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Eastern Africa Animal Feed Action Plan

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Contents

Foreword	iii
Acknowledgements	iv
Acronyms	v
Executive Summary	vi
Introduction	1
Priority Area 1: Establish and Strengthen Livestock and Feed Resources	
Data, Information and Communication Systems	5
Outputs	5
Output 1.1: Regional Feed and Water Resources Requirements and Availability Assessed and Documented	5
Output 1.2: Early Warning and Early Action Mechanism Strengthened or Established	10
Output 1.3: Reporting and Communication System Strengthened or Developed	12
Priority Area 2: Develop Sustainable Animal Feed Supply Chains	13
Outputs	13
Output 2.1: Feed Value Chains Identified and Analysed To Inform Development Intervention	13
Output 2.2: Capacity for Local Feed Production and Marketing Established and Strengthened	17
Output 2.3: Feed Supply Chains Established and Emergency Mechanism Specified	24
Output 2.4: Support institutionalisation of Livestock Emergency Guidelines and Standards (LEGS) in the Livestock Emergency Interventions Design and Implementation	26
Priority Area 3: Identify Status of Rangelands and Grazing Areas and Disseminate Best Management Practices	29
Outputs	29
Output 3.1: Status of Rangeland and Grazing Areas Determined	29

Output 3.2: Evidence-Based Best Practices on Rangeland and Grazing Management Adopted and Disseminated	34
Output 3.3: Improve Governance and Management of Rangelands	36
Priority Area 4: Strengthen Enabling Environment for Feed Production and Marketing in the Region	37
Outputs	37
Output 4.1: Policy, Institutional, Strategic Frameworks and Standards and Quality Control System Supported	37
Output 4.2: Capacity for Feed Production, Processing and Marketing Strengthened	43
Implementation of the Action Plan	48
References	52

Foreword

Livestock production is an important means of livelihood and economic growth in the Eastern Africa region. It plays an important role as a source of food, employment and income as well as means of resilience for particularly the pastoral population of the region. The sector makes substantial contributions to export revenues, national gross domestic product (GDP), and to the broader socioeconomic development of the region. The current trend shows an increasing demand for livestock products such as milk, meat and eggs both globally and in the Eastern Africa region due to population growth, increasing incomes, urbanisation and globalisation. The Eastern Africa region is endowed with huge livestock resources potential and diverse agro-ecologies suitable for different livestock production systems. However, the current productivity of the livestock sector is very low and much below its potential. This calls for increasing productivity of livestock to keep pace with the increasing demand.

The Eastern Africa region regularly suffers from recurrent droughts that often results in scarcity of feed and water with adverse effects on productivity and even survival of the livestock resources. Therefore, animal feed plays a pivotal role in determining the performance of the livestock sector because it affects almost all operations and services of the animal industry. Animal feed is the major cost of livestock production. Evidence from the region shows that pastoral destitution is largely driven by feed and water scarcity. The increasing incidence of climate change and variability, and recurrent droughts further exacerbated the feed gap. According to the reports of OCHA (2023), the Horn of Africa experienced the worst drought in decades in 2020-2022 that resulted in the death of 13.2 million livestock in Ethiopia, Somalia and Kenya alone due to scarcity of feed and water.

This Animal Feed Action Plan is intended to provide governments, development partners, and the private sector and livestock producers with a systematic and guided plan to facilitate sustainable improvements to animal feed challenges in the region. The Action Plan is an updated version of the previous five years Action Plan and has been prepared in alignment with the Livestock Feed Strategy for the region. It is the result of a consultative and participatory process that captures the experiences and lessons learnt by a wide spectrum of stakeholders in the public and private sectors, including policy-makers, traders, pastoralist and farmers' organisations, civil society, non-governmental organisations and development partners.

IGAD and FAO are partnering in the initiation and development of the Action Plan and are committed to materialise it through the promotion of technically feasible actions and sensitising member countries to harmonise policies and legislative frameworks relevant to feed to stimulate livestock sector growth in Eastern Africa.

