve specialized dairy production units.

Improved family dairy (IFD) production in the MRS

Targets

It is recommended that AI and synchronization, combined with feed and health, interventions are carried out in the MRS typology zone, where according to the LSA, AI and synchronization is profitable. The specific targets include:

- The number of households participating in the intervention activity will reach 1.3 million by 2020.

Table 2: Increase in number of crossbred cattle in IFD systems in the MRS zone during the GTP II

Dairy system	Number of crossbred dairy cattle (in thousands)						% change
	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	
IFD	453	777	1296	2006	2920	4044	793% ⁴

The expected increase in number of crossbred cattle in IFD systems in the MRS zone during the GTP II will be 3.6 million or almost eight times the base-year number.

In IFD, with the adoption of the intervention during the GTP II, crossbred dairy cattle will:

- Produce an average of 6 litres of milk per day as compared to 1.9 for local cattle milk (an increase of 216%).
- Weigh 375 kg, while the average live-weight of local adult animals is 280 kg.
- Have a lactation period of 270 days on average as compared to 200 days for local breeds (an increase of 35%).
- Produce an average of 1053 litres of milk per year as compared to 247 for local breeds (a 326% increase).

4. The percentage change in the number of crossbred cattle drives the changes in milk production and GDP.

Table 3: Expected increase in total cow milk production from the IFD system during the GTP II (in million litres)

Dairy system	(Base year) 2014/15	Milk production					% change
		2015/16	2016/17	2017/18	2018/19	2019/20	
IFD	167	286	478	739	1076	1490	793% ¹

Challenges and strategies

Feed: The challenges include:

- Limited access to land for production of forage seed and forage;
- Inadequate and poor access to quality forage seed and cuttings; and
- Planted forage constrained by poor extension and training.

These challenges could be addressed through:

- Policy interventions to make land available to investors for forage seed and forage production;
- The establishment of a forage seed industry; and
- Forage seed production and certification.

Genetic potential: The challenges include:

- Inefficient AI services.
- Low productivity of local breeds and a low number of improved genotypes.

Strategies to help improve genetic potential include:

- Establishing and strengthening calf-rearing and heifer-rearing farms through private, public and private-public joint ventures;
- Promoting, expanding, and strengthening private provision of AI, and AI with synchronization, services;
- Improving the efficiency of public AI services to ensure semen quality, the timing of insemination and heat detection; and
- Providing training, backup support and incentives to farmers to work as AI technicians.

Animal health services: The challenges include:

- Very high calf mortality;
- Insufficient animal health extension advice;
- Inefficient animal health services;
- Inadequate supply of drugs;
- Poor quality control of drugs and supplies; and
- The lack of a bio-security system in place.

These challenges could be addressed by:

- Rationalizing and strengthening the animal health regulatory capacity of the federal and regional agencies under the coordination of the LSM.

Marketing and processing: The challenges include:

- Seasonal demand fluctuations leading to inconsistencies in milk supply and processing;
- A lack of milk quality and grading standards, and enforcement mechanisms;
- An absence of quality-based pricing incentives;

- Stiff competition from the other beverage industries and limited promotion of dairy-product consumption (competition with soft drinks, etc.); and
- Insufficient supply of affordable milk to many consumers.

These challenges could be addressed through:

- The promotion of investment in UHT, powdered milk production;
- The introduction of quality-based standards and pricing to encourage quality milk supply;
- The enforcement of milk quality standards; and
- Investment in the promotion of dairy-product consumption.

Policy: Additional challenges include:

- Pricing policies causing disincentives.

These challenges could be addressed through the:

- Introduction of protective trade policy that includes increasing import tariffs or bans and/or subsidies for domestically-produced milk to enable competition with imports; and
- Establishment of a grading and standards system for dairy products.

Interventions to achieve targets

Crossbreeding through AI and synchronization in the MRS typology zone

It is recommended that AI and synchronization, combined with feed and health, interventions are carried out in all of the MRS typology zone where it was found to be highly profitable, showing very high IRR values (for small IFD IRR= 32.5% and for medium IFD IRR= 23.7%). In contrast, the AI and synchronization intervention in most of the MRD typology zone is not profitable, as it shows very low IRR values (IRR=1% for small MRD and IRR=5% for medium MRD).

However, raising the genetic potential of local breeds to achieve significantly higher milk production through crossbreeding with exotic dairy breeds using AI and synchronization, is recommended in dairy sheds and peri-urban areas in the MRD and is proving successful in an on-going MoA AI and synchronization campaign. Moreover, crossbreeding is not recommended for LG pastoral and agro-pastoral systems due to feed shortages and high temperatures in the LG typology zone.⁵

The AI and synchronization intervention will include the:

- Adoption of AI and synchronization by 32% of the reproductive female cattle in the MRS by 2020, starting with 10% in the first year (2015/16);
- Replacement of local cattle in herds with crossbreds as indicated in Table 1. It is assumed that cattle herd sizes will remain the same, with crossbreds joining and replacing local cattle in herds;
- Training of at least 20,000 public and private AI technicians, such as farmer AI technicians, during the five-year GTP II period of activity;
- Participation of 1.3 million households in the activity by 2020; and
- Training of at least the 1.3 million farmers adopting the technology on better husbandry and feeding practices of rearing crossbred dairy cattle and on the handling of dairy production.

⁵ However, it should be noted that high yielding crossbred cattle can be kept anywhere if handled by commercial-scale specialized dairy farmers.

Table 4: Households involved in AI and synchronization activities during the GTP II

Number of households in the MRS	2015/16	2016/17	2017/18	2018/19	2019/2020
	372,630	594,535	829,326	1,077,717	1,340,465

Improve feeding and health services in the IFD system

- Provide the additional feed supplementation that takes place in the IFD: 1.5–2kg of concentrate per day per lactating cow, as compared to traditional cattle feeding system.
- Improve pasture productivity through over sowing, community-based pasture management and utilization scheme, as well as practicing soil and water conservation activities, and gully rehabilitation combined with a cut-and-carry feeding system.
 - Grass and legume seed and elephant grass cuttings are made available.
- Train dairy farmers on livestock feeding and disease control as part of improved management.
- Train dairy farmers on forage production in backyards, and part of cropping lands, and on lands under rehabilitation program (set-asides or natural resource management (NRM) enclosures).
- Health intervention to reduce YASM of cattle.
 - Coverage of YASM to be 80% of the households over 20 year period, while the adoption to be linear, reaching 20% of the households in the MRS over the five-year GTP II period.
 - Access to quality of veterinary services to be improved by rationalizing public/private veterinary services.
 - Enabling environment and incentives to be created for remote area veterinary practices.
 - Health services to be improved through the delivery of vaccinations for major diseases like FMD, contagious bovine pleuropneumonia (CBPP), anthrax and pasteurellosis, with control/treatment for external and internal parasites twice a year.

Investments

Investment in dairy cattle breed improvement in the MRS system through crossbreeding using AI and synchronization

- For the five-year GTP II period, a total investment of ETB 148 million is needed to improve the capacity of the AI centres and the related service, and the training of AI technicians (Table 5).
- It is assumed that farmers will cover the costs related to each AI and synchronization service provided. The estimated costs per synchronization and per AI service are ETB 100 and 200 respectively. Assuming a double insemination, the cost to the farmer per service is estimated at ETB 340.
- At national level the total recurrent cost for the AI and synchronization service covered by the farmer is ETB 2817 million, as shown in Table 5. The investment by the GoE to put in place the AI and synchronization services for the intervention is only ETB 148 million (very good leveraging by the GoE).

Table 5: Total recurrent and investment costs for breed improvement activities in the MRS system through crossbreeding using AI and synchronization (in ETB millions)

Investment interventions	Activities	Investment over five years					Total
		2015/16	2016/17	2017/18	2018/19	2019/20	
Improve the AI service and train technicians	Improve the capacity of the AI centres and related service, and train AI technicians	42	38	24	24	20	148
Recurrent cost of AI and synchronization	Double insemination and hormonal synchronization	247 ⁶	397	551	721	902	2817
Total investment to improve cattle breed in the MRS		289	435	575	745	922	2965

Investments to improve health and feeding services in the IFD system

- At national level, over ETB 1 billion will be spent over the first three years to reduce YASM in all species and all systems. The cost of investment in reducing YASM of cattle in the MRS is ETB 214.5 million.
- To improve pasture productivity in the MRD and MRS, a total of ETB 443.5 million is allocated for the five years. The cost of investment for the years 2015/16–2019/20 to improve pasture productivity in the MRS is estimated to be ETB 252.8 million⁷.
- The recurrent cost for health care increases from the current ETB 14 per animal per year to ETB 53 per animal per year. This increment of health service cost is expected to improve the delivery of health services to crossbred animals.
- An additional feeding cost of ETB 4.2 per cow/day is expected to satisfy concentrate feed demand of crossbred cows in IFD.

Table 6: Investment cost to improve feeding and health in the MRS (in ETB millions)

Investment interventions	Activities	Investment over five years					Total
		2015/16	2016/17	2017/18	2018/19	2019/20	
Investment to improve health services in the MRS	Improve health services to reduce YASM	63	70	81.5	-	-	214.5
Investment to improve pasture land	Pasture land improvement	30	40	52.8	60	70	252.8
Total		93	110	134.3	60	70	467.3

Table 7: Additional recurrent costs to improve feeding and health (paid by IFD farmers) (in ETB millions)

Investment interventions	Activities	Investment over five years					Total
		2015/16	2016/17	2017/18	2018/19	2019/20	
Recurrent cost of supplementation of feed to cows	Purchase of concentrate feed	200 ⁸	334	518	753	1043	2849
Recurrent cost of health care	Investment for vaccinations, internal and external parasite control	41	69	106	155	214	585
Total		241	403	624	908	1257	3434

⁶ The assumptions are: ETB 340 per service, 50% birth per service and 5% average mortality rate.

⁷ Calculated from the assumption that 43% of the pasture land is in the MRD and 57% of the pasture land is in the MRS; refer to LSA report.

⁸ Calculation based on assumptions that: Cows represent 35% of the total herd and 65% of the cows are lactating; the cost of supplementation is assumed to be ETB 4.5 per lactating cow per day.

Total investment in IFD production

Table 8: Total investment costs related to IFD production (in ETB millions)

Investment interventions	Activities	Total investment cost		
		Public	Private	Total
Improve the AI service and train AI technicians	Improve the capacity of the AI centres and related service, and train AI technicians	148	-	148
Investment to improve health services in the MRS	Improve health services to reduce YASM	214.5	-	214.5
Investment to improve pasture land	Pasture land improvement	252.8	-	252.8
Total investment cost		615.3	-	615.3

Table 9: Total recurrent costs related to IFD production (paid by IFD farmers) (in ETB millions)

Investment interventions	Activities	Total recurrent cost		
		Public	Private	Total
Recurrent cost of AI and synchronization	Double insemination and hormonal synchronization	-	2817	2817
Recurrent cost of feed supplementation to cows	Purchase of concentrate feed	-	2849	2849
Recurrent cost of health care	Investment for vaccination, internal and external parasite control	-	585	585
Total recurrent cost		-	6251	6251

Impacts

ROI

- In small-sized IFD, the IRR of the investment at herd level is 32.5%.
- In medium-sized IFD, the IRR of the investment at herd level is 23.7%.

Milk production

- The contribution to national milk production of IFD increases from 167 million litres in 2014/15 to 1490 million litres by 2020, an increase of 793%.

GDP

- The GDP contribution of IFD system increases from ETB 1.1 billion in 2014/15 to ETB 10.0 billion in 2020, an increase of 793%.

Table 10: GDP contribution of IFD system (in ETB millions)

GDP (millions ETB)	IFD		% change
	(base year) 2014/15	2019/20	
	1 120	10,001	793%

Additional returns to family resources from the investment in IFD

- Incremental net income increase at herd level is ETB 815 for small MRS cattle production system and ETB 3066 for the medium MRS cattle system due to improvement in breed, feed and health interventions in the MRS.
- As the results in Table 11 indicate, AI and synchronization integrated with feed and health intervention is not profitable in the MRD. The incremental net income increase at herd level for MRD is found to be ETB -14 for small and ETB -337 in medium MRD cattle production systems.

Table 11: Household level estimates of annual benefits and costs due to investment in AI and synchronization services in mixed livestock production systems (MRS and MRD)

Livestock production System	Annual incremental benefits (ETB/ herd)	Annual incremental costs (ETB/ herd)	Annual net incremental benefit (ETB/ herd)	Benefit cost ratio	Annual net benefit per head (ETB)	Annual incremental income per person (ETB)
Cattle MRS small	2110	1295	815	2	272	63
Cattle MRS medium	8967	5901	3066	2	341	52
Cattle MRD small	500	514	-14	<1	-7	-3
Cattle MRD medium	1731	2068	-337	<1	-56	-16

Source: Based on LSIPT results. Note: The annual incremental benefits and costs are obtained by annualizing 20-years cumulative cash flows using a discount rate of 10%.

Activities timeline and sequencing: Gantt chart

Activities	2015/16		2016/17		2017/18		2018/19		2019/2020	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Train AI technicians										
Strengthen the facilities at the AI centres										
Support the transitioning of AI technicians to private sector										
Provide budget allocation support to mobilize AI and synchronization activities										
Provide extension service training on the husbandry of crossbred cattle										
Finalize dairy breeding strategy										
Promote dairy products consumption										
Set up forage seed industry										
Establish forage seed certification guidelines and procedures										
Establish institutional setup for forage seed certification										
Build regional human capacity on forage seed certification										
Ensure forage seed is available										
Develop and implement milk quality standard control, enforcement and grading										
Develop and implement milk quality incentive pricing scheme										
Support expansion of private health service providers in the intervention areas										
Train para-veterinarians in the intervention areas										
Set up dairy technology training										
Establish fresh milk pasteurizing plants ⁹										
Establish powdered milk processing plants										
Establish UHT milk processing plants										

Complementary intervention and success requirements

The government and private sector actions required to ensure success are the:

- Provision of full support in terms of budget allocation for mobilizing and strengthening AI and synchronization facilities, services and activities;

⁹ These plants process milk that comes from all livestock production systems. The investment costs are covered under the specialized dairy intervention.

- The creation of AI infrastructure, including regional semen production facilities and cold storage for distribution;
- Introduction of more conducive policies and laws establishing clear sanitary standards and regulations, together with enforcement mechanisms;
- Establishment and enforcement of quality standards and quality-based price incentives for milk produced and sold;
- Provision of continuous training and refreshment training given to AI technicians—public, private and farmers;
- Introduction of strong extension services focusing on training dairy farmers in better management of crossbred cattle;
- Improvement of animal health services provided to dairy farmers;
- Provision of effective technical and business training to all VC actors; and
- Expansion of private sector investment in dairy processing.

Specialized dairy production systems

Targets

The specialized dairy production systems are improved through better genetics, feed and health services and the units expanded in quantity to increase the number of dairy cows and the contribution of specialized dairy to national milk production. The specific targets for specialized dairy include:

Table 12: Increase in the number of small and medium specialized dairy units during the GTP II

Units	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Small specialized dairy	57,229	70,049	85,740	104,946	128,451	157,227	175%
Medium specialized dairy	400	429	488	554	629	715	79%

Table 13: Annual increase in the number of dairy cattle in the specialized dairy systems

Population	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Small specialized dairy	286,147	350,244	428,699	524,728	642,267	786,134	175%
Medium specialized dairy	40,000	42,933	48,772	55,405	62,940	71,500	79%
Total	326,147	393,177	477,471	580,133	705,207	857,634	163%

In specialized dairy, with the adoption of the interventions during the GTP II, crossbred dairy cattle will show the following improvements:

- Average milk production per crossbred cow per day in small specialized dairy increases from 10 to 12 litres (20% increase);
- Average milk production per crossbred cow per day in medium specialized dairy increases from 16 to 19.2 litres (20% increase);
- Average milk production per crossbred cow per year in small specialized dairy units increases from 2593 to 2746 litres (6% increase); and
- Average milk production per crossbred cow per year in medium specialized dairy units increases from 4608 to 5080 litres (10% increase).

Table 14: Contribution of the specialized dairy system to national milk production (in million litres)

Milk production (million litres)	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Small specialized dairy	401	479	589	730	898	1123	134%
Medium specialized dairy	94	100	114	133	153	178	78%
Total	495	579	703	863	1051	1301	125%

Challenges and strategies

Many of the challenges and strategies mentioned in the same section of the IFD roadmap are also pertinent for specialized dairy. Thus, only the most critical specific challenges and strategies which are important to specialized dairy are given here.

Feed: The challenges include a:

- Shortage and unavailability of quality purchased concentrate feed and roughage; and
- Lack of effective feed quality control and standards enforcement mechanisms.

These challenges could be addressed by:

- Making land available for commercial forage production by investors;
- Promoting and enforcing outsourcing contracts to produce forage for specialized dairy;
- Enforcing feed quality standards, quality monitoring and control;
- Promoting the establishment of flour mills to make more concentrate ingredients available; and
- Promoting domestic production of cooking oil to replace the importation of cooking oil, and limiting or banning the exportation of oilseeds that affect availability of concentrate feeds.

Marketing and processing: The challenges include a:

- Lack of diversity of dairy products and packaging that meets consumption needs of different consumers; and
- Shortage of dairy technologists.

The needed marketing strategies include:

- Promoting investment in UHT, powdered milk production, and other value-added products like yogurt, ice cream, cheese, etc.; and
- Building the capacity of the dairy technology institute(s).

Policy: The challenges that require policy support include:

- An absence of breeding policy;
- A need for milk-quality standards control and enforcement, as well as grading and pricing policies;
- A need for an effective land acquisition policy for dairy investments (preferential treatment for accessing land for specialized dairy production and milk processing);
- The enforcement of a land policy to encourage investment in large scale commercial feed production;
- A need for incentives for investors to establish dairy processing plants and specialized dairy farms; and
- An absence of animal welfare policies.

Interventions to achieve targets

Increasing the volume of milk production per cow from specialized dairy farms

The interventions are not specific to the production typology zone (MRS, MRD, and LG), but to specialized dairy unit size. High yielding crossbred cattle can be kept anywhere if handled properly by commercial specialized farmers. The interventions include:

Promoting the production and marketing of improved forage feed and seed including:

- Promoting and enforcing outsourcing contracts for non-dairy farmers to produce forage for specialized dairy units;
- Changing land use and investment policy to encourage investment in large scale commercial feed production;
- Increasing the coverage of the intervention to 60% of specialized dairy farms by 2020; (both small- and medium-sized farms);
- Changing the adoption rate gradually over the investment period, increasing to 30% in 2020; and
- Leaving recurrent costs to be paid by the specialized dairy farmers.

For small size specialized dairy units (average herd size of five):

- Additional costs for seed and forage production at herd level will arise as the demand for more improved forages increases. For the small specialized dairy farms, the recurrent costs of improved forage seed increases from the current ETB 50 to 200 per ha, the cost of access to water from ETB 20 to 54 per cow per year, the labour requirements (people per year) change from 1.1 to 1.25 person years per unit; and
- The estimate of additional improved forage seed and land needed to produce the improved forage feed is shown in Table 15.

Table 15: Estimate of forage seed and land needed for forage production to improve small specialized dairy farm units

Materials	Years						% change
	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	
Land area (ha) for forage/ herd ¹⁰	0.12	0.25	0.25	0.25	0.25	0.25	108%
Total number of herds	57,229	70,049	85,740	104,946	128,453	157,227	175%
Total area outsourced or cultivated (ha)	6,867	17,512	21,435	26,237	32,113	39,307	472%
Annual seed required (thousand quintals) ¹¹	4	9.8	12.1	14.8	18.1	22.1	453%
Perennial seed required (thousand quintals)	0.1	0.3	0.4	0.5	0.6	0.8	700%

For the medium-sized specialized dairy (average herd size of 100):

- The area requirement for improved forage cultivation increase from four to six hectares through outsourcing an additional two hectares. The cost of improved forage seed increases from ETB 50 to 200 per ha;
- The cost of outsourced forage production is estimated at ETB 15,300 per ha for land rental and contract enforcement. To estimate the cost of the land to produce forage, the opportunity cost for wheat cultivation is used;
- Feed purchase decreases from the current 85% to 77.5 % of the total feed consumed by the medium-sized specialized dairy animals;
- 715 medium specialized dairy farms will be engaged in forage production outsourcing agreements by the year 2020 (Table 16); and
- The additional improved forage seeds and land needed to produce improved forage feeds is shown in Table 17.

¹⁰ This land could be obtained through outsourcing agreements or the use of the farmer's own land for forage production.

¹¹ It is assumed that 75% of the land will be covered by annual and 25% covered by perennial forages.

Table 16: Estimate of medium dairy farms involved in forage production outsourcing agreements over the five-year GTP II period

Total number of herds in medium specialized dairy farms that outsource forage production	Years					
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
	-	429	488	554	629	715

Table 17: Estimate of forage seed and land for forage production in specialized medium dairy farms over the five-year GTP II period

Materials	Years						% change
	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	
Land area (ha) for forage/ herd ¹²	4	6	6	6	6	6	50%
Total number of herds	400	429	488	554	629	715	79%
Total area contracted out or cultivated (ha)	1600	2576	2926	3324	3776	4290	168%
Annual seed required (thousand quintals) ¹³	0.6	1.0	1.1	1.2	1.4	1.6	167%
Perennial seed required (thousand quintals)	0.06	0.10	0.12	0.13	0.15	0.17	183%

Increasing milk production from specialized dairy by increasing the number of crossbred dairy cattle

- For small specialized dairy system, the number of dairy units will increase from about 57,229 in 2015 to 157,227 by 2020 and the number of units of medium specialized dairy will increase from 400 in 2015 to 715 by the year 2020 (Tables 15 and 17 above).
- Herd size of five for small specialized dairy and 100 for medium dairy remain constant until 2020. The number of dairy cattle in the system, therefore, would be 786,135 (5 cattle*157,227 farms) for the small specialized dairy and 71,500 (100 cattle*715 farms) for the medium specialized dairy by 2020. A total of 857,634 cattle will be in the specialized dairy system (Table 13 above).

Because the number of crossbred dairy cattle increases, additional feed is required. Additional demand for concentrate feeds (wheat bran, molasses, and oil cake) by 2020 will reach 756,000 tonnes (Table 18).

Table 18: Additional concentrate feed demand (in thousand tonnes) for the specialized dairy system

Type of specialized dairy system	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Small specialized dairy	253	309	378	463	567	694
Medium specialized dairy	33	37	42	48	54	62
Total	286	346	420	511	621	756

Additional milk processing plant requirements:

To sustain both the IFD and specialized dairy systems and meet growing demand for milk and milk products, the following processing facilities are required:

- An additional 10 fresh milk pasteurizing plants with a capacity of processing 10,000 litres of milk per day will need to be built in 10 different regional cities of the country, as well as two with a capacity of 100,000 litres per day in or near Addis Ababa during the GTP II period; and
- Two milk powder processing plants with a capacity of 400,000 litres of milk per day and one plant with a capacity of processing 5000 litres of milk per hour for long shelf-life UHT milk.¹⁴

¹² Land to produce forage; four hectares owned and two outsourced.

¹³ It is assumed that 75% of the land will be covered by annual and 25% covered by perennial forages.

¹⁴ These plants will not just process milk from the specialized dairy system, they will process milk from all other production systems, including IFD and traditional dairy farms (those with local cows).

Investments

Feed

An investment of ETB 215 million will be required (Table 19) to promote forage production and trade through the establishment of a forage seed industry and support for quality forage seed production and marketing, as well as for outsourced forage feed production.

Table 19: Investment in forage production and trade promotion

Specialized dairy systems	Number of units	Herd size	Total investment (ETB millions)
Small specialized dairy	57,229	5	188
Medium specialized dairy	400	100	27
Total investment cost			215

Table 20: Recurrent costs in the specialized dairy system for the promotion of forage production and trade (in ETB millions)

Recurrent costs	Year					Total
	2015/16	2016/17	2017/18	2018/19	2019/20	
Recurrent cost for purchase of seed	168	205.8	249.5	303.8	370	1297
Recurrent cost for additional water need	2.4	2.9	3.6	4.4	5.4	19
Recurrent cost for contracted forage production	13.1	14.9	17.0	19.2	21.9	86
Total recurrent costs for forage production and trade promotion	183.5	223.6	270.1	327.4	397.3	1402

Wheat flour mills

For the 15 years (2013 to 2028) a total investment of ETB 4.467 billion will be needed to establish wheat flour mills. These flour mills are targeted to produce wheat by-products that could be used as supplementary feed to both specialized dairy and cattle feedlots. Though the total investment (ETB 4.5 billion) is meant to establish wheat flour mills in the next 15 years, the real value associated with wheat by-products, as opposed to flour, is comparatively small (ETB 0.8 billion). For the GTP II period, the investment associated with wheat by-product production is ETB 250 million for specialized dairy and 97 million for specialized cattle feedlots.

Processing for value addition on milk

The establishment of milk processing plants will require an estimated amount of ETB 760 million. The investments need to focus on pasteurizing fresh milk and processing milk into UHT milk and powder. Details are shown in Table 22.

Table 21: Investment cost estimates for milk processing facilities

Type of processing	Capacity	Investment cost/ plant (ETB)	Number of plants
Cow milk processing (UHT)	5000 litres per hour	120 million	1
Powder milk	400,000 litres per day	150 million	2
Fresh cow milk processing	10,000 litres per day	10 million	10
Fresh cow milk processing (Addis)	100,000 litre per day	120 million	2

Total investment in the specialized dairy system

Table 22: Total investment cost of improving the specialized dairy system (in ETB millions)

Investments of the private and public sectors and farmers	Activities/supports	Total investment		
		Public	Private	Total
Investment for forage seed production and trade promotion	Setting up forage seed industry and support for outsourced forage production	215	-	215
Establish wheat flour mills (investment portion for wheat by-product produced)	Establishment of more wheat flour mills	-	250	250
Establish milk processing plants (private sector investment)	Establishment of milk processing plants	-	760	760
Total investment		215	1010	1225

Table 23: Total recurrent cost of improving the specialized dairy system (in ETB millions)

Investments of the private and public sectors and farmers	Activities/supports	Total recurrent cost		
		Public	Private	Total
Total recurrent costs for forage production and trade promotion (ETB millions) (paid by farmers)	Purchase of seed, additional water provision, and payment for forage produced through outsourcing	-	1402	1402
Total recurrent cost		-	1402	1402

Impacts

ROI

- In small specialized dairy system the IRR of the investment at the herd level is 28.6%.
- In medium specialized dairy system the IRR of the investment at the herd level is 42.8%.