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This Action Plan is the result of the joint efforts of IGAD-ICPALD and the Food and Agriculture Organisation of the United Nations (FAO). Hence the conception, facilitation and coordination roles of Dr. Wamalwa Kinyanjui and Dr. Ameha Sebsibe both from IGAD-ICPALD and Dr. Paul Opio of FAO are duly acknowledged. Due appreciation goes to Dr. Dereje Wakjira, Director of ICPALD, and Cyril Ferrand of FAORTEA for their positive recognition and support. This revised Action Plan is based on the first Action Plan developed in 2019, and hence, the contributions of all actors involved in the development of the first Action Plan are duly acknowledged. Moreover, all the participants of the validation workshop made immense contributions in shaping this Action Plan, and they are all duly recognised for their immense contributions.

Acronyms

AIBP	Agro-Industrial By-Products
ASAL	Arid and Semi-Arid Lands
AU	Africa Union
CBO	Community Based Organisation
CGIAR	Consultative Group on International Agricultural Research
CP	Crude Protein
DM	Dry Matter
FAO	Food and Agriculture Organisation of the United Nations
FCI	Forage Condition Index
GDP	Gross Domestic Product
GIS	Geographic Information System
IBLI	Index Based Livestock Insurance
ICPALD	IGAD Centre for Pastoral and Livestock Development
ICT	Information and Communication Technology
IFIF	International Feed Industry Federation
IGAD	Intergovernmental Authority on Development
LEGS	Livestock Emergency Guidelines and Standards
ME	Metabolizable energy
MRV	Measurement, Reporting and Verification
NDMA	National Disaster Management Authority
NDVI	Normalized Difference Vegetation Index
NGO	Non-Governmental Organisation
OCHA	Office for Coordination of Humanitarian Affairs
PEG	Polyethylene Glycol
PET	Pictorial Evaluation Tool
PFS	Pastoralist Field School
PLEWS	Predictive Livestock Early Warning System
TLU	Tropical Livestock Unit
UN	United Nations
USD	United States Dollar

Executive Summary

The livestock sector plays a critical role in the livelihoods, food and nutrition security, economy, and resilience of the population of the countries in the Eastern Africa region. It provides nutritious foods such as meat, milk and eggs for the family and domestic markets. The sector employs over 60 per cent of the population and contributes substantially to export revenues, national gross domestic product (GDP) of the individual countries, and to the broader socioeconomic development of the region. Demand for livestock products is continuously increasing, globally and more so in developing countries including the Eastern Africa, due to population growth, increasing incomes, urbanisation and globalisation. Currently, most countries in Eastern Africa consume one-third of the recommended amounts of animal source foods. This offers a huge opportunity to increase animal production and income of livestock farmers.

The sustainability of the livestock sector hinges on how feed is produced and fed to livestock. A holistic view of animal nutrition illustrates that animal feeding impacts production and reduction, animal health and welfare, the environment including biodiversity, land degradation and land-use change, food-feed-fuel competition, animal product quality and safety, among others. The supply of adequate, safe and quality animal feed is the foundation of all livestock production operations, from pastoral to agro-pastoral, mixed crop-livestock and more market oriented intensive systems. Animal feed is the major component of cost of production of most intensive and semi-intensive livestock operations.

Livestock feed and feeding systems in the Eastern Africa are constrained by a host of interconnected factors, including recurrent droughts, land tenure and land use changes such as encroachment of crop farming into grasslands, encroachment of invasive plant species, restrictions of livestock mobility, resource use conflicts, overgrazing, grassland degradation, soil infertility and inadequate inputs and planting material. In addition, poor feed conservation practices, limited capacity for feed manufacturing, lack of knowledge on appropriate feed and feeding practices, and inadequate data on estimates of the proportion/number of animals kept within specific production systems constrain the efficient use of available feed resources.