Milk production

The contribution of the specialized dairy production system to national milk production increases from 495 million litres in 2014/15 to 1301 million litres by 2019/20 (Table 14).

GDP

- The increased number of improved units results in an increase in the GDP contribution of the specialized dairy system from ETB 3.6 billion in 2014/15 to ETB 9.6 billion in 2019/20.
- The contribution of small specialized dairy to GDP increases from ETB 2207 million in 2015 to ETB 6287 million in 2020 (Table 24).
- The contribution of medium specialized dairy to GDP increases from ETB 353 million in 2015 to ETB 751 million in 2020 (Table 24).

Table 24: Milk GDP contribution of the small and medium specialized dairy system (in ETB millions)

Specialized dairy system	Commodity	Value added		% change
		2015	2020	
Small specialized dairy	Milk	2207	6287 ¹⁵	164%
Medium specialized dairy	Milk	353	751 ¹⁶	71%
Total specialized dairy system		2817.2	7037.3	150%

¹⁵ An additional ETB 2371 million is obtained by 2020 from small specialized dairy system from other products like meat and manure production.

¹⁶ An additional ETB 214 million is obtained by 2020 from medium specialized dairy from other products like meat and manure production.

Complementary intervention and success requirements

The government and private sector actions required to ensure success are the:

- Creation of a supportive investment climate with reduced bureaucratic obstacles to obtaining land for forage and seed production, and to set up and build dairy agribusinesses;
- Establishment and enforcement of quality standards and quality price incentives;
- Development of well-defined contracting procedures, and the enforcement of legal contracts;
- Creation of strong links between government agencies and the private sector (specialized dairy farms and smallholder forage producing farms) through a platform or cluster approach;
- Creation of more effective extension services, AI infrastructure and health services;
- Provision of required technical and business training to all VC actors;
- Introduction of policies and laws establishing clear sanitary standards and regulations, together with enforcement;
- Investment by the private sector in forage seed and forage production;
- Investment by the private sector in flour mills and oilseed processing for concentrates; and
- Investment by the private sector in processing to create demand for milk from farmers every day all year round.

Conclusions

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

- Raising and realizing the genetic potential of local breeds for significantly higher milk production through crossbreeding with exotic dairy breeds, and AI and synchronization, combined with better feed and health services.

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

- Bringing more crossbred cattle into the commercial cattle dairy system; and
- Increasing the availability of forage feeds by improving forage feed production and marketing.

Local cattle, or the vast majority of individual animals, also represent huge potential to bridge the gap between the national cow milk consumption and production. The intervention—mainly targeted at improving animal productive, reproductive and weight gain performance—also affects milk production and productivity significantly in all (MRS, MRD and LG) typology zones. These are achieved by:

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

These combined interventions will result in:

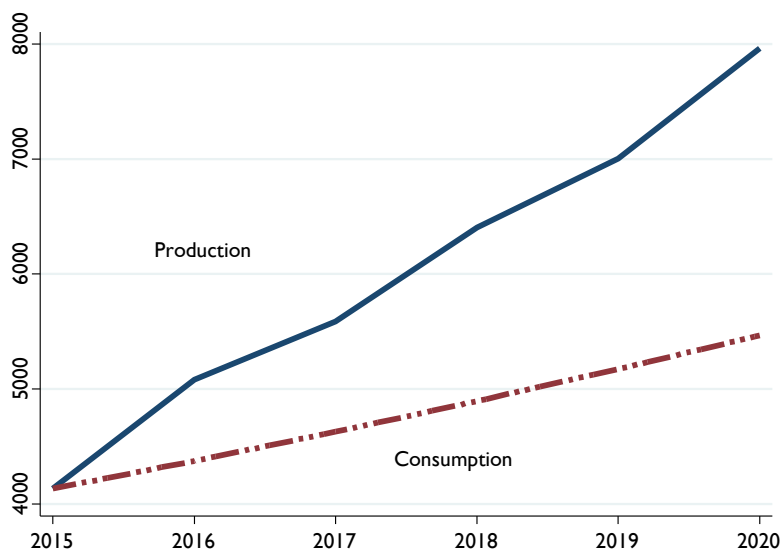
- A 93% increase in national cattle milk production over the GTP II period (from 4132 in 2015 to 7967 litres in 2020);
- An increase in the contribution of cow milk to the national GDP from ETB 28 billion in 2014/15 to ETB 52.9 billion in 2019/20; and
- The production of a surplus of 2501 million litres of cow milk over projected domestic consumption requirements by 2020.

This surplus could substitute for imported milk products and be used domestically for new or additional industrial purposes (e.g. in the baking industry) or exported as milk powder or UHT (Table 26 and Figure 1) to raise foreign exchange earnings and stimulate production.

Table 26: Cow milk production and consumption (in million litres)

Intervention activity results	Base year (2014/15)	Milk				
		2015/16	2016/17	2017/18	2018/19	2019/20
Projected cow milk production	4132	5081	5588	6404	7006	7967
Projected cow milk consumption	4132	4373	4627	4894	5173	5466
Projected cow milk surplus	-	708	961	1510	1833	2501

Figure 2: Production and consumption trend and production-consumption balance for cow milk over the GTP II period of 2014/15–2019/20 (in million litres).



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

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

Red meat-milk and cattle feedlot systems development roadmap (2015/16–2019/20)

Red meat /milk and cattle feedlot systems development roadmap (2015/16–2019/20)

Vision

The projected domestic consumption requirements for red meat that arise due to rapidly growing population, increasing urbanization, and rising incomes will be met; and live animal and meat exports will be increased to generate foreign exchange earnings.

Overall targets

To raise red meat production in ITMM to reach 1,933,000 tonnes in the year 2020 through the improvement of animal health and feeding, and the implementation of a genetic recording scheme.

To increase the herd size, number of fattening cycles and fattening units in the specialized cattle feedlots and increase the total number of animals passing through the commercial feedlot operations to 3.1 million and 6.7 million, by 2020 and 2028 respectively. The objective is to achieve this by expanding the production capacity of the specialized cattle feedlots to 368,305 tonnes of beef from feedlots by 2020.

Improved traditional red meat-milk production

Targets

Interventions aimed at increasing red meat output are expected to bring the following changes in animal productivity:

- In cattle: a 10% increase in live weight, a 3 percentage point increase in dressing percentage and parturition rate over 20 years, and 1–1.5% annual increase in the off-take rate;
- In sheep and goats: a 20% live weight gain, a 3 percentage point increase in dressing percentage, a 4 percentage point increase in parturition rate over 20 years and an annual increase of the adult off-take rate from 4–5%; and
- In camels: a 10% increase in live weight, 3 percentage point increase in dressing percentage, 2.5 percentage point increase in parturition rate and an annual off-take rate increase of 2% in adult females.

Table 27: Annual increase in the number of cattle in the ITMM cattle system (in thousands)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	15,628 ¹⁷	15,750	15,874	15,999	16,126	16,254	4%
MRD	15,030	15,136	15,243	15,351	15,460	15,570	4%
MRS	25,358	26,312	27,308	28,349	26,312	30,571	21%
Total	56,016	57,198	58,425	59,699	57,898	62,395	11%

- The total increase in the number of cattle over all production zones grows from 56 to 62 million in 2020 (11% increase).

Table 28: Annual increase in the number of sheep in the ITMM-sheep system (in thousands)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	17,288 ¹⁸	18,567	19,963	21,488	23,157	24,982	45%
MRD	6315	6813	7351	7932	8559	9236	46%
MRS	10,904	12,016	13,242	14,593	16,081	17,722	63%
Total	34,507	37,396	40,556	44,013	47,797	51,940	51%

- The total increase in the number of sheep over all production zones grows from 35 to 52 million in 2020 (51% increase).

Table 29: Annual increase in the number of goats in the ITMM-goat system (in thousands)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	22,874 ¹⁹	24,211	25,630	27,135	28,732	30,428	33%
MRD	5,101	5,609	6,168	6,784	7,463	8,210	61%
MRS	4,484	4,672	4,868	5,072	5,286	5,508	23%
Total	32,459	34,492	36,666	38,991	41,481	44,146	36%

- The total increase in number of goats over all production zones grows from 32 to 44 million in 2020 (36% increase).

Table 30: Annual increase in the number of camels in the ITMM-camel system

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	4,527,040 ²⁰	4,540,622	4,554,244	4,567,906	4,581,611	4,595,355	2%

- The total increase in the number of camels grows from 4.5 to 4.6 million in 2020 (2% increase).

Table 31: Contribution of cattle in ITMM to national red meat production (in tonnes)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	251,364	256,897	266,120	272,533	280,128	279,152	11%
MRD	235,776	241,607	248,853	254,854	261,503	249,150	6%
MRS	352,941	377,813	423,407	462,768	504,271	535,849	52%
Total	840,079	875,007	923,024	971,191	1,020,803	1,084,477	29%

- The potential contribution of cattle to red meat over all production zones grows from 840,079 (in 2015) to 1,084,477 tonnes by 2020 (29% increase).

17, 18, 19, 20 The greater number of cattle, sheep, goats and camels in the LG, cited in the LSA, as opposed to the numbers found in the 2011 CSA livestock census, is explained by the difference of data sources. The LSA used data collected by Save the Children in nomadic and sedentary households, whereas CSA data only accounts for livestock found in sedentary households.

Table 32: Contribution of sheep in ITMM to national red meat production (in tonnes)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	54,071	66,069	70,759	75,875	81,461	87,561	62%
MRD	23,791	29,245	31,555	34,048	36,741	39,647	67%
MRS	36,914	46,935	51,725	57,001	62,815	69,222	88%
Total	114,776	142,249	154,039	166,924	181,017	196,430	42%

- The potential contribution of sheep to red meat over all production zones grows from 114,776 (in 2015) to 196,430 tonnes by 2020 (42% increase).

Table 33: Contribution of goats in ITMM to national red meat production (in tonnes)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	69,881	92,623	98,031	103,770	109,858	116,318	67%
MRD	15,022	22,880	25,158	27,666	30,428	33,470	123%
MRS	12,428	18,332	19,102	19,905	20,741	21,612	74%
Total	97,331	133,835	142,291	151,341	161,027	171,400	43%

- The potential contribution of goats to red meat over all production zones grows from 97,331 (in 2015) to 171,400 tonnes by 2020 (43% increase).

Table 34: Contribution of camels in ITMM to national red meat production (in tonnes)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	73,996	97,669	97,962	98,256	98,550	98,846	34%

- The potential contribution of camels to red meat grows from 74,000 (in 2015) to 99,000 tonnes by 2020 (34% increase).

Table 35: Contribution of cattle in ITMM to national milk production (in million litres)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	847	897	926	971	995	993	17%
MRD	845	873	899	939	960	995	18%
MRS	1945	2732	3060	3631	4000	4678	141%
Total	3637	4502	4885	5541	5955	6666	83%

The potential contribution of cattle to the national cattle milk over all production zones grows from 3,637 (in 2015) to 6,666 million litres by 2020 (83% increase).

Table 36: Contribution of goats in ITMM to national milk production (in million litres)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	169	281	297	315	333	353	109%

- The potential contribution of goats to the national production of goat milk in the LG grows from 169 (in 2015) to 353 million litres by 2020 (109% increase).

Table 37: Contribution of camels in ITMM to national milk production (in thousand litres)

Typology zones	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	% change
LG	1003	1085	1088	1092	1095	1098	9%

- The potential contribution of camels to the national production of camel milk in the LG, grows from 1 (in 2015) to 1.1 million litres by 2020 (9% increase).

Challenges and Strategies

Feed: The challenges related to feed include:

- Poor quality of grazing lands;
- A need for greater knowledge on the use of crop residues; and
- Poor availability of concentrates and feed supplements when needed.

These could be addressed through the:

- Rehabilitation of rangeland/grazing land;
- Introduction of better use of crop residues; and
- Establishment of flour mills, thus making more concentrates available.

Genetic potential: challenges include:

- Negative selection of (inferior) bulls for draught purposes and use of inferior bulls for breeding;
- Low genetic improvement extension coverage;
- Poor recording scheme;
- Inadequate local semen collection and processing, and AI delivery; and
- Limited knowledge on the selection of higher producing cows for milk production.

The challenges of improving the genetic potential of local animals could be overcome through selection strategies: developing a recording scheme, and establishing effective AI service through the use of semen from selected local bulls.

Animal health services at production level: challenges include:

- Poor animal health extension advice;
- Inefficient animal health services;
- Inadequate supplies and qualities of vaccines and drugs; and
- Poor quality control of drugs and supplies.

Strengthening animal health regulatory capacity under the coordination of the LSM is the main thrust of the strategy. The strategy also includes engaging the private sector for the production of vaccines and veterinary drugs.

Marketing and processing: challenges include:

- Poor market infrastructure and roads;
- Poor technical knowledge of VC actors, especially processing technicians;
- Inadequate market information; and
- Poor linkages between producers, processors and export abattoirs.

These challenges could be overcome through capacity building and by building infrastructure.

Policy: challenges include:

- An absence of breeding policy;
- The enforcement of land use policy; loss of land to alternative investments outside livestock; and
- A need for protective trade policy through appropriate measures.

These challenges could be better addressed through clearly defined guidelines on land use and access rights, and by implementing appropriate land policies.

Interventions to achieve targets²¹

The **LG** interventions do not involve AI, which are not practiced here. Therefore, genetic progress by improved selection of indigenous breeds is anticipated to be slow. The main proposed technological interventions are:

- Feed improvement through better range management, over sowing with grass and legumes, and the control of invasive species. The intervention to improve rangeland productivity includes water development and rangeland improvement by shrub clearing, and the application of fertilizers and herbicide treatment where major shrub encroachment takes place. In later years, additional fertilizer and herbicide treatment will be needed, particularly for poor and fair condition rangelands;
- Reduction of YASM: The relevant health interventions include improving access to quality of veterinary services through rationalized use of public/private veterinary services; anti-parasitic control/treatment; and vaccinations;
- Promotion of community-based small ruminant breeding;
- Breed improvement through better selection and management of male breeding animals; and
- Much needed introduction of a herd/flock recording scheme for breed improvement.

In the **MRS and MRD**, the main proposed interventions include:

- Breed improvement, involving AI with semen of improved local breeds;
- Breed management improvement through the implementation of a herd/flock recording scheme;
- The maintenance of a ram to ewe ratio of 1:20 and training/extension to improve the capacity of farmers to select and manage male breeding animals;
- The reduction of YASM with vaccines and anti-parasites;
- The introduction of integrated fodder crops with food crops;
- Soil and water conservation practices on communal grazing lands (gully prevention and rehabilitation);
- The timely harvesting of grass, and storage and conservation of hay from communal grazing lands.
- Increased efficiency of crop residue use (proper storage, supplementation, treatment including physical treatment-chopping, and urea); and
- Over-sowing and rotational grazing.

Investments

In the **LG**

- The time horizon for the project is 20 years.
- The initial investment cost is estimated at ETB one billion (see Table 38 for the LG, and 40 for the MRS and MRD) to be spent over the five years of the project life, covering the training and installation of private veterinary and para-veterinary clinics (basic supplies), subcontracts for vaccinations, and procurement of vaccines and medicines;

²¹ The greater number of cattle, sheep, goats and camels in the LG, cited in the LSA, as opposed to the numbers found in the 2011 CSA livestock census, is explained by the difference of data sources. The LSA used data collected by Save the Children in nomadic and sedentary households, whereas CSA data only accounts for livestock found in sedentary households.

- For all species, it is assumed that a full vaccination regime (once—twice per year depending on the disease risk) and de-worming, plus a mineral supplementation package, are applied; and
- For all scenarios, the annual discount rate assumed is 10%, which is the assumed current social opportunity cost of capital in Ethiopia.

Table 38: Investment in young and adult stock mortality in ITMM in the LG (in ETB thousands)²²

Typology	Investment over the five-year period					Total
	2015/16	2016/17	2017/18	2018/19	2019/2020	
LG	134,539	149,489	174,047			458,076

Table 39: Rangeland rehabilitation public investment cost estimate (in ETB thousands) (CRGE 2011)

Items	2015/16	2016/17	2017/18	2018/19	2019/2020	Total
Rangeland improvement	76,668	102,224	134,936	153,337	178,8930	646,060
Water development	151,661	202,215	266,924	303,322	353,876	1,278,000
Total investment cost	228,329	304,439	401,860	456,659	532,769	1,924,060

MRD and MRS

In addition to the investment in reducing YASM (Table 40), investment on pasture land improvement and production is shown in Table 41.

Table 40: Investment in young and adult mortality in the MRS and MRD (in ETB thousands)

System	Investment over the five year period					Total
	2015/16	2016/17	2017/18	2018/19	2019/2020	
MRD	80,683	44,264	50,300	43,848	14,835	211,932
MRS	130,373	68,922	78,320	68,274	23,099	329,992

Table 41: Investment costs for pasture land improvement and seed production (in ETB thousands)

Items	Cost during the investment period					Total
	2015/16	2016/17	2017/18	2018/19	2019/2020	
Legume seed production	3423	2582	2934	2557	865	12,363
Elephant grass seed production	25,671	19,364	22,004	19,182	6489	92,712
Pastureland	93,707	70,683	80,321	70,018	23,689	338,420

²² Investment over the first three years.

Table 42: Total investment and recurrent costs for the ITMM production system (in ETB millions)

Investment	Responsible actor		Total investment cost (ETB thousands)
	Public	Private	
Pasture land improvement and seed production	400,000	43,495	443,495
YASM in the LG	457,076	1,000	458,076
YASM in the MRD	169,546	42,386	211,932
YASM in the MRS	98,998	23,0994	329,992
Rangeland improvement in the LG	646,060	-	646,060
Water development in the LG	1,278,000	-	1,278,000
Total investment			3,367,555

Impacts

Return on Investment (ROI)

The IRR on investment of ITMM interventions was found to be 23% in the LG, 17% in the MRS, and 38% in the MRD (greater than the social discount rate of 10%).

Production

Table 43: Red meat production for the baseline year (2015) and 2020 with red meat intervention (in tonnes)

Products	Total red meat in 2015 (tonnes)—baseline	Total red meat in 2020 (tonnes)—with intervention	% change in red meat production due to intervention
Meat in the LG			
Cattle	251,364	287,863	15%
Sheep	54,071	87,561	62%
Goats	69,881	116,318	66%
Camels	73,996	98,846	34%
Total	449,312	590,588	34%
Meat in the MRD			
Cattle	235,775	254,958	8%
Sheep	23,791	39,647	67%
Goats	15,022	33,470	123%
Total	274,588	328,075	19%
Meat in the MRS			
Cattle	352,941	541,657	54%
Sheep	36,914	69,222	88%
Goats	12,428	21,612	74%
Total	402,283	632,491	57%
TOTAL	1,126,183	1,551,154	38%

Table 44: Total red meat in ITMM by species—cattle, sheep, goats, and camels (in tonnes)

Products	Total red meat in 2015 (tonnes)—baseline	Total red meat in 2020 (tonnes)—with red meat intervention	% change in red meat production due to intervention
Total Red Meat			
Cattle	989,000	1,467,000	48%
Sheep	114,776	196,430	42%
Goats	97,996	171,400	43%
Camels	73,996	98,846	34%
Total	1,275,768	1,933,676	52%

- The total red meat from ITMM grows from 1.3 million in 2015 to 1.9 million in 2020, showing an increase by 52%.

GDP

Table 45: Livestock GDP for baseline year (2015) and 2020 with red meat intervention (in ETB millions)

Products	Total livestock GDP 2015 (in ETB millions)—baseline	Total livestock GDP 2020 (in ETB millions)—with red meat intervention	% change in national livestock GDP
Meat in the LG			
Cattle	5272	8062	53%
Sheep	2893	4503	56%
Goats	3979	6452	62%
Camels	3614	4813	33%
Meat in the MRD			
Cattle	7410	8318	12%
Sheep	1549	2518	63%
Goats	1070	2319	118%
Meat in the MRS			
Cattle	11,025	15,072	37%
Sheep	2499	4565	83%
Goats	885	1497	69%
TOTAL	40,196	58,119	44.6%

- The GDP contribution of red meat from the ITMM system in all typology zones has shown an overall increase by 45% compared to the 2015 GDP. This amounts to ETB 40 billion in 2015, compared to 58 billion in 2020.

Activity timeline and sequencing: Gantt chart

Activities	2015/16		2016/17		2017/18		2018/19		2019/2020	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Anti-parasitic control and treatment										
Adult stock immunization										
Young stock immunization										
Animal disease surveillance										
Strategic feed supplementation to the dams (breeding animals)										
Introduction of flock/herd recording scheme										
Fodder production initiatives to get land										
Rangeland or grazing land rehabilitation										
Extension work to support improved feeding of cattle, sheep, goats, and camels										

Complementary interventions and success requirements

The following government action is required:

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

Specialized cattle feedlots

Targets

Table 46: Number of cattle units in the specialized cattle feedlot system²³

Units	2014/15	2019/20	% change
Small fattening ²⁴	9397	577,052	163%
Medium fattening ²⁵	20,881	701,592	298%

²³ Ninety-seven per cent of the live animals from the medium-sized feedlot production are exported.

²⁴ The fattening unit sizes are described by the number of cattle per unit. The cycles per year for small units are three.

²⁵ The cycle per year for the medium is 3.4.

Table 47: Contribution of the specialized cattle feedlot system to national meat production (in tonnes)

Type of feedlot unit	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Small fattening units	97,200	119,556	147,054	180,876	222,478	273,647	129%
Medium fattening units	37,885	54,193	62,322	71,670	82,240	94,657	150%
Total	135,085	173,749	209,376	252,546	304,718	368,304	173%

Table 48: Contribution of the specialized dairy production system to national meat production (in tonnes)

Type of feedlot unit	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Small specialized units	11,152	13,162	16,088	19,688	24,096	29,867	168%
Medium specialized units	2682	2772	3155	3609	4104	4676	74%
Total	13,834	15,933	19,244	23,297	28,200	34,544	150%

Challenges and strategies

Feed challenges include:

- Limited access to land for production of forage seed and forage;
- Limited support to commercial feedlots in meeting the feed demand;
- Inadequate and poor access to quality purchased concentrate feed; and
- Lack of effective feed quality control: standards and mechanisms of enforcement.

These feed challenges could be addressed through:

- Making land for forage production available to investors;
- Promoting and enforcing land contracts to produce forage for commercial feedlots;
- Promoting the establishment of flour mills and thus making more concentrates available; and
- Promoting the establishment of agro-industries for increased availability of by-products that could be used as feed supplements.

Animal health services challenges include:

- Poor animal health extension advice;
- Inefficient animal health services;
- Inadequate supplies of drugs;
- Poor quality control of drugs and supplies;
- Poor disease surveillance;
- A need for traceability and identification; and
- Inadequate quality control in abattoirs.

Strengthening the animal health regulatory capacity under the coordination of the LSM is the main thrust.

Marketing and processing challenges include:

- An absence of quality-based pricing;
- A lack of holding area and feedlot space;

- A need for more knowledge on meat-cutting and-grading;
- Poor links to export abattoirs; and
- Few export market destinations.

Challenges could be addressed by:

- Building the capacity of staff in meat technology;
- Increasing training of meat processing staff;
- Promoting forward contracting of feedlots and abattoirs; and
- Investing in export infrastructure for animal holding and quarantine, as well as programs to ensure food safety and animal health through disease surveillance, monitoring of abattoirs, animal identification and traceability, etc.

Policy challenges that require special attention include:

- A need for the enforcement of meat quality standards, control, grading, and pricing policies;
- A need to ensure full implementation of the policy on breeding;
- A need to ensure the development of land policies, or the full implementation of existing policies, related to feed production and land acquisition for feedlot investment;
- Inadequate feed quality monitoring and controlling;
- The introduction of further incentives to establish feedlots (including land access in appropriate locations conducive to feed production, linkages with export market, and infrastructure—road access, power and water supply);
- The promotion of domestic production of oilseed to replace the importation of cooking oil and stop the exportation of oilseeds that affect availability of concentrate feeds;
- The promotion of domestic production of grain flour to replace the importation of flour that affects availability of energy concentrate feeds that are by-products of the grain milling industries;
- The introduction of protective trade policy to reduce the importation of cooking oil and grain flour; and
- The development and implementation of animal welfare policies.

Interventions to achieve targets

Increasing the number of animals fattened

The specialized production feedlot system will be improved through better feed and health services, the expansion of the number of specialized cattle feedlot units, and an increase in the number of cattle being fattened.

Table 49: Projected number of cattle fattened by the commercial small-and medium-sized cattle feedlots

With change				
Number of animals fattened/ unit/ year	Type	2015	2020	% change
	Small fattening	6	9	50%
	Medium fattening	343	539	57%
Number of fattening units	Small fattening	150,000	281,531	88%
	Medium fattening	875	1119	28%
Total cattle fattened	Small fattening	900,000	2,533,775	182%
	Medium fattening	300,000	603,407	101%
Total cattle fattened (millions)		1.2	3.1	61%

Increasing the availability of feed ingredients required by specialized cattle feedlot

Table 50: Estimated amount of additional concentrate feed needed for additional animals going to beef feedlot by the year 2020

Type of feedlot system	Number of animals		Additional number of animals in 2020 relative to 2015	Additional concentrate/year (thousand tonnes)
	2015	2020		
Small fattening units	900,000	2,533,775	1,633,775	243
Medium fattening units	300,000	603,407	303,407	1577

The additional concentrate needed per animal will be 0.15 and 5.2 tonnes per year.

Table 51: Estimated amount of ingredients (bran, molasses, and oilcake) comprising concentrate feed

Type of feedlot system	Feed ingredients (thousand tonnes)			Total (thousand tonnes)
	Wheat bran	Oilseed cake	Molasses	
Small fattening	49,641	22,911	57,278	129,831
Medium fattening	1,127,439	520,356	1,300,891	2,948,686
Total	1,177,080	543,268	1,358,169	3,078,517

Investments

Table 52: Investment in slaughterhouse establishment through PPP²⁶

Type of processing	Cost per unit (ETB)	Number of new slaughterhouses	Capacity	Investment cost/plant(ETB)	Area/ population covered
Small slaughterhouses	100,000	100	50 sheep and goats and 20 cattle/ day	10 million	Towns and cities with 100,000 population
Big slaughterhouses (with rendering system)	5,000,000	6	200 sheep and goats and 100 cattle/ day	30 million	Towns and cities with 200,000 population
Export slaughterhouses (with all required facilities)	100,000,000	2	3000 sheep and goats and 600 cattle/ day	200 million	

Table 53: Incentives for investment in flour and oilseed mills by private sector paid by GoE

Total GoE incentives to flour and oil mills	Investment cost (ETB)
	96 million

- Incentives of ETB 96 million paid to mills in cash or kind

Impacts

Return on Investment (ROI)

The return on investment in cattle feedlots is big and attractive. The benefit/cost ratio is 9 and 1.3 for small and medium feedlots units, respectively (greater than 1).