Evidence from the region indicates that pastoral destitution is largely driven by feed and water scarcity. In most countries, the natural resource base in the rangelands is shrinking fast owing to prolonged and more frequent drought events and due to land use changes. In recent decades, increasing climate change and variability, recurrent droughts and conflicts have exacerbated the feed gap. The Horn of Africa has experienced severe and frequent livestock feed and water crises of unprecedented

proportions due to frequently recurrent droughts of prolonged duration. Successive rainfall failures have accelerated the loss of vegetation cover and cause depletion of soil-seed-bank of desirable forage species and drying up of water sources. The most recent drought of 2020-2022 with a record five consecutive seasons of rain failure in the Horn of Africa, severely affected large areas of Somalia, southern and south-eastern Ethiopia, and northern and eastern Kenya resulting in the death of 13.2 million livestock across the region, including 6.8 million in Ethiopia, 3.8 million in Somalia and 2.6 million in Kenya. This calls for a concerted effort of regional bodies such as IGAD-ICPALD, international development partners such as FAO and the member states to develop a coherent action plan to address the problem.

The Eastern Africa Animal Feed Action Plan for 2023-2027 is intended to provide governments, development partners, and the private sector and livestock producers with a systematic and guided plan to facilitate sustainable improvements to animal feed challenges in the region. The Action Plan is an updated version of the previous five-year Action Plan produced in 2019 and has been prepared mirroring the Eastern Africa Livestock Feed and Feeding Strategy for 2023-2037. It is to guide actions leading to improvements in feed resource availability and quality and better feeding management through increased year-round availability of sufficient and improved-quality feed, a critical step in building the resilience of livestock-dependent livelihoods in the region.

The Action Plan comprises the following four major parts, each containing a series of actions and outputs associated with them. The four major areas are:

1. Establish and strengthen livestock and feed resources data, information and communication systems.
2. Develop sustainable animal feed supply chains.
3. Identify the status of rangelands and grazing areas and disseminate best practices for their management.
4. Strengthen an enabling environment for feed production.

The main objectives of the animal feed action plan are to:

- Leverage the potential and opportunities provided by animal feed resources to stimulate development and income generation in poor rural communities by improving the efficiency and profitability of the animal feed sector;
- Enhance the participation of poor rural communities in the animal feed value chain;

- Facilitate private sector-driven animal feed market development, within and outside Eastern Africa, ensuring market access and competitive prices across countries;
- Provide a guide for governments to develop enabling policies and regulatory frameworks on feed for enhanced trade between countries in East Africa; and
- Exploit the production potential of rangelands and ensure sustainable natural resource use as a key ingredient in the development of the animal feed sector in East Africa.

Introduction

Eastern Africa includes countries like Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Sudan, Tanzania and Uganda. The region is endowed with diverse and rich cultures, resources and opportunities. The livestock sector plays an important role in livelihoods, food and nutrition security, economy, and resilience of the population of the region. The sector contributes substantially to export revenues, national gross domestic product (GDP) of the individual countries, and to the broader socioeconomic development of the region. At a national level, the sector provides between 30 and 80 per cent of the agricultural GDP, and at farmer level up to 70 percent of cash income is generated from livestock. In the Eastern Africa region, the sector generates foreign currency earnings through live animal and meat exports to the Middle East and North Africa (ICPALD, 2013) and employs over 60 per cent of the population, particularly in the arid and semi-arid areas. Demand for livestock products is continuously increasing, globally and more so in developing countries including the Eastern Africa, due to population growth, increasing incomes, urbanisation and globalisation. Currently, most countries in Eastern Africa consume one-third of the recommended amounts of animal source foods. This offers a huge opportunity to increase animal production and income of livestock farmers.

Most livestock in the region are kept under extensive production systems. Pastoralists and agro-pastoralists are the dominant livestock keepers in the arid and semi-arid lands of Djibouti, Ethiopia, Kenya, Somalia, South Sudan, the Sudan and Uganda. Smallholders dominate the subsistence-oriented mixed crop-livestock systems. Most of the meat consumed locally in Eastern Africa and exported to the Middle East and the Gulf States comes from an open-grazing livestock production system with minimal inputs. Hence, livestock products from the region are highly sought-after products for organic markets.

Animal feed plays a leading role in determining the performance of livestock as it affects almost all operations and services of the animal industry. Sustained availability of the desired type and quantity of animal feed and animal feeding is the foundation of livestock production systems. Animal feed availability and feeding is a multi-faceted theme. It influences all livestock sub-sectors across production systems. It also has far reaching effects on human nutrition, poverty, food prices and global economy. It impacts almost every sector of the livestock production – from animal reproduction, health and welfare – to farm economic viability, the environment, animal product safety and quality (Figure 1).

The sustainability of the livestock sector hinges on how feed is produced and fed to livestock. A holistic view of animal nutrition illustrates that animal feeding impacts

livestock productivity, reproductive performance, animal welfare and health, the environment including biodiversity, food-fuel-feed competition, animal product safety and quality, among others. The supply of adequate, safe and quality animal feed is the foundation of all livestock production operations. Animal feed is the major component of cost of production of most intensive and semi-intensive livestock operations.

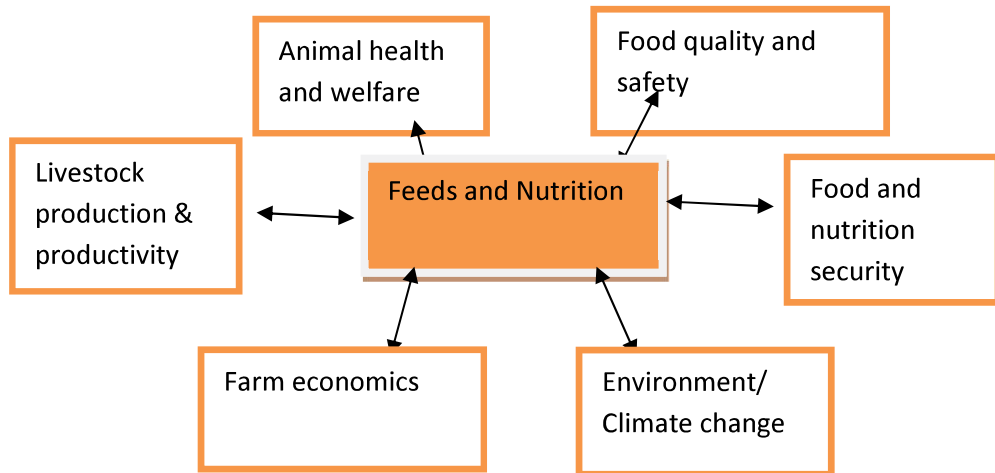


Figure 1. Impact of feed and feeding on various aspects of livestock operation

A wide seasonal variation in feed availability and quality, inadequate feed manufacturing capacity and severe shortage of feed, particularly during the dry season/droughts, result in poor nutritional status and low productivity of livestock, eventually leading to death of animals in extreme situations. Livestock feed and feeding systems in the Eastern Africa region are constrained by a host of interconnected factors, including recurrent droughts, land tenure and land use changes such as encroachment of crop farming into grasslands, encroachment of invasive plant species, restrictions of livestock mobility, resource use conflicts, overgrazing, grassland degradation, soil infertility and inadequate inputs and planting material. In addition, poor feed conservation practices, limited capacity for feed manufacturing, lack of knowledge on appropriate feed and feeding practices, and inadequate data on estimates of the proportion/number of animals kept within specific production systems constrain the efficient use of available feed resources.

In most countries within the region, the sustainable development of the livestock sector is seriously impacted, among other factors, by seasonal feed scarcity and low quality of available feeds. The main feed resources are low quality roughages arising from natural grazing lands and various types of crop residues depending upon agro-ecology and production system. Extensive grazing on rangelands is the most common livestock feeding practice in the pastoral and agro-pastoral areas of the arid and semi-

arid rangelands. The intensity of cropping determines the area available for grazing. The quantity and quality of available feed declines as the dry season progresses and becomes much more serious as drought sets in. Unfortunately, fodder conservation to help reduce seasonal feed supply gap is rarely practiced in the region.