²⁶ Expansion should be considered while planning the facilities.

Production

Table 54: Change in beef production from specialized cattle feedlot for the baseline year (2015), to 2020 beef feedlot intervention

Products	Total production 2015 baseline	Total production 2020— with commercial feedlots intervention	% change in production
Beef in tonnes			
Cattle	135,085	368,305	173%

Total red meat production from the specialized cattle feedlot increases by 173% by the year 2020, resulting in an increase from 135,000 (2015) to 368,000 tonnes (in 2020).

GDP

- The contribution to the GDP by the specialized cattle feedlot system grows from ETB 54 billion in 2015 to 83 billion in 2020, showing an increase by 53%.

Table 55: Livestock GDP for baseline year (2015) and 2020 with interventions on specialized cattle feedlots

Product (meat)	Total livestock GDP 2014/15 (ETB millions)—baseline	Total livestock GDP 2020(ETB millions)—with specialized feedlots interventions	% change in national livestock GDP
Cattle	54,090.3	82,746.2	53%

Activity timeline and sequencing: Gantt chart

Activities	2015/16		2016/17		2017/18		2018/19		2019/2020	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Implementing the roadmap for the rationalization of public/private veterinary services										
Anti-parasitic treatment										
Adult stock vaccinations										
Disease surveillance										
Establishing quarantine facilities										
Establishing identification and traceability tools										
Quality control in Abattoirs										
Identifying potential locations for feedlot establishment										
Creating new feedlots										
Ensuring MoA support for the establishment of feedlots in strategic locations										
Establishing slaughterhouses										

Complementary interventions and success requirements

- Industry strategy developed by GoE in collaboration with industry association.
- Access enabled to sufficient production factors (including land, water and finance).
- Policy and investment environment (less bureaucracy) to attract and enable private investment in feedlots and slaughterhouses improved.

- Feed coming from new and existing sugar plantations and other types of large-scale crop production investments in Ethiopia strategically used.

Conclusions

- The potential contribution of ITMM and specialized cattle feedlot to improve food security, red meat consumption and nutrition, and contribute to economic growth is significant, given the production increase shown in Table 56.
- However, this can only be realized if:
 - Investments are implemented by the GoE and private investors in a timely manner and are adequately funded.
 - Feed needs are given priority. This includes the establishment of flour mills and the increasing availability of roughages, such as crop residues or feeds in the form of agro-industrial by-products. The bulk of additional concentrate feed needs to come from investment by the private sector in flour mills and agro-industries.
 - An industry strategy is put in place in collaboration with industry associations to enable access to sufficient production factors (including land, water and finance).
 - The policy environment to attract and enable sustainable growth in feedlots is improved.
 - Linkages are established for a viable stocker feeder program where the young male stock from the LG are channelled to feedlot operations, thus reducing the grazing pressure in the system.
 - The establishment of new feedlot operations takes into account the spatial distribution of sugar cane factories, agro-industrial processing plants and milling industries.

Table 56: Total red meat production by species (thousand tonnes)

Species	2015	2020	% change
Cattle in			
ITMM	840.1	1,065.5	27%
Specialized cattle feedlot	135.1	368.3	73%
Specialized dairy	13.8	34.5	150%
Sheep	114.8	196.4	71%
Goats	97.3	171.4	76%
Camels	74.0	98.8	34%
Total	1,275.1	1,934.7	52%

- Even if all the above conditions are met the red meat (ITMM, cattle feedlots and specialized dairy) production and consumption balance for the period 2015–2020 projects a deficit of 73,000 tonnes by 2020.
- Production grows from 1,275,000 tonnes in 2015 to 1,934,700 tonnes in 2020, an increase of 52%.
- Consumption grows faster, from 1,275,100 tonnes of red meat in 2015 to 2,008,000 tonnes by 2020, and increase of 58%.

Figure 3: GTP targets for production, projected consumption, and production-consumption balance for cattle meat in thousand tonnes)

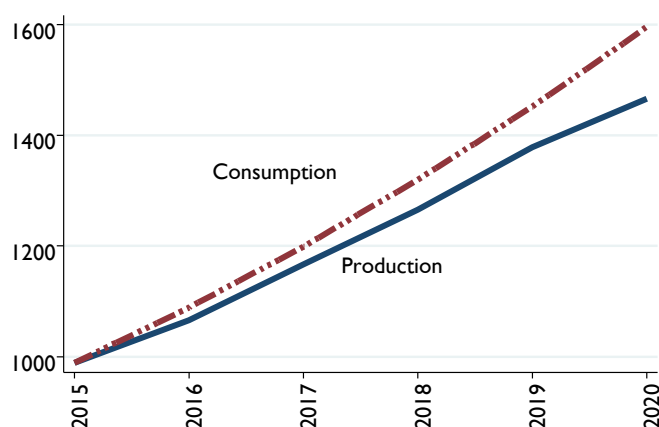


Figure 4: GTP targets for production, projected consumption, and production-consumption balance for sheep meat in thousand tonnes)

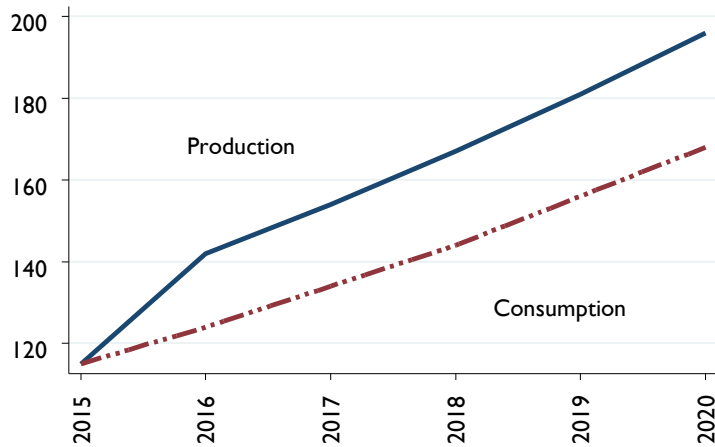


Figure 5: GTP targets for production, projected consumption, and production-consumption balance for goat meat in thousand tonnes)

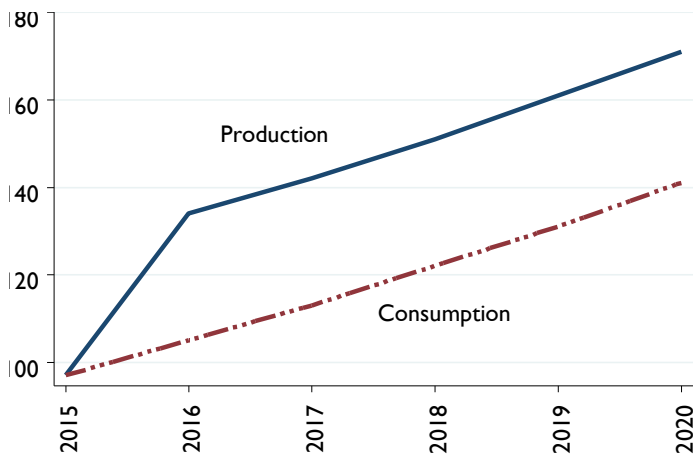
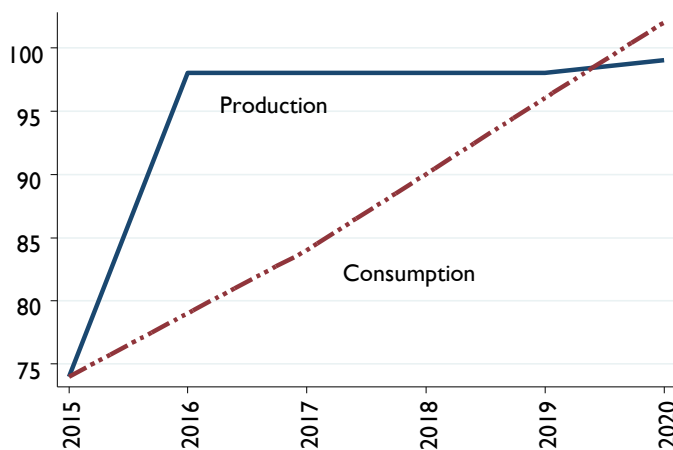


Figure 6: GTP targets for production, projected consumption, and production-consumption balance for camel meat in thousand tonnes)



Poultry development roadmap (2015/16–2019/20)

Poultry development roadmap (2015/16–2019/20)

Vision

Ethiopia will meet its chicken meat and egg demand for its growing population and produces export surpluses. The poultry sub-sector will move away from the traditional scavenging family poultry system (TFP) to the improved semi-scavenging family poultry system (IFP) and increase the scale of specialized layer and broiler production (specialized poultry). This transformation will make a substantial contribution to reducing poverty and malnutrition among rural and urban poor.

The sub-sector will help close the total national meat production-consumption gap and achieve the CRGE target of increasing the share of chicken meat consumption to total meat consumption from the current 5% to 30% by 2030 by substituting red meat that comes from larger high emitting ruminants.

Overall target

To raise chicken meat production to 164,000 tonnes and eggs to 3.9 billion by the year 2020 through IFP and expanded specialized poultry.

Moving traditional (scavenging) family poultry to improved (semi-scavenging) family poultry system

Targets

Table 57: Number of hens in TFP and day-old chicks (DOCs) in IFP subsystems 2015–2020 (in millions)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
TFP	5.7	5.1	4.6	4.1	3.7	3.4	-41%
IFP	3.0	3.6	4.3	5.8	7.8	10.4	246%

- Number of chickens in the TFP drops from 5.7 million hens with followers to 3.4 million hens with followers, a 41% drop.
- Number of DOCs in the IFP subsystem grows from 3.0 million in the base year to 10.4 million in 2020, a 246% increase (Table 57).

Table 58: Number of IFP-keeping households by production typology zone

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
IFP MRS	66,000	79,200	95,040	126,500	170,500	228,800	247%
IFP MRD	48,000	57,600	69,120	92,000	124,000	166,400	247%
IFP LG	6000	7200	8640	11,500	15,500	20,800	247%
IFP all	120,000	144,000	172,800	230,000	310,000	416,000	247%

- The number of IFP-keeping households (farms or units of 25 hens each) increases from 120,000 in the year 2015 to 416,000 in the year 2020, a 247% increase across all typology zones.
- The distribution of IFP farms (households) remains 5% in the LG agro-pastoral, 40% in the MRD and 55% in the MRS through the GTP II period (Table 58)

Table 59: Chicken meat production from IFP and TFP (in thousand tonnes)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
IFP meat	2.9	3.5	4.2	5.6	7.60	10.2	251%
TFP meat	45.6	41.1	36.96	33.3	29.9	26.9	-41%

- Chicken meat production from IFP increases from 2900 tonnes in the year 2015 to 10,200 tonnes in the year 2020, a 251% increase (Table 59).
- Chicken meat production from traditional scavenging poultry reduces from 45,600 tonnes in the year 2015 to 26,900 tonnes in the year 2020, a 41% reduction.

Table 60: Egg production from IFP and TFP (in millions)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
IFP egg	258	309.6	371.5	494.5	666.5	894.4	246%
TFP eggs	133	119	108	96.8	87.1	78.4	-41%

- Egg production from IFP increases from 258 million in the year 2015 to 894 million in the year 2020, a 246% increase (Table 60).
- Egg production from the TFP decreases from 133 million in 2015 to 78.4 million by 2020, a 41% reduction.
- Average culling weight of TFP hens is 1.4 kg at 36 months, as compared to 2.8 kg in IFP at 18 months.
- Egg production per hen increases from 42 in TFP to 150 in IFP.
- Average egg weight increases to 60 gm in IFP, as compared to 40 gm in TFP.
- Flock size per family in IFP increases to 25 hens, as compared to 2 hens and 8 followers in TFP.
- Mortality drops from current level of 50% in the TFP to 10% in the IFP.

Challenges and strategies

Feed: challenges include:

- Limited access to land for production of maize and soybeans for poultry feed;
- A need for more cooking oil processing plants in which by-products, such as soybean cakes, could be made available for poultry feeding;
- Inadequate and poor access to quality purchased concentrate feed; and
- A need for the enforcement of efficient feed quality control and standards.

These could be addressed by:

- Acquiring land for maize and soybean production;
- Promoting and providing attractive incentives (e.g., tax holidays, land) for those private investors establishing agro-industries that would help to increase availability of by-products, such as soybean cake, for use as poultry feed;
- Regulating the export of oil crops and import of cooking oils; and
- Setting up a mechanism to control feed quality.

Animal health services: challenges include:

- Low animal health extension coverage;
- Inefficient animal health services;
- Inadequate drug supplies and quality vaccines (e.g. vaccine for Newcastle disease); and
- Lack of efficient quality control of drugs and veterinary supplies.

These challenges could be addressed by strengthening the animal health services, extension, and regulatory capacity in the LSM and the regional state agricultural bureaus, and by encouraging private sector investment in animal health services, as well as in input production and distribution.

Breeding: challenges include:

- Availability of chicken breeds suitable for semi-scavenging production;
- Limited investment by the private sector in establishing grandparent, parent and commercial chicken production; and
- Low productivity of indigeous breeds.

These challenges could be addressed by providing incentives to the private sector for poultry investment, strengthening research to select productive indigenous breeds, and by developing breeds suitable for semi-scavenging production systems.

Marketing and processing: challenges include:

- Seasonal demand fluctuations (due to fasting) leading to variations in chicken meat and egg supply and processing;
- Inefficient DOC and pullet distribution systems;
- Attitudinal/behavioural challenges towards producing and consuming eggs and meat from hybrid and exotic breeds; and
- Limited cooking and serving skills in relation to chicken meat and eggs.

These could be addressed by:

- Processing and marketing strategies developed with private sector, farmer groups, cooperatives, etc.;
- Providing incentives to and strengthening the private sector in developing market distribution systems and retail outlets for chicken meat and eggs;
- Intensifying the promotion and extension work to change the attitudes of consumers towards consuming eggs and meat from hybrid and exotic breeds; and
- Developing diverse skills in cooking and serving of chicken meat and eggs to meet the needs of a diverse group of consumers.

Policy challenges that require special attention include:

- A need to ensure the full implementation of policy related to land acquisition for poultry feed production.
- A need to safeguard effective implementation of quality monitoring and control mechanisms.

- The introduction of policy to discourage the importation of cooking oil and the exportation of oilseeds that affect availability of concentrate feeds.
- The introduction of protective trade policy to encourage domestic private investment in poultry production.
- The development and implementation of animal welfare policies.

Interventions to achieve targets

The intervention in smallholder poultry upgrades the family backyard poultry production (TFP, with hen and followers) to a higher yielding IFP system. The IFP intervention is based primarily on the importation of exotic breeds to cross with local breeds and create crossbred, semi-scavenging, improved breeds²⁷, with complementary health and feed improvement interventions. The adoption rate is expected to be slow at the start, 0.7% in year two, 2016/17, reaching 14% in year five, 2019/20. In the year 2020, chicken meat from the IFP systems will reach 10,200 tonnes and 894.4 million eggs, increases of 251% and 246% respectively.

- The estimated amount of poultry feed required for IFP in the year 2020 for:
 - Maize is 266,600 tonnes; and
 - Soybean meal is 127,300 tonnes.
- The land needed to meet the IFP added requirement in the year 2020:
 - For maize production is 51,900 ha; and
 - For soya production is 43,200 ha.
- One national and four regional grandparent farms are established and operationalized²⁸.
- The grandparent foundation stock of suitable tropical exotic semi-scavenging breeds is imported.
- The existing regional multiplication centres are upgraded.
- Twenty-five new public and private multiplication centres for production of DOCs are established.
- Two hundred and fifty new PPP or private production and distribution businesses for three-week old chicks are established.
- Some 10.4 million improved semi-scavenging DOCs are produced and distributed in the year 2020.
- Coverage for IFP is 58% of the TFP system. The adoption rate is 0.7% in year two, 2016/17 reaching 14% in year five, 2019/20.

Investments

See the investment sub-section of the cattle feedlot section in the chapter on red meat-milk and cattle feedlot systems.

Impacts

Return on Investment (ROI)

- The return from the investment in IFP subsystems is very large and attractive. The benefit/cost ratio is 10.5.

Production

- Chicken meat production from IFP increases from 2900 tonnes in the year 2015 to 10,200 tonnes in the year 2020, a 251% increase.
- Total egg production increases from 258 million in the year 2015 to 894.4 million in the year 2020, a 246% increase.

²⁷ The exotic or crossbred semi-scavenging breeds not specified as alternatives will be tested and chosen in the first year of the GTP II.

²⁸ This is for both IFP and specialized poultry.

Specialized poultry production

Targets

Table 62: Number of DOCs in specialized poultry subsystems (in millions)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Specialized poultry layers	0.145	3.0	6.0	9.0	12.0	15.0	10,243%
Specialized poultry broilers	0.193	17.0	34.0	51.0	68.0	85.0	43,859%

- The number of chickens in the specialized poultry layers subsystem grows from 0.145 million in base year to 15 million in 2020, a 10,243% increase. The specialized poultry broilers subsystem grows from 0.193 million in 2015 to 85 million in the year 2020, a 43,859% increase (Table 62).
- The mortality rate is 10%.

Table 63: Number of units and average flock size of enterprises operating specialized poultry layers and poultry broilers)

Poultry subsystem	2014/15 ²⁹	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Specialized poultry layer units	290	1818	2143	2278	2353	2400	728%
Specialized poultry layer average flock size/unit	500	1650	2800	3950	5100	6250	1150%
Specialized poultry broiler units	30	1398	1897	2154	2310	2415	7950%
Specialized poultry broiler average flock size/unit	6400	12,160	17,920	23,680	29,440	35,200	450%

- The number of specialized poultry units for layers increases from 290 in the year 2015 to 2400 in the year 2020, and for broilers it increases from 30 in the year 2015 to 2415 in the year 2020.
- The average number of birds kept per unit per year for layers increases from 500 in the year 2015 to 6250 in the year 2020 and for broilers it increases from 6400 in the year 2015 to 35,200 in the year 2020.

Table 64: Chicken meat production from specialized poultry layers and broilers (in thousand tonnes)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Specialized poultry layer	0.140	2.9	5.8	8.7	11.7	14.5	10,285%
Specialized poultry broiler	0.255	22.4	44.9	67.4	89.9	112.2	43,913%
Total	0.395	25.3	50.7	76.1	101.5	126.8	31,994%

Chicken meat production from specialized poultry increases from 395 tonnes in the year 2015 to 126,800 tonnes in the year 2020, a 31,994% increase (Table 64).

²⁹ The flock size for layers and broilers in 2015 is 500 and 6400 respectively.

Table 65: Egg production from specialized layers (in millions)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Specialized poultry egg	28	583	1168	1749	2343	2916	10,314%

- Egg production from specialized layers increases from 28 million in the year 2015 to 2916 million in the year 2020, an increase of 10,314% (Table 65).

Table 66: Total chicken, meat and egg (specialized poultry, IFP and TFP) production

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Chicken meat (in thousands tonnes)	48.9	69.9	91.9	115	139	163.9	235%
Eggs (in millions)	419	1011.6	1647.5	2340.3	3096.6	3888.8	828%

- Total chicken meat production increases from 48,900 tonnes in the year 2015 to 163,900 tonnes in the year 2020, a 235% increase.
- Total egg production increases from 419 million in the year 2015 to 3,888.8 million in the year 2020, an 828% increase.

Challenges and strategies

Feed: challenges include:

- Limited access to land for production of maize and soybeans for poultry feed;
- A need for more cooking oil processing plants in which the by-products, such as soybean cakes, could be made available for poultry feeding;
- Inadequate and poor access to quality purchased concentrate feed; and
- The enforcement of efficient feed quality control and standards.

These could be addressed by:

- Acquiring land for maize and soybean production;
- Promoting and providing attractive incentives (e.g., tax holidays, land) for those private investors establishing agro-industries that would help to increase availability of by-products, such as soybean cake, for use as poultry feed;
- Regulating the exportation of oil crops and importation of cooking oils; and
- Setting up a mechanism to control feed quality.

Animal health services: challenges include:

- Inadequate drug supplies and quality vaccines (e.g. vaccine for Newcastle disease); and
- Inefficient quality control of drugs and veterinary supplies.

These challenges could be addressed by strengthening the animal health services and regulatory capacity in the LSM and the regional state agricultural bureaus, and by supporting private investment in animal health service delivery, input production and distribution.

Marketing and processing challenges include:

- A lack of diversity of poultry products and packaging that meets consumption patterns of different consumers;
- Seasonal demand fluctuations (due to fasting) leading to variations in chicken meat and egg supply and processing;
- Attitudinal/behavioural challenges towards consuming eggs and meat from hybrid and exotic breeds; and

- Limited cooking and serving skills in relation to chicken meat and eggs.

These challenges could be addressed by:

- Providing incentives to and strengthening the private sector in developing market distribution systems and retail outlets for chicken meat and eggs;
- Intensifying the promotion and extension work to change the attitudes of consumers towards consuming eggs and meat from hybrid and exotic breeds; and
- Processing and marketing strategies developed with the private sector, farmer groups, cooperatives, etc.; and
- Developing diverse skills in cooking and serving of chicken meat and eggs to meet the needs of a diverse group of consumers.

Policy challenges that require special attention include:

- A need to ensure full implementation of policy related to land acquisition for poultry feed production.
- A need to safeguard effective implementation of quality monitoring and control mechanisms.
- The introduction of financial incentives for poultry farms.
- The introduction of policy to discourage the importation of cooking oil and exportation of oilseeds that affect availability of concentrate feeds.
- The introduction of protective trade policy to encourage domestic private investment in poultry production.
- The development and implementation of animal welfare policies.

Interventions to achieve targets

The interventions for specialized poultry improvement involve increasing the scale of operations and volume of production from specialized poultry farms i.e., specialized poultry layers and broilers. The major intervention proposed for the specialized poultry layers and broilers is increasing the average number of chickens kept per farm and the number of specialized farm units. The average number of broilers per specialized farm/year is expected to increase from 6400 in the year 2015 to 35,200 in the year 2020, and the average number of layers from 500 to 6250. Over the five-year GTP II period, it is anticipated that the existing number of layer and broiler enterprises will reach to 2400 and 2415 units respectively. As a result of these interventions, the production of chicken meat and eggs from the specialized poultry increases dramatically. In the year 2020, chicken meat from the specialized systems reaches 127,000 tonnes and eggs 2.9 billion, an increase of 31,994% and 10,293% respectively.

- The estimated amount of poultry feed required for both specialized poultry layer and broiler sub-systems in the year 2020 for:
 - Maize is 580,000 tonnes; and
 - Soybean meal is 299,000 tonnes.
- Land needed to meet the added requirement by the year 2020:
 - For maize production is 122,000 ha; and
 - For soya production is 102,000 ha.
- One national and four regional grandparent farms are established and operationalized.
- The grandparent foundation stock of suitable specialized breeds (broiler and layer) is imported.
- Twenty-five new public and private multiplication centres for production of DOCs are established.
- Eighty-five million DOC broilers and 15 million DOC layers are produced for meat and egg production respectively in year 2020.

Investments³⁰

A total ETB 7.9 billion investment and recurrent costs are required for implementing IFP and expanding the specialized poultry layers and broilers. This investment is over a 15-year period. The investment costs cover the:

- Identification, importation and testing of suitable tropically adapted specialized and IFP breeds (grand-parent or pure breed);
- Establishment of grandparent farms which could eventually produce 440 million DOCs per year;
- Establishment of feed processing plants, at a cost of ETB 130 million (private investment);
- Allocation of sufficient land to produce the key ingredients of poultry feed. Some ETB 5.6 billion are required to lease the land to grow soybean and maize. It is expected the government sets below market land-lease rates to encourage private investors to produce soybean and maize;
- Establishment and management of the program for 20 years, at the recurrent cost of ETB 100 million; and
- Establishment and management of chicken meat and egg processing plants, costing an additional ETB 770 million. This will be a private sector investment.

In total, the investment and recurrent cost, including cost of processing plants, add up to ETB 8.7 billion (see LSA report for details).

The investment and recurrent costs for the five roadmap-years add up to ETB 2.4 billion. Of this total, ETB 457.9 million (19%)³¹ comes from the public and ETB 1.97 billion (81%) from the private sector. This does not include other recurrent expenses that will be incurred by smallholders with IFP and the specialized poultry farms to procure the parent stock and DOC/pullets and to pay for health and feeding expenses (See Table 67 for details).

³⁰ The flock size for layers and broilers in 2015 is 500 and 6400 respectively.

³¹ The public investment does not include what the government loses by leasing land to poultry investors for less than the market rate.

Table 67: Five-year investment and recurrent costs to create the IFP system and expand specialized poultry³²

Activity ³³	Responsible actors	Cost in ETB		Total cost in ETB	Cost in USD
		Public	Private		
Identifying suitable tropically adapted poultry breeds	EIAR, international institutions, e.g. ILRI	98,000,000		98,000,000	4,900,000
Importing suitable breeds (grandparent/pure breed)					
Testing breeds at EIAR, regional ARIs and at farm level, and developing appropriate business models	Livestock Sector of MoA, EIAR, ARIs, with technical backup support from ILRI				
Establishing five grandparent farms through PPP and public-private share companies	Livestock Sector of MoA, EIAR, private investors, public-private share companies	30,000,000	30,000,000	60,000,000	3,000,000
Strengthening/upgrading regional multiplication centres	Regional research and multiplication centres	26,000,000		26,000,000	1,300,000
Establishing 25 new PPP or private multiplication centres for production of DOCs	Private or PPPs ^{34,35}	-7,500,000	20,000,000	37,500,000	1,875,000
Establishing 250 new PPP or private production and distribution businesses for three-week old chicks	Public and private commercial businesses	50,000,000	450,000,000	500,000,000	25,000,000
Ensuring the availability of extension services to support poultry production and consumption	Regional and woreda extension services	80,000,000		80,000,000	4,000,000
Promoting exotic chicken meat and egg consumption	PPP with MoA	31,425,313	125,701,251	157,126,564	7,856,328
Supporting the running and maintenance of infrastructure/facilities put in place at the testing, grandparent, multiplication centres; and supporting program monitoring and evaluation.	Livestock Sector of MoA, EIAR, and regional agricultural research and multiplication centres	60,000,000	40,000,000	100,000,000	5,000,000
Covering research expenses	EIAR and regional research centres	15,000,000		15,000,000	750,000
Covering cost to establish and run the program	Livestock Sector of MoA	50,000,000		50,000,000	2,500,000
Covering cost of feed mill establishment	Private sector		117,500,000	117,500,000	5,875,000
Enabling land for investment in feed (maize and soya) production ³⁶	Private and public sector		716,909,130	716,909,130	35,845,457
Total processing Investment ³⁷	Private investment		470,000,000	470,000,000	23,500,000
Total Investment		457,925,313	1,970,110,381	2,428,035,694	121,401,785

32 About 70% of the investment and recurrent costs are needed in the first two years of the implementation period.

33 Capacity building is required at each level of activity for the diverse group of actors involved.

34 Engaging the private sector might also need incentives at the start.

35 Developing a PPP model is required.

36 The government provides a lower land leasing rate ETB 90 per ha per year, as compared to a market rate four to five times higher.

37 This total is also in Table 68 under total processing investment.

Table 68: Detailed investment costs for the private sector in chicken meat and egg processing

Type of processing	Capacity	Investment cost/ plant (in ETB)	Number of plants
Small poultry slaughterhouse with meat processing	1,000 birds/ day	10 million	20
Large poultry slaughterhouse with meat processing	100,000 birds/ day	60 million	2 (for export and for domestic)
Egg processing	200–500 thousand/day	200 million	1
Chicken meat and eggs cold storage		200 million	1
Total		470 million	

Table 69: IFP and specialized poultry producer recurrent costs (in ETB) (paid by producers)

Activities	IFP	Specialized poultry layers	Specialized poultry broilers
Cost/ DOC	25	25	23
Feeding cost/bird/year	147.5	476	41
Health cost (vaccine and drugs)/bird/year	4	4	5
Night shelter and management cost/bird/year	20	-	-
Small equipment/flock/year	4	1250	1250
Energy and water/flock/month	15	300	330
Taxes and other contributions/year	-	66,449	58,582
Permanent employees/year	-	27,000	27,000

Impacts

Return on investment (ROI)

- The returns from the investment in the specialized layer and broiler sub-systems are very large and attractive. The benefit/cost ratios for specialized poultry broiler and layer are 1.54 and 1.68 respectively.

Production

- Total chicken meat production from specialized broiler increases from 255 tonnes in the year 2015 to 112,000 tonnes in the year 2020, a 43,913% increase (Table 64).
- Total chicken meat production from specialized layer increases from 140 tonnes in the year 2015 to 14,500 tonnes in the year 2020, a 10,285% increase (Table 64).
- Total egg production from specialized layer increases from 28 million in the year 2015 to 2916 million in the year 2020, a 10,314% increase (Table 65).

GDP

- Contribution from specialized poultry layers will reach ETB 7582 million in the year 2020.

Table 70: GDP contributions from specialized poultry layer and broiler (in ETB millions)

Subsystem	Commodity	GDP contribution		% Change
		2015	2020	
Specialized poultry layer	Egg	73.2	7582	10,257%
Specialized poultry layer	Meat	3.3	345	10,355%
Specialized poultry broiler	Meat	7.1	3143	44,168%
Total		83.6	11,070.00	13,140%

Incremental annual average income

- Layer = ETB 579/bird
- Broiler = ETB 942/bird

Activity timeline and sequencing: Gantt chart

Activities	2015/16		2016/17		2017/18		2018/19		2019/20	
	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Identify suitable specialized poultry breeds for layers and broilers	■									
Import selected breeds (grandparent/pure breed)	■									
Establish one national and four regional grandparent farms	■	■	■	■						
Allocate land for maize and soybean production	■									
Make the national and regional grandparent farms functional		■	■	■						
Strengthen/upgrade parent stock multiplication centres for DOCs		■	■	■	■	■	■	■	■	■
Produce DOCs from parent stock and distribute to specialized farms		■	■	■	■	■	■	■	■	■
Promote exotic chicken meat and egg consumption		■	■	■	■	■	■	■	■	■
Produce chicken meat and egg			■	■	■	■	■	■	■	■
Train and build capacity of specialized farms in production, feeding and health management			■	■	■	■	■	■	■	■
Support the running and maintenance of infrastructure/facilities at the testing, multiplication centres; and support program monitoring and evaluation			■	■	■	■	■	■	■	■
Research to regularly monitor the purity of the imported breed lines			■	■	■	■	■	■	■	■

Complementary intervention and success requirements for both specialized poultry and IFP

- Sustainability of the specialized poultry and IFP depends on the effectiveness of the DOC production and distribution system. A well-functioning private DOC industry will be required for the efficient production and distribution of DOCs to the specialized poultry farms and IFP smallholders.
- Government encouragement of poultry agribusiness investors and a reduction of bureaucratic obstacles will be required.

- Government (MoA extension) encouragement of out growers (mother units) through tax exemptions or input subsidies will be required to raise DOCs into three-week pullets for distribution to IFP farms.
- A network that involves DOC multiplication centres, pullet out growers (mother units), individual smallholder farmers, women groups and cooperatives will be required to make a successful IFP.
- Government should invest in the training of poultry technicians and IFP smallholders in the area of feed and health management of the improved breeds.
- Government should give priority to specialized poultry in land allocation to establish poultry farms and produce poultry feeds.
- The increase in production of eggs and chicken meat that exceeds domestic demand opens up opportunities for export and processing. Large investments in processing plants will be needed to produce value added products for industrial uses (e.g. powdered eggs) or to meet foreign consumer demand for eggs and egg powder. The government should encourage private investors in chicken meat and egg processing through tax holidays and with low interest loans.
- Poultry feed is a critical factor to the success of the specialized poultry operation. There is a need to set up mechanisms for low-cost feed production and formulation at all levels, in particular for IFP producers.
- Specialized poultry enterprises should make efforts to link-up with chicken meat and egg processing enterprises to ensure regular access to market outlets, and with maize producers and cooking oil plants to ensure a regular supply of feed.
- There is a need to put in place effective extension and health services (public or private) to meet the service needs (health, feed and management) of the coming millions of improved poultry family units.
- PPP should be used to manufacture and distribute quality vaccines to keep the exotic chickens healthy.
- Other essential components that need to be carried out by farmer groups and cooperatives include:
 - Out growers (mother units) schemes for pullet production and distribution;
 - Mini-hatcheries establishment; and
 - Feed processing plants and slaughtering facilities.

Conclusions

The potential contribution of the poultry industry to improve food security, meat consumption and nutrition, and its contribution to economic growth is huge. The total chicken meat production is projected to increase from 48,900 tonnes in the year 2015 to 164,000 tonnes in the year 2020, a 235% increase. Total egg production would increase from 419 million in the year 2015 to 3,889 million in 2020, an 828% increase. However, the above benefits can only be realized if:

- The feed problem is resolved;
 - An effective extension system is put in place;
 - Private investors in the sector (specialized poultry, processing plants, feed producers) are provided adequate incentives in terms of tax holidays, subsidized land-leasing rates and priority access to acquire land; and
 - Protective trade policies to encourage domestic private investors in the poultry business are implemented.
- If all the necessary conditions above are met, the production-consumption balance for chicken meat will reach a surplus of 96,000 tonnes in the year 2020, while the egg balance will reach a surplus of 3.1 billion during the same period. The figures below depict graphically the production-consumption balance for chicken meat and eggs.

Figure 7: Production-consumption balance for chicken meat (2015–2020) (in thousand tonnes).

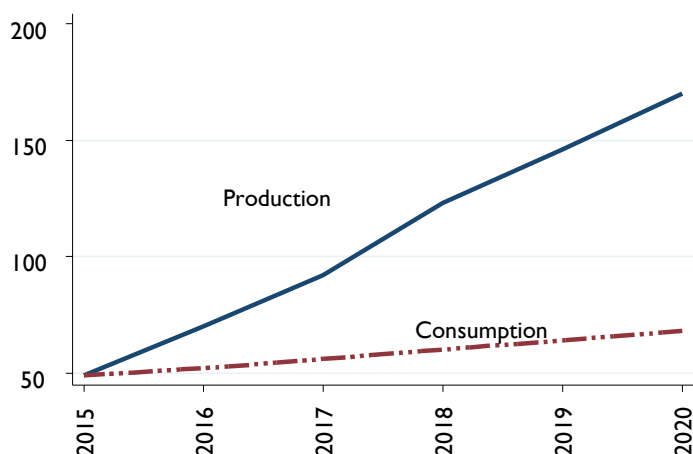
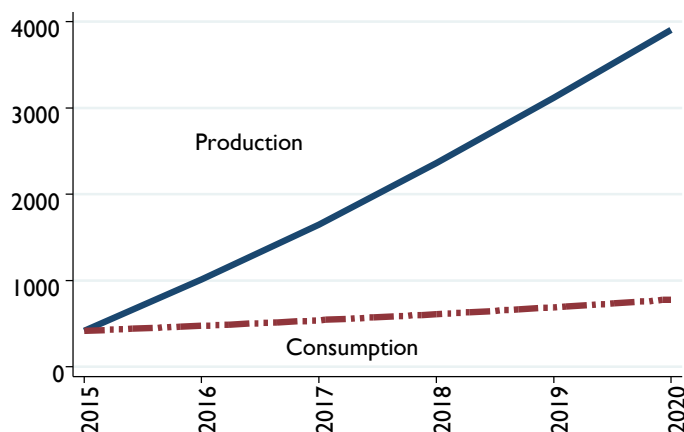


Figure 8: Production-consumption balance for eggs (2015–2020) (in million numbers).



- Similarly if the necessary conditions above are met, the contribution of the poultry sub-sector to the GDP increases from ETB 4172 million in the year 2015 to ETB 15,631 million in the year 2020. The contribution from the TFP drops by 41% over the same period.

Table 71: GDP contributions from poultry (in ETB millions)

Subsystem	Commodity	GDP contribution		% Change
		2015	2020	
Specialized poultry layer	Egg	73.2	7582	10,257%
Specialized poultry layer	Meat	3.3	345	10,355%
Specialized poultry broiler	Meat	7.1	3143	44,168%
IFP	Egg	668	2322	248%
IFP	Meat	73	262	259%
TFP	Egg	253.9	150	-41%
TFP	Meat	3094	1827	-41%
Total		4172	15,631	274%

- The IFP system needs to be linked with processors to ensure reliable market outlets for chicken meat and eggs.
- Regulation is needed to protect the small IFP farmers so that they will not be forced out of business by large specialized poultry farms. The GoE needs to balance the poverty reduction and food security contributions of the IFP sub-sector with the economic growth potential that mainly comes from the larger specialized poultry system.
- Research is needed to monitor, maintain and ensure the quality of imported breed lines. Continuing research will be needed to identify better yielding breeds, including from among the local breeds.

Livestock feed, production and extension

Livestock feed, production and extension

Introduction

The high cost and low availability of good quality animal feed from forage and fodder is one of the major constraints, if not the most critical constraint, to increasing productivity of livestock in dairy farms and feedlots, improved family and specialized poultry, and smallholder mixed crop-livestock and extensive livestock production systems (pastoral or agro-pastoral).

Underfeeding and malnutrition limit the ability of an animal to reach its genetic potential, measured through such indicators as birth weight and growth rate, milk production, mortality rate, and reproductive performance. For example, under existing levels of farm management in traditional systems, a Horo cow is reported to produce 1.7 litres of milk on average at peak lactation, but 4 litres when it is fed and managed properly (Tolera 2012).

Along with genetic and health interventions, supplemental feeding interventions are required to realize the full genetic potential and productivity increases possible from synchronization and AI in crossbred cows, as well as in improved poultry breeds, (LSA report 2014).

Current situation

- The national feed resources potential includes natural pasture (fodder, forage), cultivated forage, concentrates, blood meal, bone meal, crop residues, stubble grazing, brewery and winery by-products, oilseed by-products, molasses, sugarcane tops, other feed resources, such as foliage and pods, maize or sorghum thinning, cactus pear, etc.
- The LSA indicates it is possible to make commercial dairy farms or feedlots more productive, if sufficient amount of improved forage is produced through the use of outsourcing agreements between farmers and commercial dairy farms and feedlots (LSA report 2014).
- To increase availability of forage feed, either each dairy or poultry farm needs to have sufficient land to produce its own feed or it needs to have access to feed for purchase. Increasing the number of improved family and specialized dairy and poultry units demands the delivery of more and better inputs (including health services and feed) and improved extension services (LSA report 2014).

In Table 72 below crop residues and other agricultural by-products were estimated based on 2010/11 crop production data from the CSA, whereas the amount of feed obtainable from different grazing sources was based on estimations by the Woody Biomass Inventory and Strategic Planning Project (2001).

Table 72: Potential feed resource availability and quality in Ethiopia (Tolera et al. 2012)

Feed source	Quantity in tonnes of dry matter (DM)/annum	Percentage total
Cereal straws/stovers	33,403,800	43.7%
Pulse crop haulms	2,343,832	3.1%
Oilseed straws	1,127,499	1.5%
Vegetable wastes	101,735	0.1%
Root crop by-product	465,059	0.6%
Fruit crop by-product	2,164,572	2.8%
Chat and coffee by-products	172,096	0.2%
Sugar cane tops	356,332	0.5%
Enset	5,558,482	7.3%
Stubble grazing	8,121,471	10.6%
Pasture grazing	10,436,493	13.7%
Fallow land grazing	6,556,682	8.6%
Woodland grazing	1,486,960	1.9%
Oilseed cakes	141,362	0.2%
Wheat milling by product	336,548	0.4%
Others (5% of total)	3,644,995	4.8%
Total	76,417,918	100.0%

Feed resource availability by production zone, highland (MRS and MRD) and lowland (LG) is provided in Table 73 below. The major part of the livestock feed (78%) comes from the natural pasture.

Table 73: Feed resources available annually in highland and lowland areas (Mengistu 2012)

Time	Highland			Lowland		
	Area (in thousands of ha)	Availability		Area (in thousands of ha)	Availability	
		Tonne DM/ha	Total DM (in thousands of tonnes)		Tonnes of DM/ha	Total DM (in thousands of tonnes)
Native pasture (a)	22,300	1.5	33,450.0	43,200	0.56	24,192
Crop residues (b)	5423	1.28	6441.4	-	-	-
Cereals	4688	1.4	6563.2	-	-	-
Pulses	735	0.5	367.5	-	-	-
Stubble grazing	4688	0.4	1875.2	-	-	-
Industrial by-products (c)	-	-	198.0	-	-	-
Total	37,834	-	49397.3	43,200	-	24,192.0

Source: MoA (1991), the Ethiopian Forestry Action Programme (EFAP), pp.48 Addis Ababa, Ethiopia.

(a) Area of the natural pasture was from GoE and the International Union for Conservation of Nature (1990).

(b) Area under annual cropping from annual reports, 1979–1989, CSA (1989).

(c) Agricultural industrial by-products (oil cake, cotton seed, bran molasses) from three years (1987/88–1989/90) average (CSA, 1990). Average yield, tonnes of dry matter per hectare, and conversion factors to FU (feed unit) were from MoA (1984).

The annual feed availability estimates by Tolera and Mengistu in Tables 72 and 73 respectively are very similar to one another. The estimate by Diriba as in Table 74 below is higher than the other two even compared to the estimates of the bad seasons. Diriba used a more rigorous methodology that took into account all usable dry matter, including vegetables and fruits wastes.

Table 74: Main assumptions and usable biomass production per agro-ecological zone

Agro-ecological zone	Weather	Total area (km ²)	In grass-land ³⁸ %	Yield per km ²	Use rate %	Total usable biomass from grass	In crop land %	Yield per km ²	Use rate	Total usable biomass from crops ³⁹	Total usable DM per zone
LG + agro-pastoral (60%)	Good	682,452	100	200	50	68,290,410	0	0	0	0	68,290,410
	Average			150	50	51,326,540	0	0	0	51,326,540	
	Bad			100	45	34,183,279	0	0	0	34,183,279	
MRD (15%)	Good	171,758	50	325	65	19,537,473	40	150-220	40-60	8,459,082	28,076,555
	Average			225	65	12,599,804	150-175	40-60	6,569,744	19,209,548	
	Bad			175	65	9,768,736	100-150	40-60	5,324,498	15,173,235	
MRS (25%)	Good	286,263	40	350	70	28,053,807	48	200-250	40-60	20,639,587	48,853,394
	Average			250	75	21,469,751	150-200	40-60	16,374,263	38,004,014	
	Bad			200	75	17,175,800	150-175	40-60	14,585,117	31,920,918	

Source: LSA report, 2015

The match between available feed resources and requirements provides regional feed balances, as indicated in Table 75.

Table 75: Feed balances for the different livestock production systems under different climatic conditions (LSA report)

		Total livestock population	Average annual feed consumption per head	Total feed needs (metric tonne / year)	Feed resources good year (metric tonne / year)	Feed resources average year (metric tonne / year)	Feed resources bad year (metric tonne / year)
LG + agro-pastoral	Cattle	15,293,782	1860	28,446,435			
	Sheep	12,214,228	256	3,126,842			
	Goats	20,257,218	220	4,456,588			
	Camels	4,500,000	2586	11,637,000			
	Total			47,666,865	68,290,410	51,326,540	34,183,279
MRD	Cattle	14,796,872	1785	26,412,417			
	Sheep	6,048,392	280	1,693,550			
	Goats	4,578,885	190	869,988			
	Total			28,975,954	28,076,555	19,209,548	15,173,235
MRS	Cattle	23,520,401	2100	49,392,842			
	Sheep	11,098,505	275	3,052,089			
	Goats	4,115,200	220	905,344			
	Total			53,350,275	48,853,394	38,004,014	31,920,918
Total			129,993,094	145,220,359	108,540,102	81,277,432	

These feed balances show, under the above-provided assumptions, that in a good year when rainfall is above the long-term average and in-average rain fall years only, the LG/LG agro-pastoral system will have sufficient feed resource to feed the animals in its zone, though accessibility will still be an issue due to distance from watering points and other factors, such as conflict. In all the other zones (the MRD and MRS) there is always a feed shortage for all rainfall

³⁸ Urban and wasteland areas are excluded from the MRS and MRD, hence the percentage of grass and crop land is below 100%.

³⁹ Includes 2% of the area in forage crops, with yields varying from 2 to 3.5 tonnes of DM per ha.

situations. This means that under all rainfall conditions, the livestock feed intake falls short of the required standards of 2.5-3.0kg per 100kg live weight, which is the most critical requirement for achieving adequate production levels.

Future situation

Future outlook for feed availability is also a cause of concern. Assuming a 'business as usual' scenario for feed resources (without major feed development interventions), with the growth of animal numbers at the same rate as in the past, as estimated by LSIPT (for example 0.2-1.5% for cattle in the LG), and the same dry matter requirements per animal as above, the total requirements in 15 years will have risen to 56 million tonne of DM for the lowlands, 33 million tonnes for the MRD and 76 million tonnes per year for the MRS, as shown in Table 76. The feed requirements will not be met under any climatic condition.

Table 76: Livestock numbers and feed requirements in 2028 per livestock production systems under a business as usual scenario (no policy/technology intervention) (LSA report 2014)

Livestock numbers 2028	LG	MRD	MRS
Cattle	16,681,866	15,947,910	33,382,159
Sheep	18,575,233	12,429,424	18,865,174
Goats	36,188,226	9,151,560	6,411,348
Camels	4,706,808		
Total feed requirements 2028 TM/year	55,916,747	33,686,055	76,700,952

Feed challenges and strategies to transform the livestock sector

Highland feed challenges and strategies

- Feed shortages in both quality and quantity is a major constraint affecting animal production in the highland and lowland areas. Options for improving animal feed resources (both forage and processed) in the highland areas are outlined hereunder.

Shortage of forage feeds

- Forages for livestock are obtained from native pastures, crop residues, agro-industrial by-products and improved grown forages. The following options are recommended for improving availability of forage.

Strategic options

- At smallholder level, greater attention needs to be given to improved forage production by using available forage technologies. For native pastures, over sowing with improved grass and legume species and bush clearing/thinning from grazing fields is recommended. The use of improved forage varieties with better management techniques, and the enhancement of the quality of crop residues using urea and urea-molasses mixture treatment also needs to be considered. To achieve this, practical training needs to be given in a form of training of trainers of a large number of development agents (DAs) by the regional bureaus of agriculture in collaboration with potential stakeholders at both federal and regional levels.
- Shortage of forage seed is a critical constraint to increasing improved forage production. It is thus important to improve the supply of forage seed by making land and credit services available to potential private seed producers to enable them to establish seed companies. It is also important to strengthen the technical and material capacity of government agencies (regional and federal seed enterprises, and research centres) by making forage seed production training available.

- Regional and federal investment agencies can play a key role in facilitating private sector investment in forage seed production, while research institutes at regional and federal levels and the MoA will be the main actors in providing capacity-building support to research centres and seed enterprises.
- Irrigated land needs to be allocated by regional state government officials to investors for forage production. The federal and regional investment agencies need to avail of private investors or PPPs or public parastatals interested in seed and feed production, and land that is fertile, irrigable and close to market destinations, to ensure sufficient feed supply for the emerging market-oriented livestock operations (example, feedlots and peri-urban dairy).

Shortage of processed feeds

- Quality feed is the major constraint to improving livestock productivity and production. Processed feeds form one of the essential components of the feed used in improved production systems. Market opportunities for processed feed are opening up due to the increasing trend of entrepreneurs investing in small- and large-scale commercial dairy, feedlots and poultry operations.
- The problems facing the feed-processing industries are multifaceted and require commensurate solutions by the value chain actors involved. To improve the situation, the following interventions are proposed:

Strategic options

- To increase production of quality feed in large-scale commercial operations, government investment policy needs to make large plots of land and credit available to investors at reduced rates to encourage them to invest in animal feed production and processing.
- To ensure the quality of processed feed, it is critical that the GoE put the new Ethiopian feed proclamation (Federal Negarit Gazeta of FDRE, 2012) into effect. The proclamation involves feed regulation and control, including feed quality standards, feed safety control, import and export of feed and feed trade among others. The GoE also needs to establish accreditation of private analytical service laboratories to ensure quality feed production. This could be facilitated by organizing forums for dialogue at which concerned stakeholders/policymakers could participate. In this case, professional societies like the ESAP, EVA, Ethiopian Animal Feed Producers Association (EAFPA) and EMDIDI could play critical facilitation roles.
- It is essential to increase availability of by-products of oilseed as feed. Processing industries need to be encouraged to process cooking oil locally rather than exporting it unprocessed. The government needs to promote establishment and use of oil extraction and flour milling factories so that more by-products are made available for feed processing industries. Taxes or quotas also need to be levied to discourage imports.
- Private sector participation in large-scale production of soybean needs to be promoted to ensure sustained supply of these key ingredients as inputs for feed processing. This can be achieved through facilitating land availability by regional and federal investment agencies, and through the provision of tax incentives in return for investments.
- To promote the production of yellow maize for poultry.
- Private sector participation in large- and small-scale feed processing companies (local feed formulation and processing) needs to be promoted.
- The level of awareness of policymakers of the critical importance of livestock feed needs to be raised by organizing policy dialogue forums in which concerned stakeholders and policymakers participate. Professional and industry associations, and the EMDIDI, could play a leading role in this initiative.
- Training visits need to be made to other countries whose feed processing-industry-experience can be taken as a benchmark for developing efficient feed processing industries at home. These types of visits can be facilitated by stakeholders (private investors, government organizations and NGOs) involved in feed and livestock development programs.
- The GoE need to revisit animal-feed tax policy so as to avoid double taxation. Periodic tax exemptions for feed ingredients and compound feeds also need to be considered so as to give an initial push to the industry through increased private investment.
- The GoE needs to ensure that seasonal fluctuations in ingredients and compound feed prices are minimized and ensure sustainable feed production by advising feed processors to develop storage capacity for processed feeds and

the ingredients required to produce these feeds. This can be undertaken by relevant stakeholders (regional bureaus of agriculture, livestock development agencies, MoA, the Ministry of Trade, and NGOs like Agricultural Cooperative Development International/ Volunteers in Overseas Cooperative Assistance (ACDI/VOCA)). This can be done by organizing public awareness meetings in which the industry owners participate.

- Farmers need to be provided with training on animal husbandry, forage production and management, crop residue treatment and utilization, and cattle fattening practices. This can be done at farmers' or pastoralists' training centres by DAs, subject matter specialists (SMSs) and other potential collaborating institutions (government organizations and NGOs) working in the area of livestock development.

Lowland pastoral and agro-pastoral feed challenges and strategies

Feed shortage is a critical constraint that limits the productivity of livestock production in lowland pastoralist and agro-pastoralist systems. Options discussed above to increase improved forage and processed feed for the highland system are largely applicable to the lowland pastoral/agro-pastoral system. Strategies to deal with the challenges are suggested as follows:

- Herd management skills of pastoralists need to be strengthened through training on important topics like camel/ shoats/cattle husbandry, pasture production and management, crop residue improvement and utilization, milk handling and clean milk production procedures, etc. This can be done at pastoralists' training centres by DAs, SMS and other stakeholders working in the area.
- The GoE and other stakeholders need to promote ecologically sound water point development and distribution in the lowland areas to efficiently utilize the temporal and spatial variability in the availability of forage. This also helps to avoid localized degradation, soil erosion and gully formation that reduces the potential of an area to produce good quality forage.
- The GoE and other stakeholders need to promote herd mobility as a strategy to utilize temporal and spatial variability in the availability of forage.
- The GoE and other stakeholders need to promote bush clearing/thinning, and the use of controlled burning as a range management technique to increase production of good quality forage.

NRM activities to increase forage availability in both highland and lowland systems

- Increasing the linkages between crop and livestock production is an effective means by which plant nutrients can rapidly be recycled between farms and animals. This needs to be achieved by promoting the use of crop residues for animal feeding and recycling of manure to crop farms as fertilizer.
- The prevailing demographic and economic dynamics in the country will continue to reinforce the importance of crop residue improvement as animal feed. Potential options include: increasing on farm availability of quality crop residues through the selection of better and multi-purpose crop varieties and management practices, and the improved utilization of crop residues by chemical and physical treatment options. This could be achieved through collaborative systems-oriented research, in which crop, livestock and natural resource researchers participate to develop multipurpose crop varieties with high grain and good quality stover yields.
- It is vital that NRM activities be integrated with livestock feed production. Options include: growing forage species in enclosures established for rehabilitating degraded grazing lands, and on degraded lands; and using the herbage biomass obtained from these systems as livestock feed, as cut-and-carry fodder, so that a win-win outcome is achieved.
- There is a need to integrate reforestation activities with livestock production by incorporating multipurpose tree species like *Leucaena*, *Sesbania* and *Tagasaste* with NRM interventions, so that the fodder can be used as a protein supplement for livestock subsisting on low-quality crop residues and grasses.