The total area of natural pasture is declining from time to time as the more favourable areas are converted to crop land triggered by the rapidly increasing human population. The increased expansion of crop production provides a range of residues that can be utilised by animals. But the actual quantities of crop residues available for livestock feeding is reduced by the costs of collection, transport, storage and processing, seasonal availability, other alternative uses and wastage. Agro-industrial by-products such as oilseed cakes and meals (e.g. cottonseed cake and sunflower cake), wheat bran and molasses are important ingredients of compound feeds to be used as concentrate supplements. Brewery and distillery by-products and household wastes could be important sources of supplementary feed, particularly for farmers residing in the proximity of commercial breweries. The contribution of cultivated forage and pasture crops to the diet of farm animals in smallholder mixed farming systems is relatively very small. Foliage from trees and shrubs contributes a significant portion of feed to ruminants. In harsh and arid conditions, trees provide more edible biomass than pasture and the biomass remain green and high in crude protein (CP) when pastures dry off and senesce. The leaves and pods from fodder trees and shrubs usually have a higher CP and lower fibre content than dry grass forages and cereal crop residues. Thus, proper and strategic use of these feed resources as supplementary feed during the dry season can help to minimise seasonal fluctuation in productivity.

Evidence from the region indicates that pastoral destitution is largely driven by feed and water scarcity. In most countries, the natural resource base in the rangelands is shrinking fast owing to prolonged and more frequent drought events and due to expansion of cropping into dry season grazing and drought period fall back areas of the pastoralists. Feed and water are the foundation of livestock production systems, affecting almost all related subsectors and services.

In recent decades, increasing climate change and variability, recurrent droughts and conflicts have exacerbated the feed gap. The Horn of Africa has experienced severe and frequent livestock feed and water crises of unprecedented proportions due to frequently recurrent droughts of prolonged duration. Successive rainfall failures have accelerated the loss of vegetation cover and cause depletion of soil-seed-bank of desirable forage species and drying up of water sources. The most recent drought of 2020-2022 with a record five consecutive seasons of rain failure in the Horn of Africa, severely affected large areas of Somalia, southern and south-eastern Ethiopia, and northern and eastern Kenya resulting in the death of 13.2 million livestock across the

region, including 6.8 million in Ethiopia, 3.8 million in Somalia and 2.6 million in Kenya. In Kenya alone, the economic cost of the livestock loss was estimated at more than USD 1.5 billion (OCHA, 2023). This calls for a concerted effort of regional bodies such as IGAD-ICPALD, international development partners such as FAO and the member states of the region to develop a coherent action plan to address the problem.

The Eastern Africa Animal Feed Action Plan for 2023-2027 is intended to provide governments, development partners, and the private sector and livestock producers with a systematic and guided plan to facilitate sustainable improvements to animal feed challenges in the region. The Action Plan is an updated version of the previous five-year Action Plan produced in 2019 and has been prepared in alignment with the Eastern Africa Livestock Feed and Feeding Strategy for 2023-2037. It is to guide actions leading to improvements in feed resources availability and quality and better feeding management through increased year-round availability of sufficient and improved quality feed, a critical step in building the resilience of livestock-dependent livelihoods in the region.

The Action Plan comprises the following four main priority areas:

1. Establish and strengthen livestock and feed resources data, information and communication systems.
2. Develop sustainable animal feed supply chains.
3. Identify the status of rangelands and grazing areas and disseminate best practices for their management.
4. Strengthen an enabling environment for feed production.

A series of actions and outputs are associated with the four major priority areas.

Priority Area 1: Establish and Strengthen Livestock and Feed Resources Data, Information and Communication Systems

This priority area is aligned with Strategic Objective 1 of the Eastern Africa Livestock Feed and Feeding Strategy.

Outputs

There will be four outputs under this priority area. These include:

Output 1.1: Regional feed and water resources requirements and availability assessed and documented.

Output 1.2: Early warning and early action mechanism strengthened or established.

Output 1.3: Reporting and communication system strengthened or developed.

Output 1.4: Animal feed information management system strengthened or established.

Output 1.1: Regional Feed and Water Resources Requirements and Availability Assessed and Documented

Each country should have a dedicated national institution and taskforce to lead the assessment of feed and water requirements and the structure could also be replicated at decentralised levels. The activity can be linked with research by engaging research institutes and universities to conduct the assessment.