GTP I and implementation status

Ministry report and GTP II

Table 77: GTP I production targets achieved between 2009/10–2012/13 (MoA report)

Commodity	Base year 2009/10	Achieved in 2012/13
Meat (cattle, sheep, goats, chicken, camel) (thousand tonnes)	860	1094
Hides (millions)	0.2	3
Skins (millions)	4.0	18
Eggs (millions)	78	109
Milk (cattle and camel only) (million litres)	3,090 ⁴¹	3,506
Fish (thousand tonnes)	19	29
Honey (thousand tonnes)	42	54
Wax (thousand tonnes)	4	5
Cross bred cattle (thousand)	390	630
Cross bred cows (thousands)	140	210
Forage seed supply (thousand quintals)	50	16
Improved DOCs (thousands)	250	396

Source: MoA

- In comparison to the base year, significant positive increases in the production of various commodities were achieved by 2012/13. The report only refers to the first three years of the GTP I. In Table 78, a summary of the projected production levels for the years 2013/14 and 2014/15 are presented. By the year 2014/15, it is anticipated that the volumes produced will have reached 1,383,000 tonnes of meat, 4,976,000 litres of milk and 137 million eggs.

Table 78: GTP I production targets for 2013/14, 2014/15⁴⁰

Commodity	2013/14	2014/15
Meat (cattle, sheep, goats, chicken, camel) (thousand tonnes)	1,257	1,383
Hides (millions)	NA	NA
Skins (millions)	6	7
Eggs (millions)	125	137
Milk(cattle and camel only) (thousand tonnes)	4524	4976
Fish (thousand tonnes)	32	36
Honey (thousand tonnes)	62	71
Wax (thousand tonnes)	5.2	6.0
Crossbred cattle (thousands)	1089	1493
Crossbred cows (thousands)	392	537
Forage seed supply (thousand quintals)	112	145
Improved DOCs (thousands)	455	523
Meat export (tonnes)	34,728	39,918
Live animal export (thousand)	210	175
Exports of skins (thousand numbers)	6725	7000
Exports of hides (thousand numbers)	45	50

Source: MoA

⁴⁰ Two thousand nine hundred and forty million litres from cattle and 150 from camels.

- By the end of GTP I (2014/15), it was expected (Table 78) that there would be 1.5 million crossbred cattle, of which close to 540,000 would be crossbred cows. The number of improved DOCs distributed would reach 523,000. Increasing the production of forage and feed will be required to support the growing number of improved dairy and poultry production. It is anticipated that forage seed supply will reach 145,000 quintals in 2014/15. Given the performance of forage seed production so far (see Table 78), it is unlikely that the target set for 2014/15 will be met without the increased participation of the private sector.

Current ministry feed strategy

- The Animal Production and Feed Directorate of the MoA did not have a comprehensive implementation strategy for forage and processed feed development in Ethiopia. In the absence of strategy, the directorate took the initiative to develop guidelines and training modules for forage development (see below). These materials are more comprehensive, but still do not include all production zones, such as the LG, and all livestock species, such as the poultry. It is commendable that the directorate has produced extension materials, such as forage development guidelines, training modules and packages, to be used by extension workers. It is highly recommended that the forage and feed development strategy take into account the specific situations in all production zones, including in the specialized zones and in all livestock species.

LMP/GTP II and feed requirements and strategies for the six targeted VCs

Cow dairy

IFD production in the MRS and MRD (in dairy belts and peri-urban areas)

- The AI and synchronization intervention combined with feed and health interventions is recommended to be carried out in the MRS.
- During the GTP II, an increase in the number of crossbred cattle is expected in IFD systems in the MRS zone to over four million. This will require increases in improved forage and feed production, and feeding services, involving:
 - Improvements in pasture productivity through over sowing, a community-based pasture management and utilization scheme, as well as the establishment of soil and water conservation activities, and gully rehabilitation, combined with a cut-and-carry feeding system. Grass and legume seed and elephant grass cuttings also need to be made available.
 - Additional feed supplementation, in comparison to traditional cattle production, which takes place in the IFD: 1.5–2kg of concentrate per day per lactating cow.
 - Dairy farmers trained on livestock feeding and disease control as part of improved management.
 - Dairy farmers trained on forage production in backyards, and part of cropping lands, and on lands under rehabilitation programs (set-asides or NRM enclosures).
- To improve pasture productivity in the MRD and MRS, a total of ETB 443.5 million will be allocated for the five years.
- An additional feeding cost of ETB 4.2 per cow per day is expected to satisfy concentrate feed demand of crossbred cows in the IFD. This adds up to 2849 million, to be covered by the private sector.

Specialized dairy

- The specialized dairy are improved through better genetics, feed and health services, and the number of units expanded to 157,227 and 715 in small and medium specialized dairy respectively.
- In 2019/20, the land area for forage per herd increases to 0.25 ha for small specialized dairy and 6 ha for medium specialized dairy.

- In 2019/20, the total area outsourced or cultivated increases to 39,307 ha for small specialized dairy and to 4290 ha for medium specialized dairy.
- In 2019/20, the annual forage seed requirement increases to 25,200 quintals for both small and medium specialized dairy.
- Additional demand for concentrate feeds (wheat bran, molasses, and oil cake) by 2020 to support the crossbred cattle will reach 755,000 tonnes.

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

The specific targets for ITMM systems in all production zones (MRS, MRD and LG) include the contribution of:

- Cattle to red meat growing production from 840,079 tonnes (in 2015) to 1,084,477 by 2020;
- Sheep to red meat growing production from 114,776 tonnes (in 2015) to 196,430 by 2020;
- Goats to red meat growing production from 97,331 tonnes (in 2015) to 171,400 by 2020;
- Camels to red meat growing production from 74,000 tonnes (in 2015) to 99,000 tonnes by 2020;
- Cattle to the national cattle milk production growing from 3,637,000 thousand tonnes (in 2015) to 6,666,000 tonnes by 2020;
- Goats to the national goat milk production, growing from 169 (in 2015) to 353 million litres by 2020; and
- Camel to the national camel milk production, growing from 1 million (in 2015) to 1.1 million litres by 2020

To achieve the above ITMM meat-milk targets, the main proposed interventions are pastureland improvement and seed production in the MRS and MRD, and rangeland improvement and water development in the LG. The total investment cost adds up to ETB 1.3 billion.

Specialized cattle feedlots

- Some 243,000 and 1,577,000 tonnes of additional concentrate feed/year is needed for additional 1,633,775 and 303,407 small and medium specialized cattle feedlot animals that will go to beef feedlots by year 2020.
- Some 129,831,000 and 2,948,686,000 tonnes of ingredients (bran, molasses, and oil cake) that comprise concentrate feed are needed by year 2020 by small and medium specialized cattle feedlots respectively.

Poultry

- The overall target is to raise chicken meat production to 164,000 tonnes and egg production to 3.9 billion in the year 2020 through IFP and expanded specialized poultry.

IFP

- The estimated amount of poultry feed required for IFP in year 2020 for:
 - Maize will be 266,600 tonnes; and
 - Soybean meal will be 127,300 tonnes.
- The amount of land required to meet the IFP added requirement for maize production in year 2020 will be 51,900 ha.
- The amount of land required to meet the IFP added requirement for soya production in year 2020 will be 43,200 ha.

Specialized poultry production, broilers and layers (2015–2020)

- The estimated amount of poultry feed required for both specialized poultry layer and broiler in the year 2020 for:
 - Maize will be 580,000 tonnes; and
 - Soybean will be 299,000 tonnes.
- The amount of land required to meet the specialized poultry added requirement for maize production in the year 2020 will be 122,000 ha.
- The amount of land required to meet the specialized poultry added requirement for soya production in the year 2020 will be 102,000 ha.

Ministry feed and livestock production extension

The following documents were prepared by the Animal Production and Feed Directorate of the MoA to equip extension workers with tools to promote forage and feed extension in rural areas.

- Fodder Bank Guideline.
- Forage Crop Training Module.
- Forage Development Manual.
- Forage Seed Production Guideline.
- Feed Development Package.

The documents need further enrichment to address the forage extension needs of the different production zones, including the LG, and the different livestock species, including poultry.

Forage-livestock production research gaps

- Research on forage seed production needs to be strengthened to develop crop management technologies that contribute to improved forage seed availability by strengthening the capacity of researchers working in the areas of forage and forage seed production.
- Alternative livestock feeding strategies, based on non-conventional feed resources to alleviate the escalating cost of industrial feeds mainly for smallholder farmers, need to be developed. This is to be undertaken through the design of alternative livestock feeding experiments by regional and national research institutions.
- Feeding guidelines for different classes of cattle (calves, cows, heifers) and species (cattle, shoats, camels, etc.) need to be developed through the planning and implementation of alternative feeding trials by the national and regional research staff.
- Although the process of bush encroachment has been studied to some degree, a number of research issues still need to be addressed as part of a long-term monitoring plan which will promote better understanding of the mechanisms of bush encroachment in the savannah ecosystems. These include: the effects of human settlements; soilseed banks; and competition for soil moisture and soil nutrients affecting the regeneration of invasive woody plants across different landscapes related to grazing pressure.
- Although some information regarding the historical patterns of vegetation change is available mainly based on pastoralists' perceptions, field-based monitoring and continued research are needed to confirm these findings. In this regard, the use of earlier aerial photographs, combined with long-term vegetation monitoring, might be required in order to confirm pastoralists' observations of vegetation changes.
- The threat of bush encroachment on the pastoral economy needs further research. Generally, the link between climate change and grazing pressure in driving bush encroachment and the consequences on cattle populations requires long-term investigation. This does require a long-term research program in which both national and international research institutes participate.

- The long-term effects and the continued monitoring of bush encroachment control methods on the regeneration of invasive woody plants and the restoration of herbaceous plant biodiversity require more research in order to be better understood.
- Action research is needed to demonstrate the different bush-encroachment control methods on a small scale that could be linked to the forage reserves of communities. The purpose of this would be to strengthen community education and launch range rehabilitation efforts.

Table 79: Additional resources (in ETB) required for livestock feed development (2015/16–2019/20)

Description	Private	Public
Livestock feed development		30,000,000
Enrichment and implementation of the existing ministry forage and feed extension tools		10,000,000
Research priorities	5,000,000	5,000,000
Total	5,000,000	45,000,000

The total additional resources required from both the public and private sources are ETB 50,000,000.

Livestock health

Livestock health

Introduction

The contribution of the livestock sector to the national economy is currently small compared to its potential. One of the main causes of the mismatch between herd population size and production output from livestock in Ethiopia is undoubtedly the widespread occurrence of a multitude of infectious and parasitic diseases, causing morbidity, mortality and market restrictions, which drastically reduce animal production.

A number of livestock diseases are endemic to Ethiopia which continue to limit livestock productivity and agricultural development. The impact of animal diseases stems from direct losses due to mortality and its indirect effects due to slow growth, low fertility and decreased work output resulting from morbidity. Most livestock diseases have more devastating effects on young animals, as well as actively reproductive females.

The direct and indirect losses from livestock disease have significant economic, food security and livelihood impacts on livestock keepers and the national economy. Despite substantial demand for Ethiopian meat and livestock from potential importing countries, exports to those markets often face impediments as a result of stringent animal health requirements and repeated bans. These bans have disrupted trade with major costs to Ethiopian producers, livestock traders and meat exporters.

The prevalence of trade-limiting transboundary livestock diseases has denied the country access to international markets and makes it vulnerable to trade bans. In the wake of globalization, many countries are moving to rapidly integrate sanitary and phyto-sanitary (SPS) regulations and World Trade Organization (WTO) principals. As a result, exporting countries are reviewing their policies and practices and major changes are underway that will have an important impact on livestock trade. The escalating standards for livestock and livestock products, with their auditing and certification requirements, present a growing challenge for Ethiopia seeking access to external markets.

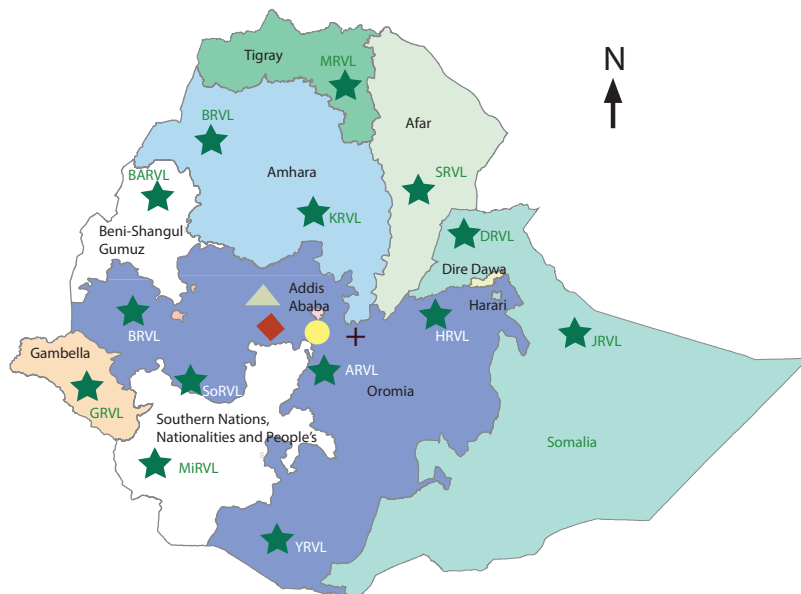
Ethiopia offers a wide range of processed and semi-processed leather products on the world market. Some diseases are direct causes of pre-slaughter defects on hides and skins, and may be either of viral or parasitic origin. Cockle (an allergic dermatitis from lice and ked infestation) is regarded as an economically catastrophic disease since it causes a downgrading of quality or an over 50% skin rejection rate. Animal diseases also have an important impact on human health, with 60% of human diseases being of animal origin. A wide range of zoonotic diseases are endemic to Ethiopia.

Current situation

- The current delivery of animal health services is inadequate both in terms of coverage and quality.
- There are very few private veterinary service providers, other than veterinary drug importers and distributors, a few private veterinary pharmacies and too few operational community animal health workers (CAHWs) usually supported by NGOs.

- There are 14 competent and capable diagnostic laboratories distributed throughout the country (Ethiopia Animal Health Yearbook, 2011) that are a prerequisite for an effective and efficient surveillance system (Map 1).

Map 1: Distribution of Federal and Regional Veterinary Laboratories in Ethiopia



Legend: ARVL = Asela Regional Veterinary Laboratory; BARVL = Benishangul-Gumuz Asossa RVL; BRDVL = Bahr Dar RVL; BRVL = Bedelle RVL; DRVL = Dire-Dawa RVL; GRVL = Gambella RVL; HRVL = Hima RVL; JRVL = Jijiga RVL; KRVL = Kombolcha RVL; MRVL = Makalle RVL; MiRVL = Mizan RVL; SRVL = Semera RVL; SoRVL = Sodo RVL; YRVL = Yabello RVL; ▲ = National Animal Health Diagnostic and Investigation Centre (NAHDIC), ◆ = Kalitti Tsetse Fly Mass-rearing Facility; + = National Veterinary Institute (NVI); ● = Quality Control Veterinary Laboratory

- Growth of private animal health service delivery is constrained by the absence of an enabling environment and competitive, subsidized, delivery of public animal health services, supplies and drugs.
- Only 45% of the country is presently served by public and private animal health delivery systems. Field services are constrained by lack of input supply, high operational costs and lack of transport.
- Government budgets do not allow drug imports or domestic purchases to cover more than a part of the annual needs. The ratio of salary expenditures to recurrent costs is high and is increasing.
- The National Veterinary Institute (NVI) is producing a wide range of vaccines (16 presently). However, some essential vaccines are not produced or are not produced in sufficient quantity and of high enough quality.
- The quality, safety and efficacy of veterinary drugs and biological agents locally produced, imported, distributed and used in the country are not properly regulated and controlled.
- Disease surveillance and reporting are poor and irregular, with only about 30-35% of the country's woredas submitting disease outbreak reports each month. This figure is below 5% for pastoral and agro-pastoral areas. Moreover, the sensitivity, specificity and timeliness of the reports are very low.
- There is not an autonomous statutory body to regulate the veterinary profession, uphold ethics and educational standards.
- The quality of veterinary education is at stake due to the growing number of new veterinary schools in the country. Over the past decade, the number of veterinary schools in Ethiopia has grown from one to 15. With such rapid growth comes the risk of deteriorating educational and professional standards in teaching and professional practice.
- The veterinary education system is not geared to address new and growing challenges in the sector, such as trade, and diversification and intensification of production systems.
- Well-developed quarantine and certification systems, which comply with international standards, and meet the requirements of trading partners are lacking. This is further compounded by the absence of livestock movement control, and the identification and traceability systems.

- Compliance with the World Organisation for Animal Health (OIE) is on going, but needs to be substantially strengthened to ensure Ethiopia's compliance with international standards so exports of meat and live animals can grow systematically.
- There are poor linkages between federal and regional laboratories, a lack of laboratory and staff capacity, and a quality management system, especially at regional level.
- There are poor import quarantine and inspection systems to control the introduction and establishment of exotic diseases into the country through the importation of live animals, animal products, and genetic and pathological materials.
- The sound and cost-effective disease control strategies are inadequate, mainly due to a lack of reliable epidemiological information and risk assessment. The implementation of control programs is mainly monitored in terms of the number of vaccinations administered, and not by monitoring the level of the disease targeted for control or eradication.
- There are no well-developed, adequately funded and coordinated emergency preparedness and contingency plans for exotic, emerging and/or re-emerging diseases.
- The prevention and control of zoonotic and food-borne diseases are poorly addressed and the veterinary service is not providing front-line services. Inspection services are limited to export meat and poorly address primary livestock products, such as milk, eggs, honey and fish.
- There are no adequate legal provisions, and enforcement of existing laws is a problem. Existing laws are frequently obsolete and fail to comply with current scientific developments and international standards.

Strengths

- The government has embraced the OIE standards and the Performance of Veterinary Services (PVS) Pathway to enhance quality of animal health services. Veterinary services (VS) management systems generally seem to have benefitted from a nationwide government policy focused on business process re-engineering, incorporating approaches based on sound planning, efficiency, stakeholder service, transparency and accountability.
- Coverage of VS has improved over recent years. Veterinary infrastructure in the field is improving as the government moves towards an ambitious target of providing approximately one animal health clinic or post per three kebeles or villages.
- Professional staffing in central and regional VS is also improving. This is due to major growth in veterinary and para-veterinary professional training. Over the past decade the number of veterinary schools in Ethiopia has increased from one to 15.
- The country has promoted the use of CAHWs in pastoral areas as an alternative service delivery system. Standard training manuals and guidelines have been developed to ensure quality and sustainability of such services.
- Memoranda of understanding to clarify roles and responsibilities between national and regional administrative bureaus, the technical NAHDIC, and the VS levels of regional laboratories have been developed and agreed upon.
- The NVI, a government parastatal, is producing 16 vaccines against various livestock diseases for local use and at times for export.
- Veterinary drug importation has been liberalized and the investment law fully accepts the establishment of private veterinary practices, pharmacies and drug shops, but economic viability is a challenge for veterinary entrepreneurs.
- Ethiopia has verifiably eradicated rinderpest. Lessons learned and the expertise that remained after the successful eradication of rinderpest can be utilized effectively for the progressive control of other major diseases.
- The diagnostic laboratory system is well established in Ethiopia in terms of physical infrastructure, and there is a cadre of well qualified personnel and equipment layout. The NAHDIC laboratory is implementing a 'quality management system' as part of seeking independent accreditation to ISO-17025. So far the laboratory has been accredited for 14 tests and six diseases.
- Over the past few years, considerable efforts have made to improve the quarantine and inspection services to meet the demands of importing countries. Ethiopia has rapidly expanded its exports to traditional markets, while also

diversifying into new markets, which has resulted in a steady increase in the volume and value of exports. Standard quarantine facilities are now under construction.

- The government has established a new authority, under the auspices of the MoA, to control and administer the quality, safety and efficacy of veterinary drugs, biological and animal feed.

Future livestock health strategy for the GTP II

There are seven major objectives related to the implementation of the LMP during the five-year period, each with specific outputs and indicators. The seven strategic objectives fall under the following headings:

1. The establishment a robust animal health information system by: improving the quantity and quality of monthly disease outbreak and inspection reports; establishing a real-time livestock-diseases-information exchange system conducting risk-based active surveillance on selected TADs (East Coast fever (ECF), Rift Valley fever (RVF), avian influenza (HPAI)); understanding the status of selected livestock diseases; supporting the NAHDIC and all regional laboratories in establishing and strengthening epidemiology units and working together with the Veterinary Services Directorate (VSD); and carrying our risk analysis and indicating the level of risk associated with various issues.
2. The reduction of the impact of livestock diseases by: reducing the impact of the goat plague (peste des petits ruminants, PPR) and of FMD; reducing lamb and calve mortality; building the capacities of regions in prioritizing and preparing control strategies; improving accessibility of livestock clinical services; engaging the public sector in areas not attractive to the private sector; encouraging and creating conducive situations for the private sector to expand; facilitating the supply of vaccines; preparing and implementing a model herd/flock health program in dairy and poultry farms; and preparing biosecurity systems for the main commodities.
3. The increase of the export volume of live animals, meat and meat products by strengthening the quarantine, inspection and certification system, and wining the trust and confidence of trading partners. This is mediated by: increasing the volume of safe and quality export meat and meat products; increasing the number of healthy and bio-secured animals to be exported; building an animal identification, registration and traceability system; and opening up new destination markets.
4. The reduction of the impact of zoonotic diseases on human health (consumers) by controlling zoonotic diseases and ensuring the safety of animal products. The key focus areas are: reducing the impact of rabies and tuberculosis (TB) on public health; facilitating the establishment of abattoirs through public- and investor-led spending in regional capitals, zones and woredas; establishing a training institute on meat inspection and food safety; and establishing a One Health forum at federal level and in the main regions.
5. The improvement of animal welfare by raising public awareness and introducing good practices.
6. The improvement of the implementing capacities of the animal health services of the country through the preparation, endorsement and implementation of various legal frameworks.
7. The building of advanced animal health systems through: the re-evaluation of the Ethiopian VS by the OIE as per the 2011 OIE PVS evaluation of the country; the adoption of international standards (as indicated in the PVS evaluation), and the evaluation of regional animal health services, identifying the gaps and enabling the preparation of a strategy to bridge these gaps.

The prioritization of diseases based on LSIPT

The LSIPT also provides tools to help prioritize animal diseases to inform decision-makers on the most appropriate allocation of resources to combat priority diseases. The priority setting is based, first on a selection of the 10 most important priority diseases, based on their incidence. Those 10 most important diseases are then ranked in

accordance to their impact on three criteria, the impact on: households and their livelihoods; markets and value chains; and intensification pathways in the production systems (see annex I for details).

In the case of cattle, the total scores indicate that the three most important diseases are FMD, CBPP and brucellosis. However, when the disease scores are examined individually against their impact on household attributes, market and value chains, and intensification pathways, their order of ranking varies. The order of ranking was FMD, lumpy skin disease (LSD) and brucellosis for market and value chains; whereas the household impact ranking was FMD, CBPP and TB. In the case of intensification pathways, brucellosis, FMD and TB were the top three in terms of the importance of impact.

Sheep and goat diseases that indicated an impact on the household, market and value chains, and intensification pathways were PPR, sheep and goats pox (SGP) and contagious caprine pleuropneumonia (CCPP), ranked in that order. The same order of ranking was indicated for market and value chains. However, regarding their impact on household attributes, CCPP ranked first, followed by PPR and SGP.

In the case of camels, surra ranked first.

In poultry, Newcastle ranks first across all attributes of households and their livelihoods, value chains, and intensification pathways.

Following the output from the LSIPT analysis, further discussion with stakeholders led to the elaboration of a priority list of animal diseases across species: FMD, PPR, tsetse-borne trypanosomosis, SGP, CBPP and external parasites (Ekek).

Strategies to address the animal health challenge

1. Enhance veterinary governance, in line with the OIE PVS Pathway

Strategic interventions

- Based on the outcome of the gap analysis, develop a strategic plan which will be used as a working document in the building of a competent veterinary service in line with international requirements—OIE/WTO.
- Develop projects/programs and seek support from the government/donors to improve the veterinary system.
- Carry out additional PVS follow-up evaluations to independently measure progress over time.
- Enhance active participation and cooperation with regional organizations, and engagement with international organizations, such as OIE and the FAO (the Codex Alimentarius Commission).

2. Strengthen livestock disease surveillance and information systems

Strategic interventions

- Develop and enforce guidelines for veterinary information and disease outbreak reporting systems, including the obligations of private practitioners from village to national level.
- Adopt the ARIS 2 system to harmonize the animal health information system at both federal and regional level.
- Introduce new technologies, such as the digital pen and mobile phones, to enhance the quality of the reporting system.
- Enhance the timely and accurate confirmation of suspected disease outbreaks, currently at very low levels.
- Expand the information system by including data coming from veterinary laboratories, abattoirs and quarantine stations.
- Strengthen the feedback system to the regions and districts through newsletters, bulletins, year books, websites etc.
- Carry out regular active surveillance for diseases selected on risk assessment to inform control strategies and policy development.

- Strengthen and build the capacity of federal and regional epidemiology units with adequate staff and facilities.
- Promote use of participatory diseases surveillance in disease investigation.

3. Control and/or eradicate livestock diseases of trade and livelihood importance

Strategic interventions

- Develop and implement progressive control strategies for trade limiting TADs, such as FMD, PPR, SGP, LSD, CBPP, etc.
- Implement the eradication of tsetse and trypanosomosis, in accordance with the Pan-African Tsetse and Trypanosomosis Eradication Campaign (PATTEC).
- Control Newcastle and Gumoro diseases both in the backyard and commercial settings.
- Control lice, ked and mange mites which are seriously affecting the leather industry. On-going large-scale campaigns to control external parasites to improve the quality of hides and skins will have to be scaled up to make real impact.
- Promote commodity-based and compartment approaches to reduce the risk of trade sensitive diseases.
- Promote regional approaches for the control of TADs and harmonize activities with neighbouring countries.
- Encourage regional states to set their priorities and strategies for controlling non-TADs, sporadic and production diseases.

4. Strengthen veterinary public health services to combat zoonotic diseases

Strategic interventions

- Effectively implement the Good Hygiene Practice, the Hazard Analysis Critical Control Points and the ISO 22000 in export abattoirs.
- Develop food safety standards for primary animal products, such as milk, fish, egg and honey.
- Ensure the hygiene and sanitation of meat and meat products by maintaining the required cold chain and applying routine personal hygiene from production until it reaches the end market.
- Develop standards for meat and offal packing and labelling in close consultation with the industry.
- Set and implement minimum standards for the plant design and staffing of domestic abattoirs.
- Progressively improve the hygiene and inspection standards of domestic slaughterhouses to equivalence with those of export slaughterhouses.
- Support private sector investments in slaughterhouses and gradually sell existing municipal slaughterhouses to private operators.
- Extend food safety awareness measures and regulations to animal products, such as milk and milk products, with a priority focus on zoonotic risks, particularly brucellosis and TB, from raw milk.
- Establish mechanisms for joint engagement between the ministry responsible for livestock and that responsible for health in the control of zoonotic diseases.

5. Establish line management and coordination procedures between federal and regional veterinary services in the control of TADs

Strategic interventions

- Ensure a clear, legislated chain of command involving singular decision-making authority and accountability during a declared animal health emergency.
- Set requirements ensuring regional states comply with national disease reporting and execute national disease control programs in their respective areas, in line with strategies set by the federal veterinary services.

- Create a national veterinary committee or equivalent where this committee, the chief veterinary officer and all regional heads of animal health meet together formally and at regular intervals to discuss and agree upon policy and programs, and monitor their consistent implementation throughout the country.

6. Improve the efficiency and coverage of public clinical service

Strategic interventions

- Initially implement a partial-cost recovery arrangement, moving gradually to full-cost recovery, and finally self-financing sustained clinical services provided by public veterinary clinics.
- Improve the coverage and efficiency of clinical services through the provision of an adequate operational budget and transport.
- Provide resources towards in-service training and continuous professional development for existing animal health workers.
- Set categories and standards, including the plant design, and the number and education level of animal health staff required for veterinary clinics.
- Train staff in veterinary clinics in sample collection, preservation and submission to laboratories.
- Improve staff evaluation and merit-based promotion to motivate and retain field staff providing grassroots service delivery.

7. Improve and sustain laboratory diagnostic services at federal and regional levels

Strategic interventions

- Establish a laboratory quality management system involving proficiency testing and third-party accreditation.
- Develop an effective laboratory information management system involving both federal and regional veterinary laboratories.
- Build the capacity of the NAHDIC and regional laboratories to meet the growing demand for export-testing and disease surveillance.
- Collect and stock file isolates of important pathogens for genetic sequencing and production of effective vaccines.
- Develop functional linkages and collaboration between regional and federal veterinary laboratories.
- Create strong linkages between field veterinary clinics and regional laboratories.
- Initiate cost recovery from the commercial sector for the self-financing of quality laboratory services.
- Maintain close working relations and linkages between the NAHDIC and world reference laboratories (OIE/FAO).
- Support the NAHDIC to be a reputable and credible laboratory in the region, and to serve as a centre of excellence for selected diseases.
- Build analytical capacity to undertake residue testing in foods of animal origin (meat, fish, milk, honey etc.).

8. Promote animal welfare

Strategic interventions

- Enact and enforce animal welfare legislation and guidelines.
- Establish an animal welfare fund for the implementation of legislation and guidelines.
- Encourage good farm practices to enhance animal welfare.
- Develop a comprehensive communication action plan to produce and disseminate accurate, useful and timely public information on animal welfare.
- Encourage the establishment of animal welfare groups.

9. Strengthen the legal framework on animal health and food safety

Strategic interventions

- Endorse and enforce draft proclamations and regulations awaiting approval.
- Establish a mechanism to review animal health laws regularly in light of changing disease risks, scientific advances and international SPS and OIE standards.
- Raise public awareness among stakeholders of the livestock sector on the existence of laws and regulations governing animal health issues.
- Establish mechanisms for the enforcement of existing laws and regulations at all levels.

10. Improve national capacity for early detection and response to animal health emergencies

Strategic interventions

- Establish a disease early warning system and emergence preparedness unit to deal with the epizootics of diseases of major economic and public health importance.
- Advance the preparation of both generic and disease-specific emergency plans and operating procedures for priority diseases.
- Allocate the necessary financial and human resources to ensure rapid mobilization in response to disease outbreaks.
- Include animal disease emergencies as a component of the national disaster response plan.
- Develop coordinated and efficient mechanisms to ensure collaboration of all relevant stakeholders.

11. Expand private animal health services and strengthen public private partnership

Strategic interventions:

- Outsource certain public goods activities to the private sector through the use of sanitary mandates.
- Support existing veterinary physicians and new graduates to set up private rural farm stores (selling veterinary supplies, AI, pesticides and other agricultural inputs). The GoE will need to interest donors in funding projects to support their establishment, including with grants and credit guarantees.
- Provide incentives for the establishment of a private animal health service delivery system.

12. Administer and control the quality, safety and efficacy of veterinary drugs and biological products

Strategic interventions

- Establish in a timely manner the authority to regulate the importation, production, distribution and use of veterinary drugs and biological.
- Develop analytical capacity to undertake chemical tests to determine the nature, content, quality, quantity and potency of veterinary drugs and biological agents.
- Equip and staff the analytical laboratory under construction with adequately trained personnel.
- Collaborate with the Pan African Vaccine Centre for the quality control of veterinary vaccines.
- Establish a laboratory quality management system in the analytical laboratory and secure third party accreditation.
- Reduce the availability of substandard and illegally marketed animal drugs.

13. Ensure the timely and regular supply of adequate animal health inputs

Strategic interventions

- Establish a drug fund to ensure the adequate, regular and timely supply of drugs to public veterinary clinics.
- Enhance the capacity of the NVI to increase the production of CCPP and FMD vaccines, and of new vaccines for diseases, like Mareks, and improve the efficacy and potency of existing vaccines, such as for African horse sickness, LSD and pasturellosis.
- Maintain appropriate cold chain and establish cold depots in strategic locations around the country for handling and transporting veterinary vaccines.
- Build the capacity of the private sector to import or manufacture appropriate veterinary drugs and vaccines in the country.
- Facilitate the development of marketing models for the distribution of veterinary drugs and vaccines through the private sector.

14. Establish a phased livestock identification and traceability system

Strategic interventions

- Study cost effective, sustainable and acceptable methods and tools for identification and traceability.
- Develop and support the implementation of a livestock identification, registration and traceability system starting with export animals and gradually expanding to the national herd.
- Formulate and enact legislation to provide for livestock identification and traceability.
- Establish a national livestock registry and traceability data bank.

15. Strengthen the quarantine and inspection system to reduce the risk of introducing and disseminating livestock diseases through the export and import of livestock and livestock products

Strategic interventions

- GoE and private operators to construct quarantine facilities, applying strict management and bio-security procedures for animals to be imported or destined for export.
- Negotiate with import and transit countries so that the quarantine facility built and the international animal health certificate issued by Ethiopian veterinary authorities are recognized.
- Study and implement the cost-effective and efficient management of the quarantine facilities through the use of PPPs.
- Establish a credible certification system and initiate negotiation with trading partners on equivalence and other standards.
- Regularly assess the retail and food service meat markets in importing countries and take corrective actions on complaints and feedback on Ethiopian products in order to remain competitive and expand market share.
- Regularly assess and compile SPS requirements of potential importing countries, identify those with less stringent requirements and initiate negotiations to penetrate new markets for Ethiopian products.
- Develop and enforce standard guidelines to ensure the safe handling of animals during trekking, loading, transporting, unloading, holding, etc.
- Strengthen veterinary border posts with the necessary facilities and trained staff.
- Harmonize livestock disease control and prevention efforts with neighbouring countries along the common border.
- Strengthen import procedures and protocols for live animals, primary animal products, and genetic and pathological materials based on risk assessment.

16. Strengthen animal health extension services at grassroots levels

Strategic interventions

- Scale up the campaigns to control external parasites so as to improve the quality of hides and skins through community participation;
- Develop a treatment regime for the prevention and control of parasitic diseases appropriate for the various agro-ecological areas.
- Prepare an animal disease map to plot potential diseases in specific areas, and an animal health knowledge kit with community participation.
- Promote information sharing on good practices in animal health advisory/extension services and on lessons learned.

17. Strengthen veterinary services in the lowland pastoral areas through community-based animal health systems

Strategic interventions

- Develop objective and transparent systems for the accreditation, monitoring and supervision of CAHWs.
- Link community-based animal health service delivery systems to private pharmacies for regular drug supply and monitoring.
- Coordinate the activities of agencies involved in community-based animal health to harmonize approaches.
- Enforce the implementation of the guidelines and standardization of training manuals for CAHWs.
- Integrate community-based animal health delivery systems into the existing animal health delivery system.

Research

The primary focus of research needs to be identifying, testing and adapting existing technologies available from around the world to the Ethiopian context, while strengthening research on areas of strategic or national importance. National institutions will partner with regional and international research organizations that have advanced laboratory and related facilities to undertake advanced basic or strategic research.

Proposed research/action research

- Development and technology transfer of a reliable thermostable vaccine against major livestock diseases.
- Development of combined vaccines.
- Development of DIVA (differentiating infected from vaccinated animals) vaccines.
- Development of pen-side tests, diagnostic kits and reagents.
- Engagement in epidemiological studies on TADs and socio-economic studies to inform policy and strategy development.
- Study of the root causes and appropriate remedies to prevent the darkening of meat and improve its shelf life.

Conclusion

Animal health services can have a far reaching impact on the productivity of the livestock and the income Ethiopia realizes from live animals. Significant efforts have already been exerted to attain the GTP I projection of reaching one billion USD from the export of live animals and livestock products. But despite this, targeted income from exports has not been attained. There is a pressing need to address the prevailing challenges so as to meet the ever rising export standards.

Reducing YASM is a key immediate strategy, alongside the production of vaccines to improve the national animal health coverage and meet the goals set for the sector. The areas of focus that need to be actively pursued both for domestic consumption and for international trade are: animal health, increased production and productivity of the national stock through improved and strengthened disease prevention, control and eradication programs, and enhanced public protection from zoonotic diseases and due regard for animal welfare.

The health interventions and the resultant improvement in productivity of the herd/flock need to be further exploited with better feeding and genetic improvement that aims at crossbreeding and also at the strategic use of the genetic niche in some local breeds for the taste and quality of their meat. Ensuring that an adequate number of adult and marketable live animals are produced is an area that also requires special attention.

One important indication from disease reports in Ethiopia (Ethiopia Animal Health Year Book, 2011) is the stagnation of reporting rates at around 30-40%, which could imply that only certain woredas of the currently recognized 773 are reporting. The Animal Health Directorate of the LSM faces a big challenge to ensure that Ethiopia stands as a reliable actor and contributor to international regulations and standards. Along this line, strategies are needed to ensure that surveillance systems can meet the challenges posed by emerging infectious diseases, while recognizing the context of resource limitations. Identifying appropriate tools and incentives that encourage the full participation of both public and private actors will also be critical.

Improving animal genetics (2014/15–2019/20)

Improving animal genetics (2014/15–2019/20)

Introduction—GoE objectives and GTP II targets

The GoE is committed to raising livestock productivity and production by improving animal genetics with health interventions and livestock husbandry. Genetic improvement is mainly achieved either by the crossbreeding of local animals with exotics or by improving local breeds through selection. Crossbreeding, as well as importing and using pure exotic breeds, needs to be largely targeted at commercial and market-oriented family dairy production systems in the MRS zone, as well as in peri-urban or milk belts in the MRD.

The LMP analysis revealed that improving local breeds is the best option for all species in all the family production systems in the other livestock production zones. Due to crossbreeding, it is expected that the number of crossbred cattle will increase by 793% in the family dairy system (Table 80) and by 163% in the specialized dairy system (Table 81). Genetic improvement of local cattle, sheep, goats and camels will continue to be heavily dependent on the results obtained from breed selection activities and the distribution of well performing local breeds (MoA, 2011). In the case of poultry, crossbreeding and the importation of exotic breeds is an option in the specialized poultry systems and IFP systems in all zones.

For the IFP, the importation of improved pure tropical breeds and/or the distribution of improved local breeds also need to be prioritized. Improved local pure breeds are the best suited breeds for the IFP (MoA, 2011). Therefore, attention needs to be given to research targeting the improvement of local breeds through selection and the distribution of improved local breeds. Tables 82 and 83 show the change in number of improved and exotic poultry breeds under IFP and specialized poultry, respectively.

Table 80: Increase in number of crossbred cattle in IFD systems in the MRS zone during the GTP II

Dairy system	Number of crossbred dairy cattle (in thousands)						% change
	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	
IFD	453	777	1,296	2,006	2,920	4,044	793%

Table 81: Annual increase in number of crossbred dairy cattle in specialized dairy systems

Population	(Base year) 2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Small specialized dairy	286,147	350,244	428,699	524,728	642,267	786,134	175%
Medium specialized dairy	40,000	42,933	48,772	55,405	62,940	71,500	79%
Total	326,147	393,177	477,471	580,133	705,207	857,634	163%

Table 82: Number of local hens in TFP and improved poultry DOCs in IFP subsystems 2015–2020 (in millions)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
TFP	5.7	5.1	4.6	4.1	3.7	3.4	-41%
IFP	3.0	3.6	4.3	5.8	7.8	10.4	246%

Table 83: Number of crossbred poultry DOCs in specialized poultry subsystems (in millions)

Poultry subsystem	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	% change
Specialized poultry layers	0.145	3.0	6.0	9.0	12.0	15.0	10,243%
Specialized poultry broilers	0.193	17.0	34.0	51.0	68.0	85.0	43,859%

Current performance of genetic resources in Ethiopia

Livestock genetic resources, potential and yield gap

Currently, the majority of livestock found in Ethiopia are local breeds. Though there have been campaigns over many years to encourage crossbreeding between local and exotic breeds of almost all species, the number of crossbreds in the country is still negligible. Even in species that have been under crossbreeding for some time, like cattle and poultry, crossbred numbers do not exceed 1% of their total population in the country. Tables 84, 85 and 86 show the production and reproduction performance of local and exotic crossbred animals under various production systems.

Crossbred cattle show about a tenfold increase in milk production and 50% increase in parturition rate compared to local breeds (Table 84). Similarly, crossbred poultry which are kept under specialized production systems show a sevenfold increase in egg production and 90% decrease in mortality (Table 85).

Table 84: Livestock genetic resource and expected yield and other parameters⁴¹ under different production systems

	LG			MRD		MRS		Specialized dairy (crossbred)	
	Agro-pastoral	Pastoral small	Pastoral medium	Small	Medium	Small	Medium	Small	Medium
Cattle									
Live weight									
Juvenile	100	100	100	86	90	90	90	130	165
Sub-adult	180	180	180	170	170	170	170	300	450
Adult	240	240	240	255	255	255	255	475	675
Milk offtake litre per year per breeding female	147	168	209	279	357	276	390	2593	4608
Parturition rate(%)	56	56	58	57	58	60	65	85	90
Sheep									
Live weight									
Juvenile	9	9	9	8	8	9			
Sub-adult	22	22	22	22	22	19			
Adult	28	28	28	30	30	28			
Parturition rate (%)	100	105	110	119	120	125			
Mortality rate female juvenile (%)	21	21	21	21	21	26			
Mortality rate male lambs (%)	22	22	22	23	23	26			

⁴¹ These parameters were used in the LSA analysis to develop the sector model and generate the LSA results.

	LG			MRD		MRS		Specialized dairy (crossbred)	
	Agro-pastoral	Pastoral small	Pastoral medium	Small	Medium	Small	Medium	Small	Medium
Goat									
Live weight									
Juvenile	10	10	10	10	10	10			
Sub-adult	22	22	21	22	22	21			
Adult	31	30	29	30	29	30			
Parturition rate (%)	108	109	120	120	123	120			
Mortality rate female juvenile (%)	26	29	24	23	24	28			
Mortality rate male kids (%)	26	24	24	23	28	28			
Camel									
Live weight									
Juvenile	128	128	128						
Sub-adult	294	294	294						
Adult	500	500	500						
Parturition rate (%)	45	45	45						
Milk offtake litres per year per breeding female	583	583	583						
Mortality rate female juvenile (%)	35	35	35						
Mortality rate male calves (%)	35	35	35						

Table 85: Key demographic and production parameters in different poultry production systems

Description of parameters	Backyard (local breed)	Layers (cross breed)	Broilers (cross breed)
Mortality rate overall before marketing (%)	50	5	
Young stock	-	-	7
Growing	-	-	5
Adult mortality (%)/year	20	3	2
Egg production per hen per year (number)	42	308	NA
Kg total feed/kg egg produced/kg live weight	NA	2.7kg/kg of egg	1.8 kg/kg live weight
Number animals sold per breeding female per year	1.61	NA	NA
Average weight at slaughter (kg)	1.5	2.4	2.3
Dressing percentage at slaughter (%)	65	64	65.2

Table 86: Comparative production of cattle in east African countries⁴²

	Cattle pop.	Beef production (million tonnes)	Milk production (million tonnes)	Beef production (kg)/standing head ⁴³	Milk production (kg)/standing head
Ethiopia (LSA)	55.2	0.81	4.0	14.7	72.5
Ethiopia (FAOSTAT)	53	0.338	3.8	5.7	71.7
Kenya	19	0.411	3.7	21.6	194.74
Uganda	12.8	0.19	1.2	14.8	93.75
Tanzania	21.1	0.289	1.8	13.7	85.31

Past progress in genetic improvement

Cattle

There are about 25 indigenous cattle breeds and types in Ethiopia (IBC, 2004). The major cattle breeds identified so far are Arsi, Begayit, Ogaden, Borena, Goffa, Arado, Nuer, Gurage, Jidu, Afar, Harar, Horro, Smada, Fogera, Mursi, Raya-Azebo, Adwa, Jem-Jem, Sheko, Ambo, Jijiga, Bale, Hammer, Medenece and Abergelle. Exotic cattle breeds so far imported are mainly Holstein-Friesian, Jersey and Simmental. Crosses with these exotic breeds are being used in the medium input production system, with Holstein-Friesians occupying the lion's share.

Early genetic improvement activities focused mainly on improving milk production potential of local breed cattle through selection. In the 1960s, the former Institute of Agricultural Research (IAR), now the EIAR, implemented an on-station breeding program in different agro-ecological settings, mainly involving breeds such as Horro, Boran, Fogera and Barca.

Results from these efforts demonstrated that under careful selection and mating conditions, high levels of milk production was not obtainable. The IAR on-station research results for milk yield of local cattle indicated that Borana, Horo and Barka produce 494, 675, and 559 kg milk per lactation, respectively. Arsi and Fogera breeds also show similar trends, producing 872 kg of milk (EARO, 1999).

Dairy cattle breed improvement programs were then directed towards crossbreeding. Hybrid-vigour is an important innovation that raises the potential for increasing milk production from local breeds. Dekeba et al. (2004) reported that average milk production of crossbred cattle per lactation is five times greater than that of local breed cattle. This increase in milk production, due to crossbreeding, could result in a marketable surplus and increased sales of milk. However, the proportion of crossbred cattle compared to the total cattle population was still less than 2%.

Sheep

There are about 13 indigenous sheep breeds and types (IBC, 2004): These are Begayit, Farta, Horro, Abergelle, Menz, Begi-Degu, Arsi, Ille, Tukur, Bonga, Afar, Dangila and Black Head Somali (formerly known as Black Head Ogaden) sheep breeds. Exotic sheep breeds introduced for wool and mutton production are Awassi, Hampshire, Blue-de-main, Merino, Romney, Corriedale and Dorper. Crossbreeding of the Menz breed with five exotic breeds, namely: Awassi, Hampshire, Bleu-de-Main, Romney and Dorper are being used in research and development activities.

The MoA also established three sheep breeding and multiplication ranches in different parts of Ethiopia. The main objectives of these ranches were to improve meat and wool production of indigenous sheep through selection and crossbreeding. The indigenous breeds that were involved in these programs were Black Head Somali, Menze and Horo (IBC, 2004).

⁴² Based on LSA results for Ethiopia and FAOSTAD data for the other countries. The use of FAOSTAT data for Ethiopia also resulted in its lowest rank for milk production per standing head.

⁴³ The production per standing head is calculated by dividing the total annual production of a species by the total population of same species.

The former IAR and higher education institutions, like the former Alemaya University, Ambo and Jimma Junior Agriculture College, carried out research on sheep, mainly focusing on performance evaluation of indigenous sheep breeds crossed with exotic breeds. The major breeds involved in the research included: Arsi, Horro, Black Head Somali and Afar sheep breeds.

Recently (until 2011), the Ethiopian Sheep and Goat Productivity Improvement Program (ESGPIP), established by USAID/Ethiopia, was working on crossbreeding sheep and goats. The overall objective of the program was to increase productivity of small ruminants sustainably in Ethiopia to improve food and economic securities (Teffera, 2008). However, the crossbreds have not proven sustainable under on-farm conditions, and farmers have not adopted them in large numbers.

Goats

Indigenous goat breeds and types in Ethiopia are Begayit, Ille, Afar, Hararghe Highland, Arsi-Bale, Short-eared Somali, Woyito-Guji, Long-eared Somali, Central Highland, Abergelle, Western Highland, Widar, Western Lowlands, Maefur and Keffa. Moreover, Felata, Arab, Gumuz, Agew and Oromo sub-types of the Western lowlands have been recently reported. Exotic goat breeds have also been imported, mainly with the aim of improving milk production of the local goat breeds. Anglo-Nubian and Toggenberg are exotic goat breeds that were introduced by Farm-Africa and higher learning institutions.

In 1988, Farm Africa initiated a dairy goat development program in collaboration with the MoA, the former Alemaya University, Awassa College of Agriculture and several NGOs. The objectives were to identify and characterize the indigenous goats, to describe the traditional goat husbandry practices, and improve milk and meat production of goats through crossbreeding with exotic breeds, such as Anglo-Nubian.

Crossbreds of Anglo-Nubian with Hararghe Highland and of Anglo-Nubian with Somali were introduced and used for milk production by smallholders in central, eastern, southeastern and southern Ethiopia (Teffera, 2000). Toggenberg and their crosses with Hararghe Highland were used for research purposes at Haramaya and Hawasa universities. Very recently, Boer goat semen was imported from the United States for crossbreeding studies at the two universities to try to improve local goat meat production. Moreover, from 2007 until 2011, the ESGPIP was working in all regions with the overall objective of increasing small ruminant productivity to improve food and economic securities (Teffera, 2008).

Equines

Donkey breeds in Ethiopia are the Jimma, Abyssinian, Ogaden and Sinnar. Major breeds of horses that have so far been well recognized are the Oromo and Dongola. With the exception of two well-known breeds of mule, the Sinnar and Wollo Mule breeds, there are no other well-defined hybrids in the country. In Mekele University, Tigray region, phenotypic characterization of local donkeys has been carried out. However, such activities have to be complemented with proper genetic characterization in order to classify the donkey types found in the region or elsewhere.

Until 2003, interventions made in livestock development had overlooked equine resources. However, the government is now paying due attention to these resources. The GoE established a Draft and Pack Animals Resources Development Team under the Animal and Fisheries Resources Development Department of the Ministry of Agriculture and Rural Development and now the current LSM. In addition to these activities, the Donkey Health and Welfare Trust, based at the Faculty of Veterinary Medicine in Bishoftu (Debre Zeit), undertakes surveys and studies related to the utilization and health care of equines in general and of donkeys in particular. These activities are currently being undertaken in Amhara, Oromia and Tigray regions.

Camels

Wilson (1984) classified and described major camel breeds in the country as the Afar, Borena, Anfi and Somali/Ogaden breeds. The species of domestic camels found in Ethiopia is the one-humped *Camelus dromedarius*. The various

camel populations in Ethiopia are quite diverse, but there has not been sufficient study of them to characterize the production and reproduction traits of the breeds.

Recent work by Haramaya University, the Ethiopian Somali Region Pastoral and Agro pastoral Research Institute (ESoRPARI), and the Yabelo pastoral and Dryland Research Center of the Oromia Agricultural Research Institute (OARI) has contributed to a better understanding of the genetic characterization of camel breeds.

The genetic improvement of camel breeds in Ethiopia is focused on selection and breeding within the local breeds. EIAR gave responsibility to ESoRPARI to coordinate national camel research and development activities, and a centre of excellence for camel research has been now established in Dabafyed, 17 km outside Godey town.

Poultry

Indigenous chicken breeds and types identified so far are Horro, Jarso, Tililli, Tepi and Cheffe breeds that are found in the central highland areas (Tadelle et al., 2003), as well as the naked-neck breed found in the northern, northwestern, western and southern lowland areas of Ethiopia. Exotic chicken breeds—like the Rhode Island Red (RIR), White Leghorn, Lawman Brown, Cobb-500, Fayoumi, Bovans Brown, Arob Acre and Bubcocks—are reared by small-, medium-, and large-scale commercial producers in urban and peri-urban areas. RIR and White Leghorns, as well as their crosses with indigenous chickens, are also used by rural smallholders for egg and meat production.

Both crossbreeds and pure exotic breeds are widely used to increase meat and egg production. A number of governmental organizations and NGOs have been involved in distributing pure exotic breed pullets, cockerels and fertile eggs to farmers from abroad, as well as to poultry breeding and multiplication centres in the country. Exotic breeds used as pure and for crossbreeding with the local poultry, are presently the White Leghorn, Rhode Island Red, Bovans Brown and Bubcocks.

Honeybees

Breeds of honeybees identified so far are the *Apis mellifera adansol*, *Apis mellifera lementica*, *Apis mellifera monticola*, *Apis mellifera litorea* and *Apis mellifera abyssinica*. Crossbreeding and importing of exotic honey-bee breeds is very limited. The proclamation on Honey Bees Development and Protection allows only for the importation of honey-bee semen, but not of live bees.

Policies and strategies to promote genetic improvement

The early proclamations and orders include proclamations on the dairy sector, namely, an order to provide for the establishment of a Dairy Development Agency 30/19 (1971) and a proclamation to define the power of the Dairy Development Agency 30/26 (1971). These orders had an impact on the genetic improvement of cattle, particularly in the dairy sector. The orders and the proclamation gave the mandate to the agency to improve the production of milk and productivity of cattle, as well as the marketing of quality milk and the collection of fees from milk products and services.

Moreover, recent regulations to establish the Ethiopian Meat and Dairy Technology Institute (143/2008) and EMDIDI (295/2013) were undertaken to increase milk production and supply to processing industries, upgrade the capacity of milk processing companies in product development and processing, and to reduce dependence on milk imports so the nation could become self-sufficient.