Activities

1. Estimate Livestock Feed and Water Requirements in Different Production Systems

The performance and economic contribution of livestock depends on adequate supply of good quality feed and implementation of efficient and feasible feeding systems. Hence, successful feed interventions depend on a thorough understanding of the livestock population, local context and impact of drought or other events, on livestock-dependent livelihoods. This makes it necessary to have updated and reliable information on livestock resource potential, that is livestock population by species and classes of animals, and regional distribution of the livestock population within a country to derive the feed and nutrient requirement of the livestock resources of each country. This requires mapping livestock population and feed/nutrient requirements, including information on the species, category and physiological status of the animals within a species (For example, growing, lactating, breeding, fattening, pack animals, et cetera). However, obtaining updated livestock population estimates is a major challenge. The main national source for such data should be a competent Statistical Authority. FAO's Statistical Database can also be a useful source of information when primary data is unavailable.

In a crisis, such as during drought emergencies, estimates of livestock populations at risk are critical to inform timely decisions on the type and level of support required. Where current estimates are not available, older figures supported by local information can be used to determine immediate assistance. However, a rapid inventory is still necessary to guide follow-up actions.

Key information required includes:

- Updated livestock estimates at the local/district, county, sub-national and national levels;
- Evidence of and reasons for unusual herd movements (including across borders), direction and type of animals moved, and expected unusual livestock migration in the immediate future;
- Assessment of current livestock body condition and estimate of amount of grazing forage available, as well as the breeding condition of females;
- Information on livestock disease outbreaks and interventions (if any); and
- Estimates of livestock losses (number of deaths by type of animal) attributed to the event.

2. Undertake Inventory of Availability of and Accessibility to Fodder Resources

It is desirable for each country to establish a comprehensive feed database and catalogue that will provide the information needed for development interventions. It is also important to establish feed demand and supply maps and briefs highlighting the constraints and opportunities in the feed value chain. Detailed knowledge of feed resources availability, in terms of quantity and quality, and their seasonal and spatial distribution will contribute to improve targeting of agro-ecological zones, production systems and livestock species. The information is critical to determine region and season specific feed options, including best-bet preserved forage, crop residues, agro-industrial by-products and concentrate feeds options for improving livestock productivity. First of all, it would be very important to collate and synthesise the existing knowledge regarding the quantity and nutritional value of various feed resources in each country. Inventory of available and accessible feed resources to determine the types, quantity and quality, seasonal fluctuation and spatial distribution of the major feed resources available in each country would be of paramount importance to identify the feed resources potential and gaps. The inventory will quantify and characterise feed and fodder resources in order to identify gaps and determine region and season-specific feed options. This information is crucial for sourcing feed for an emergency response, as well as for feed resources management and utilisation, developing business models, sustainable intensification, and market-oriented livestock production (fattening, dairy and poultry production).

The assessment and mapping of fodder resources focuses on determining or estimating the seasonal availability, spatial distribution, production location and accessibility, competing uses and prices of different types of fodder resources, including grazed forage (natural pasture, fallow land, stubble grazing, and forest and shrub land grazing), conserved forages (hay and silage) and crop residues. Fodder biomass production from natural pastures and other land use categories can be estimated by multiplying the area of land with the estimated dry matter yield potential of each land use category. The biomass yield potential of the natural pasture varies based on altitude, rainfall, soil type and cropping intensity. This can be augmented with Geographic Information Systems (GIS) and remote sensing data. Crop residue production can be estimated by multiplying crop production data with established conversion factors for each crop and accounting for factors like wastage, losses in transport and storage and competing uses.

So far feed inventory has been conducted in Ethiopia, Kenya, Somalia, Sudan and Uganda. In Ethiopia, the total annual potential biomass was estimated at 144.48 million tonnes (Makkar, 2018). According to this assessment, forages contributed to 96.6 and 92 per cent of total ME and CP availability, respectively, while concentrate feeds contributed little. The assessments in the other countries also show a negative feed balance on DM, ME and CP basis for Kenya and Somalia and a positive balance for Uganda and Sudan (FAO and IGAD-ICPALD, 2022). However, there are regional differences depending upon agro-ecology dictated by climatic and edaphic factors. In Kenya, a greater feed gap was reported in the Arid and Semi-Arid Lands (ASAL) compared to non-ASAL areas. In Sudan, positive feed balance of 68 per cent and 40 per cent was reported on DM and CP basis, respectively, whereas on ME basis the balance reported to be negative 5 per cent. The assessment in Uganda showed a clear positive feed balance with a potential for export to countries with feed deficit.