There is now a draft livestock breeding policy, prepared two years ago, and ready for submission to the Ethiopian parliament. It is expected that when the draft breeding policy is approved by the parliament, it will bring many changes to current breeding activities. The breeding policy document covers almost all species reared in the country and also some others that could be successful raised in Ethiopia in the future. The species included in the document are cattle,

sheep, goats, camels, donkeys, horses, mules, swine, rabbits, poultry, fish, bees, silk worms, as well as other animals like ostriches, ducks, pheasants, guinea birds, crocodiles, and civet cats.

This policy and strategy document focus on local breed improvement through both within-breed selection of indigenous breeds and crossbreeding with exotics, giving due attention to biosecurity and genetic conservation. As many breeds and species in Ethiopia are not well characterized, studying local breed production and reproduction, as well as other characteristics, is recommended to improve performance through organized within-breed selection procedures. Strategies are also included in the draft document on crossbreeding, the importation of exotic breeds (both pure and crossbreeds of exotics) and genetic materials, the establishment of multiplication centres, the development of national livestock recording schemes, breed quality, certification and control systems, and genetic improvement research.

Similarly, the 'Guideline on Import and Export of Animals and Animal Genetic Materials' was produced by the MoA in 2012. The document presents the criteria, standards and procedures for importing and exporting animal and animal genetic materials, and covers almost all species indicated in the breeding policy.

Challenges and strategies

i. A lack of genetically improved indigenous animals and genetic materials to use for breed improvement

a. Limited activities to improve indigenous breeds

Previous studies indicted that there are high within-breed variations in local breeds. Though information is available to begin between-breed selection activities for some species, continuous and structured within-breed selection activities are very limited.

Strategies

- Identify breeding objectives for each species, breeding goals and improvement strategies.
- Undertake structured and continuous within-breed selection for best-performing indigenous breeds and distribute and/or cross them with other indigenous breeds.
- Develop ranches for genetic conservation, improvement, research and selection, and the multiplication of improved breeds. In addition, control and check if the ranches recently transferred to private companies are performing in accordance with the framework and new agreements signed.
- Implement community-based local breed improvement schemes.
- Give training to farmers on genetic improvement activities and better animal husbandry.

b. Improve genetic potential and productivity of indigenous breeds through crossbreeding

Strategies

- Produce synthetic or composite breeds.
- Crossbreed cattle using AI and bull services to improve cattle productivity.
- Encourage and promote commercial heifer, ewe, doe and poultry multiplication ranches/centres and link the ranches/centres to research institutions and dairy farmers.
- Train selected farmers as trained farmer artificial inseminators to reduce the critical shortage of AI technicians.
- Test and scale up technologies to accelerate the genetic progress through such means as multiple ovulation and embryo transfer, and AI in small and large ruminants, camel and poultry.
- Encourage the production and distribution of crossbred dairy cows of 50% Holstein or Jersey Blood to smallholder farmers by strengthening public and private sector AI services, bull services, existing crossbreeding cattle ranches, and regional and federal research centres.

- Depending on the status of prevailing husbandry systems, upgrade crossbred dairy cows to 62.5% exotic blood level for market oriented peri-urban farmers with better management systems.
- Strengthen the skills of smallholder dairy farmers, DAs and SMSs on dairy animal husbandry (feeding, health, and housing) and on how to improve the reproductive efficiency of dairy cattle (AI technique, synchronization/induction of oestrus). These training activities can be undertaken by the National Artificial Insemination Centre (NAIC), regional and federal research centres, and the Agricultural Technical Vocational and Educational Training Colleges (ATVETs).
- Improve the body (physical) condition (energy balance) of dairy animals, increasing forage feed availability by availing seed and other associated inputs for forage production, as well as improved crop residue management and utilization. This can be strengthened by the continuous training of farmers, and technical support and supervision provided by DAs and SMSs at district level.

c. Improve efficiency of AI services

Inefficient public and private AI services for crossbreeding indigenous cattle with exotic breeds is common.

Strategies

- Ensure the GoE promotes and supports private AI services providers and animal health businesses by facilitating credit and business management training. These efforts could be supported by important stakeholders like investment promotion agencies, and development agencies for small and medium enterprises.
- Increase the number and service quality of public inseminators by strengthening the capacity of available ATVETs to increase the number of graduates and by improving the academic (theoretical and practical) curriculum. It is advisable for public sector AI services to focus on rural smallholder dairy systems remote from urban areas, while the private sector focuses on AI activities around peri-urban areas.
- Encourage the GoE to strengthen the capacity of the NAIC by providing financial support for the upgrading of the facility and the human resources, and fill technical capacity gaps to improve the quality and quantity of semen produced and distributed. The private sector should participate by importing sorted semen and selling it to dairy farmers willing to pay. Regional AI centres also need support from the regional bureaus of agriculture and their livestock agencies. In the process of strengthening the regional centres, the NAIC is expected to play a research and quality assurance role.
- Improve feeding systems of animals undergoing AI, using strategies mentioned in the animal feed and nutrition chapter above. This is essential as the efficiency of the AI process is partly determined by the physical condition of the animal (net energy balance).

ii. An absence of breeding policy, regulations and strategies

Interest in importing new breeds is increasing with the growth of commercial livestock production systems in Ethiopia. Satisfying this demand is critical to achieve the targeted increases in livestock production and productivity. However, uncontrolled importation and crossbreeding of animals could result in the deterioration of the indigenous genetic pool, without achieving the intended productivity increases.

Strategy

- Finalize the proposed livestock breeding policy and follow up to get its enactment and implementation by the GoE.

iii. An absence of organized information, easily accessible to investors and donors

This challenge refers to the absence of livestock resource maps indicating the potential of different areas in the country in relation to each livestock type.

Strategy

- Develop livestock resource mapping to ease the tracing of the country's important livestock resources.

iv. Lack of a national database to guide and monitor genetic improvement and progress

Strategies

- Establishment of a national database system.
- Monitoring of genetic improvement and progress through monthly test-day-based genetic evaluations.
- Development of a feedback system for farmers to enable them to select superior bulls as parents for future generations.

Strategies to meet targets

Government and private sector actions related to improving animal genetics are required to ensure success are the:

- Allocation of adequate public funding in support for the mobilization and strengthening of AI and synchronization facilities, services and activities.
- Creation of additional required AI infrastructure, including regional semen production facilities and cold storage for distribution.
- Introduction of more conducive policies and laws establishing clear sanitary standards and regulations, together with efficient enforcement mechanisms.
- Establishment and enforcement of quality standards and quality-based price incentives for milk produced and sold.
- Provision of ongoing training and refresher courses for AI technicians—public, private and farmers.
- Strengthening of extension services focusing on training dairy farmers in better management of crossbred cattle.
- Delivery of effective technical and business training to all value chain actors.
- Encouragement of private sector investment in dairy processing through the provision of financial incentives, reduced bureaucracy and increased ease in obtaining licenses and land.
- Enforcement of land policies enabling the leasing of land for agribusinesses, including land for processing, and for forage and seed production, as well as for those establishing and building dairy agribusinesses.
- Guarantee of an effective DOC production and distribution system. A well-functioning private DOC industry is required for the efficient production and distribution of DOCs to the specialized poultry farms and IFP smallholders.
- Encouragement of specialized poultry enterprises to link-up with chicken meat and egg processing enterprises to ensure regular access to market outlets, and with maize producers and cooking oil plants to ensure a regular supply of feed.
- Implementation of effective extension and health services (public and private) to meet the service needs (health, feed and management) of the millions of improved family dairy and poultry units in the future.
- Engagement of producer cooperatives in the livestock value chain.
- Encouragement of private sector involvement in the delivery of inputs and services.

Research on genetic improvement of livestock

Proposed research

Short-term research on

- The development of a national livestock resource map.
- The production of improved pure-line local poultry breeds with enhanced performance which could crossbred with other local poultry breeds and/or distributed to other suitable agro-ecologies.
- Crossbreeding by importing selected exotic breeds.
- Extending available community-based small ruminant breeding.

Long-term research on

- Within-breed selection for the development of improved indigenous dairy and beef cattle, sheep, goat, camel and poultry breeds, in cooperation with research institutes.
- The crossing of improved indigenous breeds with other indigenous cattle, sheep, goats, camels and poultry (where crossing with exotics is not practical).
- The development of synthetic indigenous breeds of beef cattle, sheep, goats, camels and poultry.
- The evaluation of indigenous breed potential for economically important traits.
- The development of a genetic improvement design for each breed of livestock.

Conclusion

In total, there are about 25 breeds or types of cattle, 13 of sheep, 15 of goats, 4 of camels, 4 of donkeys, 2 of horses, 2 of mules, and 6 of poultry, as well as 5 races of honey bees and more than 190 of fish. In addition to the huge genetic variability and potential in the livestock sector, the sheer quantity of the livestock resource base is vast. Nonetheless, satisfying local milk and meat demand remains a critical challenge.

Quick-win technologies to satisfy growing demand include the use of AI with synchronization in cattle, and breeding and husbandry improvement in poultry. The findings of the LSA report indicate these technologies, together with improvements in health and husbandry could lead to increases in the production of cow milk, poultry meat and eggs by 93%, 270% and 2312% respectively.

Technologies designed to increase livestock productivity in the long term include community-based indigenous breed improvement schemes, which can be applied to all species. It is also critical to note that on its own, genetic improvement cannot bring about the expected increases in productivity, without the successful implementation of complementary improvements in feed, health and husbandry.

The effectiveness of feed improvements, such as increased forage production, pasture and rangeland productivity and utilization of crop residues⁴⁴ will also depend on the success of the genetic improvement strategies. Similarly, well-known health improvement strategies, such as vaccination for major diseases and the timely treatment of sick animals⁴⁵, need to be implemented in tandem with both genetic and feed availability improvement interventions.

Though much research has been undertaken and a lot of technologies are available, especially for cattle, sheep and goats, there has never been a sustained attempt to develop improved indigenous breeds using between and within-breed selection, with the exception of very recent attempts for sheep and poultry. All stakeholders involved need

⁴⁴ For more details, see chapter on feed technologies.

⁴⁵ For more details, see chapter on cross-cutting technologies on health.

to continue supporting such attempts so as to produce the desired results as soon as possible. This strategy of local breed improvement is critical for improving family production systems in areas remote from markets and under agro-ecological conditions which make the introduction of exotic breeds, including for crossbreeding, impractical.

In terms of policies and strategies, the proposed livestock breeding policy, when enacted by the Ethiopian parliament and implemented, is expected to advance genetic improvement activities. The availability of the Guideline on Import and Export of Animals and Animal Genetic Materials of the MoA is another opportunity to help regulate importation of animals and genetic materials into the country; but this too must also be vigorously implemented.

Institutions and policy environment for the implementation of the livestock master plan

Institutions and policy environment for the implementation of the livestock master plan

Background and justification

After several years of neglect, the livestock sector in Ethiopia is now considered as one of the key sectors in the broader economic development plans of the country. It has the potential to make a significant contribution to national economic growth, job creation and poverty reduction, as well as increased food security and enhanced human nutrition (CRGE, AGP, GTP).

The recent livestock sectors analysis (LSA) provides clear empirical evidence of the sector's contribution to the country's economic growth and development (LSA, 2014). With rapid population and income growth, and increasing urbanization, the demand for livestock and livestock products is growing, presenting huge opportunities for the sector. Despite the potential, the livestock sector in Ethiopia is currently characterized by very meagre performance: poor productivity and limited market orientation, and low levels of commercial offtake (market supply) and competitiveness (Negassa et al., 2012).

Furthermore, the analysis of livestock production and consumption indicate that there is currently a huge shortfall in the supply of livestock products. In the absence of investment, these gaps are expected to grow, causing food insecurity and other important economic and social repercussions. However, with certain strategic investment interventions in the sector, assuming an enabling policy and institutional environment, there is a huge opportunity to close the supply-demand gaps. Moreover, there is potential to generate a surplus of livestock products for export markets, enabling the country to benefit from growing export opportunities for livestock products.

Sound investment plans and development strategies are crucial, offering the opportunities in emerging domestic and international markets to transform the livestock sector. It is within this optic that the LMP was produced to guide the development of the national livestock sector over the coming 15–20 years.

The LMP was formulated on the basis of empirical evidence generated by detailed LSA and value-chain studies. The LSA and the LMP identified key promising areas for investment in the livestock sector, and carried out ex-ante assessments on their technical and financial viability based on bio-physical and socio-economic simulation analyses. The ex-ante analyses demonstrated the technical and financial viability of the proposed investments, following the completion of a cost-benefit analysis. The important question here is whether there is an enabling (institutional and policy) environment, facilitating the realization of the investments proposed in the LMP over the coming 15–20 years.

Historically, it has been observed that policies and institutions are quite relevant for the economic growth and development of nations (North, 1990). It is argued that policies and institutions, by determining the ways in which economic actors combine their assets for production and consumption, are the principal determinants of economic growth and development.

Institutions and policies hinder the actions and behaviour of economic agents, avoiding undesirable outcomes. They reduce the risks and uncertainties in economic transactions, allowing desirable exchanges and activities to occur and thus encouraging optimal investment activities and outcomes. Certain policies and institutions prevent the implementation of desirable investments, due to risks and uncertainties involved. Thus, it is important to do an inventory of existing policy and institutional issues and identify the gaps which could limit the realization of the LMP.

Objectives

The principal objective of this section is to identify the critical livestock policy and institutional issues that affect livestock development objectives. It seeks to inform policy making processes to create a conducive policy and institutional environment favouring the implementation of the LMP and realization of the GTP strategies. The specific objectives are to: (1) do an inventory of the existing livestock institutional and policy environment; (2) identify gaps in policy and institutions; and (3) provide recommendations on essential policy actions and institutional changes.

Methodology and approach

The information presented here has been collected using different methodologies: a desk review of major policy documents, government directives, regulations, acts, laws; targeted interviews with relevant individuals from the ministry and outside; a review of the LSA; a review of LMP; and a review of research papers.

Inventory of current livestock policy and institutional issues and gaps

This section provides a review of current major policy and institutional constraints, evidence and proposed actions for selected areas of livestock production: animal health, dairy, poultry, hides and skins, live animals and meat, pastoral and agro-pastoral areas, and breed improvement. The summary results are presented in tabular forms.

Animal health service

Table 87: Review of current policy constraints and proposed actions in animal health services⁴⁶

Priority policy or institutional constraint/gap ⁴⁷	Evidence, group affected and rationale for change	Required policy action
1. Unclear roles of public and private animal health service providers, constraining an efficient deployment of available human and financial resources	<ul style="list-style-type: none"> • Low (30%) coverage of clinical services, in particular for poor livestock keepers, because: <ul style="list-style-type: none"> • Most clinical services are provided by the government; • Public services are constrained by a shortage of an operational budget; • The enabling environment for private sector development is weak; and • There are limited employment opportunities for new graduates. 	<ul style="list-style-type: none"> • The main elements of the role of the public and private sector in animal health, based on the nature of the goods, should be to: <ul style="list-style-type: none"> • Prepare a policy statement which clearly defines public and private tasks; • Establish a sanitary mandate—delegation for the provision of certain public-goods activities to the private sector; and • Provide loans to interested private service providers.

⁴⁶ Based on the review by Wondwosen Asfaw Awoke.

⁴⁷ Based on stakeholder discussions.

Priority policy or institutional constraint/gap ⁴⁷	Evidence, group affected and rationale for change	Required policy action
2. The absence of an animal identification and traceability system	<ul style="list-style-type: none"> • The absence of traceability system: <ul style="list-style-type: none"> • Restricts exports to more remunerative markets; • Constrains effective disease control; and • Complicates the backward tracing of disease. 	<ul style="list-style-type: none"> • Establish a legal framework that will support the introduction and operation of a traceability system to: <ul style="list-style-type: none"> • Test on a pilot basis the acceptability of the system and identify its key characteristics, such as a cost effectiveness and acceptability by trading partners; • Decide on up-scaling the system; and • Establish a national livestock registry and traceability data bank.
3. The need for greater emergency preparedness and a harmonized plan and strategy to prevent and control major TADs	<ul style="list-style-type: none"> • Delays detection of emerging animal diseases, such as HPAI and RVF, significantly increase their impact and control costs. • Limits the impact of ongoing disease control efforts, affecting above all poor livestock keepers. 	<ul style="list-style-type: none"> • Strengthen epidemiological survey capacity, and provide incentives and enforcement for regional states to comply with national disease reporting and execute national disease control programs in their respective areas in line with set strategies. • Confirm the prioritization of major livestock diseases for prevention and control based on their importance to trade, livelihoods and the risk of zoonotic exposure, as proposed under LSIPT (see annex 1). • Develop feasible and cost-effective control and prevention strategies for specific priority diseases. • Ensure a clear, legislated chain of command, involving singular decision-making authority, and accountability during a declared animal health emergency; • Strengthen coordination mechanisms, with other agencies including from a 'One Health' perspective. • Establish a sustainable financing mechanism for rapid mobilization in response to disease outbreaks. • Include animal disease emergencies as a component of the national disaster response plan; and • Create of a national veterinary committee, where this national committee, the chief veterinary officer and regional heads of animal health meet together formally and at regular intervals to discuss and agree upon relevant policy and programs and monitor their consistent implementation throughout the country.
4. The absence of clear policy ensuring the quality of veterinary education	<ul style="list-style-type: none"> • Poorly trained graduates. • Eleven faculties opened without considering demand in the job market. • Unemployed young graduates. 	<ul style="list-style-type: none"> • Limit the entry of new students into veterinary faculties to match the supply in the labour market. • Harmonize veterinary education among veterinary faculties. • Improve the quality of such education. • Create job opportunities for young graduates in the private sector
5. Lack of livestock movement control system	<ul style="list-style-type: none"> • Diseases transmitted through the unregulated movement of livestock. 	<ul style="list-style-type: none"> • Establish animal movement control systems. • Ensure the system is supported by adequate legislative provisions.

Dairy

Table 88: Current dairy policy and institutional constraints⁴⁸

Priority policy or institutional constraint/gap	Evidence, group affected and rationale for change	Recommended policy action
1. The need for the implementation of the cattle breeding policy	<ul style="list-style-type: none"> • The slow rate of genetic improvement of dairy cattle. • Limited access of smallholders to improved genetics.. 	<ul style="list-style-type: none"> • Finalize and implement the existing draft breeding policy, ensuring that adequate attention is paid to remote and poor smallholders.
2. The need for PPPs and leadership in the dairy sector development	<ul style="list-style-type: none"> • Lack of agreement between the different partners, particularly producers, regarding desirable dairy development strategy. 	<ul style="list-style-type: none"> • Implement the draft dairy board establishment document, ensuring the participation of all stakeholders, and in collaboration with the dairy board, develop the national dairy development strategy.
3. The need for the implementation of appropriate regulatory and incentive framework for the production of high quality milk.	<ul style="list-style-type: none"> • Limited shelf life of dairy products with important pathogen loads, in part attenuated by consumer habits of boiling milk before consumption. Changing consumer preferences will increase the demand for safe milk over the next decade. Increasing standards without incentives at producer level will affect producers' income. 	<ul style="list-style-type: none"> • Revise the standards and develop a regulatory and incentive (differential prices for hygienic milk) framework as a pilot for the Addis Ababa milk shed.
4. The need for the implementation of the dairy recording scheme	<ul style="list-style-type: none"> • On farm selection and centres of genetic improvement (AI, bull stations) constrained by lack of reliable production records. 	<ul style="list-style-type: none"> • Formulate a voluntary milk-recording scheme.

⁴⁸ Based on a review prepared by Desalegn G/Medhin

Poultry

Table 89: Current poultry policy constraints and proposed actions in the poultry sector

Priority policy or institutional constraint/gap	Evidence, group affected and rationale for change	Recommended policy action
<p>1. An absence of clear policy that defines the role of private and government institutions in relation to poultry production, processing and marketing.</p> <p>2. Inefficient and low quality service and input delivery systems (vaccination, treatment, extension, consultancy, feed, replacement stocks, credit, land, etc...)</p>	<ul style="list-style-type: none"> • Unclear roles and unfair competition from public sector constrains the entry of new producers to the sector and risks crowding out existing commercial producers, with spill-over effects on the entire chain. • LISPT data indicates the technical parameters and broiler-meat competitiveness are low, by international average standards, particularly affecting small and medium scale producers. 	<ul style="list-style-type: none"> • Establish clear policy that defines the role of private and government interventions. • Promote PPPs, based on the strategy under I, to: <ul style="list-style-type: none"> • Enhance service delivery; • Establish grandparent farms for the distribution of parents to the multipliers of commercial replacement stocks; • Improve feed quality by strengthening feed quality control and enhance accessibility by reducing VAT rates on raw materials/ ingredients and vitamin, amino acids and mineral pre-mixes; and • Facilitate the allocation of land for the establishment of poultry farms through the revision of procedures.
<p>3. Inadequate poultry disease prevention and control systems</p>	<ul style="list-style-type: none"> • High disease incidence affects all producers and ripples through the rest of the chain. 	<ul style="list-style-type: none"> • Strengthen the poultry disease control system by: <ul style="list-style-type: none"> • Reinforcing the diagnostic capacity of poultry diseases; • Establishing a policy on compensation and contingency planning in the case of the forced stamping out of a contagious disease; • Enforcing stricter disease controls on the importation of commercial replacement stock; and • Reinforcing epidemiological services.

Hides and skins

Table 90: Current policy constraints in the hides and skins sector

Priority policy or institutional constraint/gap	Evidence, group affected and rationale for change	Recommended policy action
1. An absence of clear and applicable hides and skins, and leather industry value chain development policies	<ul style="list-style-type: none"> Producers feel they do not receive fair prices for their products. Tanners are not able to collect and process high quality raw material. 	<ul style="list-style-type: none"> Develop, refine and implement a clear and applicable hides-and-skins-leather sector regulation. Develop an objective grading system for hides and skins. Create a consistent incentives scheme to encourage producers to improve the quality of their outputs. Offer financial incentives to promote quality⁴⁹ throughout the supply chain from producers to processors and traders. Encourage agreements or contracts to follow specific practices and protocols at producer or abattoir level which allow for quality premiums.
2. Poor quality of hides and skins, and ineffective collection; and a lack of incentives for quality	<ul style="list-style-type: none"> Producers and traders lose income due to high rejection rates resulting from the poor handling of hides and skins. Prices are based on the number of hides and skins accepted for processing, rather than quality grading. Producers and slaughterhouse staff still lack adequate skills. 	<ul style="list-style-type: none"> Establish regulations to encourage private/public urban/urban slaughter slabs with necessary priority for land lease access and sanitary regulations. Encourage technicians to visit abattoirs and give advice on the correct flying and skinning procedures without reducing slaughterhouse productivity. Monitor and assist producers gain access to appropriate chemicals to control ecto-parasite and disease-driven skin quality deterioration. Encourage the promotion of flawless hides.
3. A need for stronger institutional linkages	<ul style="list-style-type: none"> Weak extension services and thus poor quality of hides and skins at producer level. Obstacles to the timely flow of information. Loose integration amongst the various VC actors. Weak implementation of regulations. 	<ul style="list-style-type: none"> Implement regulations encouraging government and industry organizations to continue programs aimed at achieving reductions in the level of waste/tannery effluent. Develop a market information flow mechanism on the price of hides and skins for producers and traders. Establish stakeholder consultation platforms that bring together public and private sector actors to raise and discuss key policy issues.
4. A need for the implementation of hides and skins trade regulations	<ul style="list-style-type: none"> The existing proclamation No. 457/97 lacks an enforcement mechanism and is not being adequately enforced. 	<ul style="list-style-type: none"> Raise awareness on the regulation and how it benefits producers and traders alike. Institutionalize the regulation in the relevant sector bureaus nationally. Issue regulations on the uniform and timely implementation of the proclamation in all regions and city administrations in Ethiopia.

⁴⁹ Incentives for quality help solidify long-term relationships by encouraging added value throughout the value chain, increasing demand for the services of all participants.

Live animal and meat

Table 91: Current policy constraints and proposed actions for live animals and meat

Priority policy or institutional constraint/gap	Evidence, group affected and rationale for change	Recommended policy action
1. A need for a grading system for live animals and of qualified graders	<ul style="list-style-type: none"> Producers do not get fair price for produce: prices are based on eye appraisal. Consumers are affected. 	<ul style="list-style-type: none"> Enforce the use of demand-driven quality grading for meat and live animal pricing. Train and certify graders, and provide them with statutory powers.
2. A lack of enforcement for the use of a designated live animal and meat transport system	<ul style="list-style-type: none"> Animals lose significant weight during trucking/ trekking. Transport conditions of live animals inhumane. High transaction cost on producers and traders due to loss of animals en route to abattoirs. Deterioration in quality of meat by not using cold chain. 	<ul style="list-style-type: none"> Enforce and cost the use of designated live animals transport measures. <ul style="list-style-type: none"> Enforce use of refrigerated trucks in meat transport Monitor the regulations on the movement of animals.
3. An absence of standards on feedlot management and incentive mechanisms	<ul style="list-style-type: none"> Significant variability in the quality of meat produced. Limited knowledge by feedlot operators of cost-effective fattening rations. Little incentive to promote quality. 	<ul style="list-style-type: none"> Develop and/or enforce the standards. Build the capacity of feedlot operators, including in the design, management and operation of feedlots, best-cost ration formulation and feeding management, and livestock trade and related requirements.
4. A need for more effective policy and enforcement of regulations to formalize informal cross-border trade	<ul style="list-style-type: none"> Reduced revenue to central and regional governments. Bureaucratic hurdles. Reduced prices to the producer. Complexity of transactions high due to the number of actors involved. 	<ul style="list-style-type: none"> Develop guidelines and directives within the framework of the regional initiatives like the AU framework on pastoralism. Make policy decisions based on a cost-benefit analysis of cross-border trade in livestock.

Pastoral and agro-pastoral areas

Table 92: Current policy constraints and proposed actions for lowland areas of Ethiopia (pastoral and agro-pastoral systems)

Priority policy or institutional constraint/gap	Evidence, group affected and rationale for change	Recommended policy action
1. A need for stronger policy, legal and institutional frameworks to support sustainable pastoral and agro-pastoral production	<ul style="list-style-type: none"> • Low commercialization and a limited number of micro and small enterprises. • Vertical linkages of producers to the market poor. • Weakening of customary institutions, and poor linkage between customary institutions and formal government structures. 	<ul style="list-style-type: none"> • Market policies to support timely and reliable market information. • Introduce modalities to support cross-border livestock marketing. • Assist pastoralists in understanding marketing trends. • Provide a substantially extended role to customary institutions.
2. A need for greater attention to pastoral development in policies, strategies and programs, as compared to mixed crop/ livestock development	<ul style="list-style-type: none"> • Conflict over resources between herders and cultivators. • The capacity of livestock keepers to respond constrained. • Lack of pastoral community representatives involved in decision making (including policy) which has a direct impact on livelihoods. 	<ul style="list-style-type: none"> • Address the risks related to drought/flood and resource conflict. • Undertake further work on access and rights to pastoral land, administration and use. • Undertake participatory pastoral land use mapping and implement directives to guarantee access to land.
3. A need for stronger policies and more focused implementation to support the effective functioning of livestock trade corridors designed to mitigate effects of drought	<ul style="list-style-type: none"> • Migratory routes compromised, especially in times of drought and famine. 	<ul style="list-style-type: none"> • Introduce and enforce regulations designed to protect livestock corridors. • Allocate adequate resources to build infrastructure needed to make the corridors effective (e.g. water points, feed storage facilities, etc.). • Empower and actively involve communities in the governance of protected corridors.
4. A lack information to analyse current practices, identify key constraints, and predict how producers will respond to policy initiatives. ⁵⁰	<ul style="list-style-type: none"> • Difficult to estimate the economic performance of a sector. • Unreliable statistics obscure the factors which drive changes in livestock population numbers, such as climatic fluctuations. 	<ul style="list-style-type: none"> • Make better information available on production practices, marketing decisions, and linkages of the pastoral sector to the larger economy. • Recognize the resilience and adaptive capacity of dry lands.

⁵⁰ This idea was taken from the work of Little, P. D., Behnke, R., McPeak, J., Getachew G., 2010. *Retrospective Assessment of Pastoral Policies in Ethiopia, 1991-2008*. Report Number 1 Pastoral Economic Growth and Development Policy Assessment, Ethiopia. DFID commissioned Study.

Breed improvement

Table 93: Current policy constraints and proposed actions for breed improvement

Priority policy or institutional constraint/gap	Evidence, group affected and rationale for change	Recommended policy action
1. The need to improve genetic potential and productivity of national herd	<ul style="list-style-type: none"> • Inefficiency of the production system (including low fertility, poor offtake, high mortality). • Inadequacy of the agro-ecological and -production system zonation to prescribe appropriate productivity improvement. • Lack of understanding where local breed improvement and crossbreeding with exotics merits work. 	<ul style="list-style-type: none"> • Use AI and synchronization to improve national herd through crossbreeding and/or local selection. • Establish a system of progeny testing and selection of AI bulls. • Develop an efficient and effective supply of quality semen and other inputs, and strengthen established operating systems. • Undertake monitoring and evaluation to avoid indiscriminate crossbreeding. • Ensure the promotion of local breed improvement via selection within.
2. The privatization of AI	<ul style="list-style-type: none"> • The delineation of public/private roles recommended, but has not yet implemented. • Limited progress in privatization. • The national AI service too chronically understaffed and under-budgeted to contribute to the sector to the expected degree. • A need for greater awareness of the potential of AI in the rural areas, in tandem with the initiative of improving semen quality, particularly blood level supply of different varieties of bull semen. • A need for greater coordination among the public and private sector. 	<ul style="list-style-type: none"> • Gradually develop private AI services, where profitable, with incentives (subsidized and/or guaranteed loans to build clinics). • Encourage private involvement in the AI service delivery, and the importation of genetic germplasm. • Continue providing public services in remote areas where private AI will not go. • Provide technical and financial incentives to rural AI workers. • Increase coverage with a quality, efficiency and cost-effective service to small farmers.
3. The need to meet the requirements of buyers, weak sectorial organization— inconsistencies in supply	<ul style="list-style-type: none"> • Old animals sent to slaughter leading to beef discolouration and packaging challenges. • Producers not meeting market requirements and unable to sell animals. • Animals take longer to reach market age. 	<ul style="list-style-type: none"> • Facilitate linkages between producers and buyers. • Establish a modality of how to reach big herds in pastoral areas, and use synchronization and AI with local breeds to increase calf birth rates.

Cross-cutting institutional and policy issues

Land policy

Land is one of the critical factors of production upon which the livestock production is based. There is a demand for land for many uses: farming, real-estate development, forestry, protected areas, etc. The allocation of land for different uses is a function of the return to a given usage of land. By law, land in Ethiopia is the property of the government and the farmers and others only have the right to use it.

The main issues related to land as a factor of production are: physical availability and accessibility. Land availability in the highland areas, where the road infrastructure is relatively developed, is very limited. Conversely, land might be physically available in the low land remote areas, but accessibility is limited. The shortage of land for animal feed production is a very critical constraint in livestock production.

Therefore, in order to increase the availability of land for animal feed production, there has to be security of land use rights and security for contractual agreements between those who lease and those who contract the land. In other words, land contracts for investment purposes should be clearly regulated, creating clear rights and responsibilities for those who hold the right to use land and sub-contractors.

Agricultural research

There are different organizations which are engaged in livestock research in Ethiopia: the EIAR, national universities, and member centres of the CGIAR. With regard to livestock sector, the domestic research is mainly concerned with the improvement of primary livestock production. However, the research on secondary production, like processing and food manufacturing, is less developed. In order to improve the productivity and competitiveness of the sector, research on the processing and manufacturing sector is both very critical and timely.

Human-resource capacity building

The LMP and LSA were conducted with the support and collaboration of ILRI. The LSM needs to build in-house capacity to conduct detailed LSAs, implement, monitor and evaluate and formulate new policies and to revise or develop new LMPs after the current one has expired. The LSM needs to develop the institutional capabilities to generate and compile reliable social, economic and environmental statistics which facilitates the monitoring and evaluation of the impact of new investments, policy and institutional changes. In this regard, it is important to have a livestock policy support unit, capable of implementing the above mentioned activities.

Conclusion

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

Overall conclusions

Overall conclusions

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

For the specific VCs and interventions, the main conclusions and implications for the GTP II, as well as conditions critical to achieving success, are as follows:

Crossbred cow dairy development

The investment interventions proposed in the cow dairy roadmap to improve cattle milk production and the cow dairy VC could transform family dairy farms in the MRS from traditional IFD to market-oriented systems. Moreover, the specialized dairy systems could also be improved through better genetics, feed and health services as the units are expanded to increase the number of dairy cows in the systems.

The combined cow milk interventions could result in a 93% increase in national cow milk production during the GTP II period (2015–2020). This production increase would make it possible to meet the all-milk production targets in the GTP II, as well as to meet and exceed the growing domestic demand for all milk (see Figure 9, Panel D). The cow milk production increase would result in a surplus of 2501 million litres of cow milk over projected domestic consumption requirements by 2020 (see Figure 9, Panel A).

The surplus created could substitute for imported milk products and be used domestically for new or additional industrial uses (e.g. in the baking industry) or be exported as milk powder or UHT to raise foreign exchange earnings.

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

- Changing land-lease policy to make land available to investors for forage seed and forage production, and dairy farms;
- Encouraging the private sector to invest in milk processing plants, especially in UHT and powdered milk production to overcome seasonal fluctuations in dairy product demand;
- Introducing quality-based standards and pricing to encourage quality milk supply;
- Encouraging the private sector to invest in providing AI and synchronization services;
- Ensuring the availability of more and better feed seed and forage production, and marketing, and health services in all areas, regardless of whether breed improvements are implemented;
- Introducing more effective extension services to support the production, processing and marketing of quality milk;
- Promoting the establishment of flour mills to make more concentrate ingredients available; and
- Promoting domestic production of cooking oil to replace importation of cooking oil, and banning the exportation of oilseeds that affect availability of concentrate feeds.

Red meat-milk and feedlot development

The potential contribution of the ITMM production systems (cattle, sheep, goats, and camels) in all production zones (MRS, MRD and LG), and the specialized cattle feedlot to improve food security, red meat consumption and nutrition, and economic growth is very significant, given the anticipated productivity improvements and increase in the size of the sub-sector.

The combined interventions indicate a 52% increase in total red meat production. Production grows from 1,275,000 tonnes in 2015 to 1,933,000 tonnes in 2020. However, consumption grows even faster, from 1,275,000 tonnes of red meat in 2015 to 2,008,000 tonnes by 2020, an increase of 58%. Thus, even if the red meat interventions were successful, the red meat production and consumption balance for the period 2015–2020 would still show a deficit of 187,000 tonnes by 2020 (Figure 10, Panel F).

Besides not meeting the domestic demand for red meat for the rapidly growing population and increasing incomes in Ethiopia, such deficits can be expected to lead to continually high domestic prices for red meat. Moreover, meeting the growing red meat export goals in the GTP II period would also be extremely difficult.

Furthermore, to help tackle poverty reduction goals, cattle numbers cannot be expected to fall dramatically, as called for in the draft of the CRGE Livestock Investment plan. However, the annual growth rate in the cattle population could be substantially reduced (yet, this would likely require substantial incentives for farmers to reduce cattle numbers in household herds).

To be successful, the red meat-milk interventions need to be supported by meeting the following conditions:

- Rising productivity increases health and feed investments (in range and pasture lands), and ITMM systems are adequately funded and implemented by GoE agencies in a timely manner.
- Feed needs are met for feedlots, including the establishment of additional flour and oil mills by the private sector for additional feeds from agro-industrial by-products, while the availability of roughages, such as crop residues, are also increased.
- A support strategy is developed and implemented, in collaboration with industry and farmer associations, to enable access to sufficient production factors (including land, water and finance).
- The policy and investment environments are improved (less bureaucracy) to attract and enable private investment in feedlots and slaughterhouses.
- The required policy support would attract and ensure sustainable growth in private feedlots—land availability, reduction in feed ingredient taxes, tax holidays, etc.
- The establishment of new feedlot operations takes into account the spatial distribution of sugar cane factories, agro-industrial processing plants, and milling industries.
- To facilitate and promote formal exports of live animals and meat, investments are made in export infrastructure for animal holding and quarantine, as well as programs to ensure food safety and animal health through disease surveillance, monitoring of abattoirs, animal identification and traceability, etc.
- Linkages are established for a viable stocker feeder program where the young male stock from the LG are channelled to feedlot operations, thus reducing the grazing pressure in the system.

Poultry development

If the proposed poultry intervention investments were carried out, the poultry sub-sector could move away from the TFP to the IFP and the scale of the specialized poultry operations could be greatly increased. This transformation could make substantial contributions to reducing poverty and malnutrition rates among rural and urban poor, as well as generating increases in national income.

With the success of the poultry investment interventions, Ethiopia will meet its chicken meat and egg demand for its growing population and produce a very significant surplus for domestic industrial use or export (see Figure 10, Panels

E and H). Ethiopia will raise chicken meat production to 164,000 tonnes and eggs to 3.9 billion by 2020 through the IFP and the expanded specialized poultry.

The combined interventions indicate a 247% increase in chicken meat production by 2020:

- Total chicken meat production increases from 49,000 tonnes in the year 2015 to 164,000 tonnes in the year 2020.
- The production-consumption balance for chicken meat goes from a surplus of 18,000 tonnes in 2015 to 102,000 tonnes in 2020.

The combined interventions also could result in an 828% increase in chicken egg production:

- Total egg production increases from 419 million in the year 2015 to 3.9 billion in 2020.
- The surplus goes from 537 million to 3.128 billion eggs during the GTP II period.

Perhaps most importantly, the growth of the poultry sub-sector would enable Ethiopia to close the total national meat production-consumption gap (see Figure 8, Panel G). It would also make possible meeting the CRGE target of increasing the share of chicken meat consumption to total meat consumption from the current 5% to 27% by 2030, but only if chicken substitutes for red meat coming from larger high emitting ruminants. Taking advantage of the benefits of the potential poultry revolution would thus require substantial investments in promotional activities to shift tastes and preferences away from beef and mutton, as well as from local chicken meat and eggs, towards exotic chicken meat and eggs.

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

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

The above benefits can only be realized if:

- The feed constraint is resolved by increasing the acreage dedicated to maize and soybean, and ensuring imported nutritional additives are available without excessive custom duties (now 53%);
- The private sector invests adequately in DOC and pullet production and distribution, as well as egg processing to make egg powder;
- An effective livestock extension system is put in place to train farmers in management of crossbreds in the IFP;
- The IFP and specialized poultry systems are linked with processors and retailers to ensure reliable market outlets for chicken meat and eggs;
- Regulations are enacted to protect the small IFP farmers so that they will not be forced out of business by large specialized poultry farms. The government will need to balance the poverty reduction and food security benefits of the IFP sub-sector with the economic growth contribution of the large specialized poultry production sub-sector.
- Private investors in the sector (specialized poultry, processing plants, feed producers) are provided adequate incentives in terms of tax holidays, subsidized land-leasing rates, and priority in acquiring land;
- Protective trade policies are put in place to discourage chicken meat imports, thus encouraging domestic private investment in poultry businesses;
- Research to monitor, maintain and ensure the quality of the imported breed lines takes place. Continuing research will also be needed to identify better yielding breeds, including from among local breeds;
- Balanced policies are introduced to encourage investment in animal production and meat processing to meet both rapidly increasing domestic demand for meat, and export demand. Otherwise, the exploding domestic demand could continue to put upward pressure on domestic prices and constrain future exports; and Investment in research to better understand demand for livestock products is undertaken, including to inform promotional activities meant to modify tastes and preferences.

Poverty reduction impacts of the investment interventions

The LMP results show the proposed investment interventions (better genetics, feed and health services, together with complementary policy support) could help meet the GTP II targets by improving productivity and total production in the key livestock VCs. Furthermore, if all the investment interventions presented in the roadmaps and mentioned below (for poultry, red meat-milk, and dairy) are successfully carried out, they could eliminate poverty in about 25% of livestock-keeping households, or among 2.36 million households (double counting eliminated), as shown in Table 94 below.

Table 94: Major technology interventions proposed for the GTP II by production zone and number of farm households expected to adopt the interventions

Interventions	Production zone	Number of adopting households	
		2014/15	2019/20
Improved family poultry with semi-scavenging crossbreeds or exotics, with improved feeding and health services	MRS	66,000	228,800
	MRD	48,000	166,400
	LG	6000	20,800
Red meat—reducing YASM (vaccines, internal and external parasite treatment package), and improved feeding	MRS	-	1,005,000
	MRD	-	792,000
	LG	-	225,000
Dairy cattle breed improvement through AI and synchronization, with improved feeding and health services	MRS	226,500	1,340,465
Total adopting households in all production zones			3,778,465

Total investment

The total investment costs required to carry out the LMP roadmap are ETB 7762 million. The proportion of investment from the public and private sectors is 57% (ETB 4463 million) and 43% (ETB 3299 million) respectively.

Table 95: Total investment cost

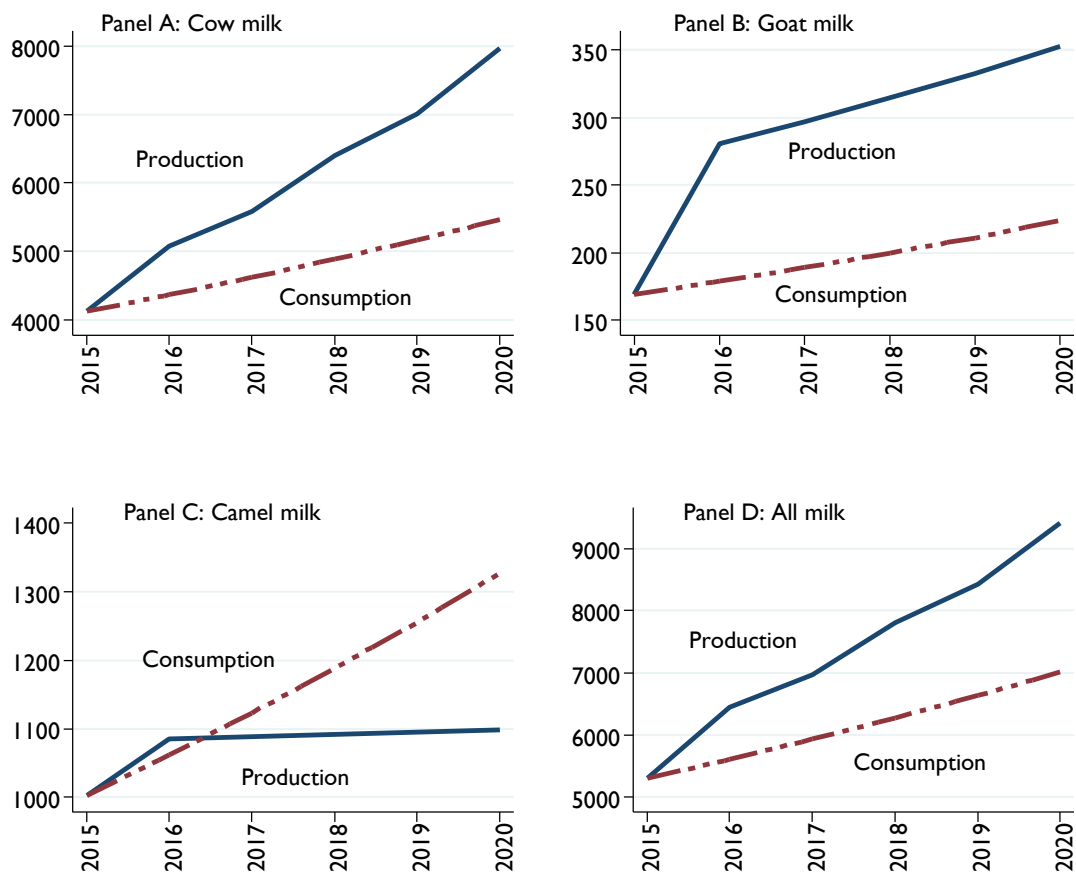
Investment interventions	Total investment cost in ETB millions			Cost in USD in millions
	Public	Private	Total	
Cow dairy development ⁵¹	830	1010	1840	92
Red meat-milk and feedlot development	3175	319	3494	174.7
Poultry development	458	1970	2428	121
Total	4463	3299	7762	387.7

Finally, the results for all the targeted VCs thus show that investing in the LMP could help transform family farms from traditional to improved market-oriented systems. This includes all the traditional family systems: cow milk or IFD, the ITMM and the IFP systems. The specialized production systems (specialized dairy, cattle feedlots, and poultry (broilers and layers)) could also be improved through better genetics, feed and health services and by increasing the number of specialized units and livestock in them to increase their contributions to national livestock production and GDP.

⁵¹ Investments to improve pasture productivity and reduce YASM are included in the investment of red meat-milk and feedlot system.

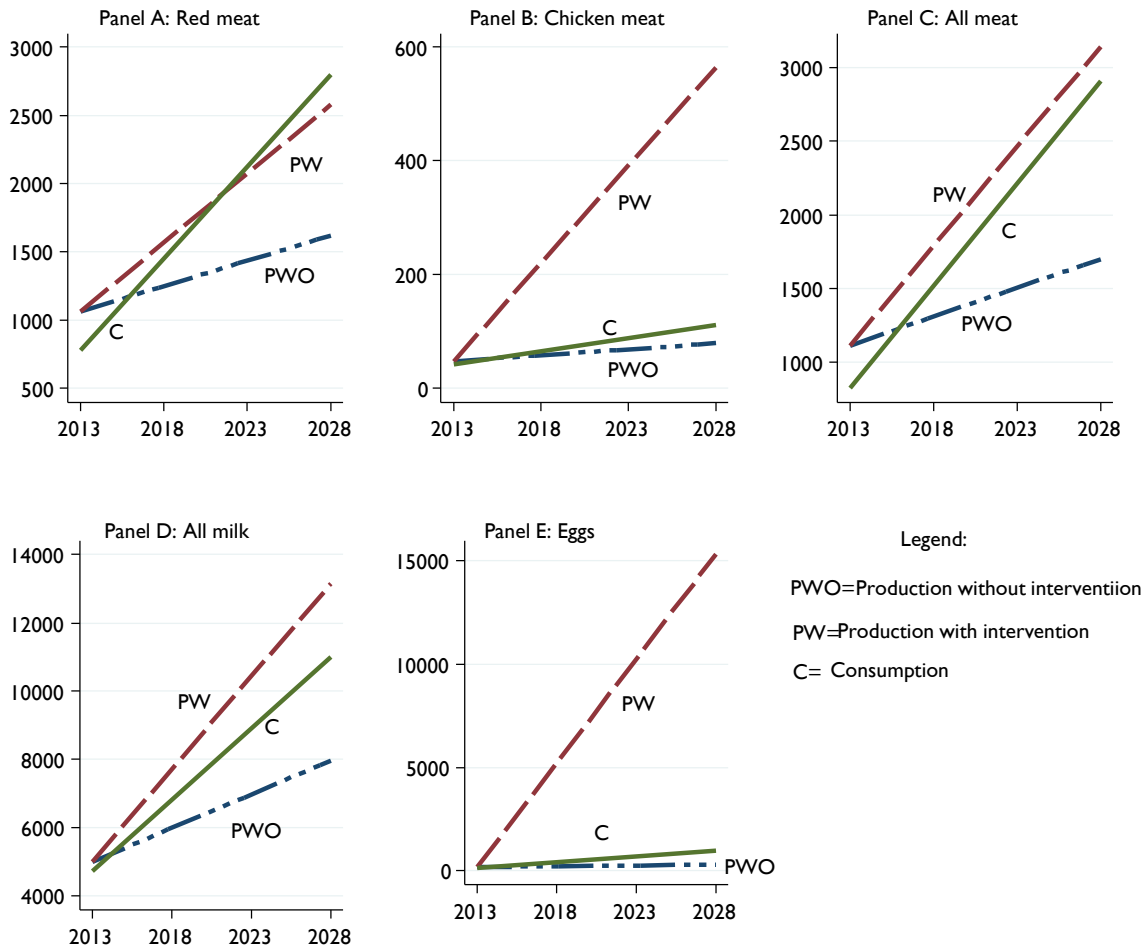
Moreover, livestock development does not just have an impact on rural people. The anticipated transformation of the livestock sector also has the potential to impact positively on urban consumers through lower animal product prices. It is, therefore critical to the attainment of food and nutrition security at household, sectorial and national levels.

Figure 9: GTP targets for production, projected consumption, and production-consumption balances for milk from various animal types, and combined milk (2015–2020), (in million litres).



Source: Based on LSA results.

Figure 10: GTP targets for production, projected consumption, and production-consumption balances for meat from all livestock types and combined meat (in thousand tonnes), and eggs, (in millions), (2015–2020).



Source: Based on LSA results.

Annex I: Disease prioritization based on the LSIPT tool

Annex I: Disease prioritization based on the LSIPT tool

The LSIPT provides tools to help prioritize animal diseases to inform decision-makers on the most appropriate allocation of resources to combat the priority diseases. The priority setting is based, first on a selection of the 10 most important priority diseases, based on their incidence. Those 10 most important diseases are then ranked according to their impact on three criteria:

- The impact on households and livelihoods (from the perspective of the farmer based on the impact on the five types of capital possessed by rural households. i.e. financial, natural, human, social and physical capital).
- The impact on markets and value chains (from the perspective of industry based on five types of impacts: causes the closure of local markets; depreciates the quality and value of products; causes the closure of processing units; stops demand; and/or prevents access to international markets).
- The impact on intensification pathways in the production system (from the perspective of extension service providers, i.e., improvement in genetics, feeding, health inputs, management, and husbandry).

These global scores are then weighted in accordance to the share of:

- The households in the affected production systems (where livestock is essential for household income);
- Total value added generated from the sub-chain affected; and
- The animal population in production systems affected (as a percentage of total livestock population by species).

Table 96: Diseases ranked in descending order based on the degree of impact on the attributes of household density, VC, and intensification pathways.

Diseases ranking based on the impact on household density	Diseases ranking based on the impact on market and VC	Diseases ranking based on the impact on intensification of livestock production
FMD	FMD	Brucellosis
CBPP	LSD	PPR, FMD
LSD	Brucellosis	TB and Newcastle
TB	CBPP, Newcastle	CBPP
Brucellosis	TB	LSD
CCPP	Chicken pox	Gumboro,
SGP	Gumboro	Salmonella
PPR	SGP	SGP
Newcastle	PPR	Chicken pox
Surra	Echinococosis	Surra

The order of the ranking in Table 96 changes when the aggregate information is further partitioned by species of livestock. The results are shown in Table 97 a (cattle), b (sheep and goats), c (camels), and d (poultry).

In the case of cattle, the total scores indicate that the three most important diseases are FMD, CBPP and brucellosis. However, when the disease scores are examined individually against the impact on household attributes, market and value chains, and intensification pathways, the order of ranking varies. The order of ranking was FMD, LSD, and brucellosis for market and value chains; whereas household impact ranking was FMD, CBPP and TB. In the case of intensification pathways, brucellosis, FMD, and TB were the top three in terms of their importance of impact on the intensification attributes.

Sheep and goat diseases that indicted an impact on the household, market and value chains, and intensification pathways were PPR, SGP and CCPP, and ranked in that order. The same order of ranking is indicated for market and value chains. However, with regard to the impact on household attributes, CCPP ranked first followed by PPR and SGP. In the case of camels, surra is ranked first.

In poultry, Newcastle ranks first across all attributes of households, value chains and intensification pathways.

Table 97: Summary of scores⁵² on the impact of animal diseases (by species) on household⁵³, value chain⁵⁴ and intensification⁵⁵

a. Cattle

	Diseases				
	FMD	LSD	CBPP	TB	Brucellosis
Impact on households	16.8	12.4	16.0	11.6	11.5
Impact on value chains	1.7	1.5	0.9	0.0	1.1
Impact on intensification	2.8	2.2	2.2	2.6	6.3
Total	21.3	16.1	19.1	14.2	18.9

b) Sheep and goats

	Diseases		
	PPR	SGP	CCPP
Impact on households	5.9	5.9	6.8
Impact on value chains	0.3	0.3	0.2
Impact on intensification	4.0	3.0	0.0
Total	10.2	9.2	7.0

52 Scale for scoring from 1 to 5: Totally disagree (1), Disagree (2), Neither disagree nor agree (3), Agree (4), Strongly agree (5)

53 Household attributes considered in the analysis are financial, human, social, natural, and physical capital. The impact of the diseases on these capital assets is considered and scored.

54 The measure of impact of animal diseases on markets using the specific dimension 'disrupting markets and value chains' and attributes, including: the closure of collection markets, depreciation of value, closure of processing units, stoppage of demand, closure of international markets. In the LS IPT analysis each of the attributes are also given policy weight based on the extent to which the national policy highlights the importance of avoiding some aspects of disease impact.

55 Intensification of livestock systems, in this case, the proxies are genetics; feeding; AI, inputs and basic health care; habitat housing; husbandry practices and hygiene. The extent to which national policy highlights these intensification pathways is weighted and is referred to as 'policy weight'.

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ISBN 92-9146-425-2



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