The flow of feed into and out of a given area should be captured through the survey. Information on accessibility indicators (location, distance to market, seasonality and access to market/transport) as well as affordability indicators (price, price score/willingness to pay, where marketed and true feed utilisation costs) will be captured as part of the feed value chain study.

3. Map Agro-Industrial By-Products (AIBPs) and Best Efficient Practices

Agro-industrial by-products (AIBPs) are the by-products of the primary processing of crops, including bran and related by-products of flourmills, oilseed cakes from small and large-scale oil processing plants, by-products of the sugar factory such as molasses, and brewery and distillery by-products. These by-products are of relatively high-quality feed. Agro-industrial by-products such as oilseed cakes and meals, wheat bran and molasses are important components of concentrate feeds used in commercial livestock

operations and market-oriented smallholder livestock production. They can also be important components of livestock emergency feed during drought emergencies.

A mapping exercise would involve identifying different AIBPs, spatial distribution of the different agro-industries producing the by-products, amount produced, alternative uses (if any) and amount available for use as animal feed, potential feed safety hazards associated with their use, suppliers and key actors (For example, small and large producers, small-scale processing units, wholesalers, small retails, et cetera). Alongside this, the (formal and informal) value chain – production, aggregation, processing and distribution – should also be mapped. It is important to understand how the products flow along the chain and the volume of product handled by each actor, as well as value addition and amount being lost, wasted or inefficiently used. These are critical steps to develop a business model for the sector. For immediate interventions, identifying and sourcing by-products to be procured for emergency response is very important. Efficient use of agro-industrial and food processing by-products could be critical in bridging the gap between supply and demand of emergency feeds.

A better understanding of the value chains linked to use and misuse of biomass is important to develop strategies for their efficient use, including waste reduction. This would also open new avenues and opportunities for green economy development, job creation and environmental protection. Inventory of AIBPs, including millings by-products of cereals and pulses, oilseed cakes, breweries and malt factories, food industries, horticultural/fruits and vegetables, sugar factories, slaughterhouses, and aquaculture/ fisheries by-products is invaluable for all Eastern African countries, especially those recurrently affected by drought. Based on this information, strategies could then be developed to efficiently use the by-products and create business opportunities.

4. Develop Feed Balance Sheet/Information System

A feed balance sheet or information system is an important tool for strategic planning, enabling public, private and development actors to make informed decisions on short- and long-term actions. A unified method for feed balance calculations in the region can incorporate all information available on feed resources, using the most up-to-date tools and approaches. The information system should be robust enough to provide the most accurate status at the time, as well as forecast feed balance changes in the following months so that appropriate and timely humanitarian and development actions can be taken.

5. Map Zones and Systems at Risk of Feed Deficiency/in Excess

Aggregate national figure of feed availability can mask some zones or production systems within a country that are at a risk of feed deficiency or that are endowed with

excess amount of feed relative to the livestock population of that particular area of production system. Hence, identifying and mapping of zones and systems at risk of feed scarcity and those endowed with excess feed is vital for early warning, and to facilitate planning and preparedness for early response to emergencies, as well as informing development along the value chain.

6. Assess and Document Technology Options for Efficient Use of Widely Available Low Quality Roughage Feeds

Natural pastures and crop residues are the major feed resources used for feeding ruminant livestock in the region. However, these feeds contain large quantities of lingo-cellulosic materials and are deficient in protein, energy, minerals and vitamins. In addition, the quality of grazing and browse varies substantially according to the season; and livestock productivity consequently declines, and in some cases lactation ceases, unless supplements are offered. Supplementation with good quality forage legumes, small amount of concentrate and other feed additives or application of other feed quality enhancing technologies can improve the use of low-quality roughages, mainly through the supply of nitrogen to the rumen microbes and improving digestibility.

FAO's PLEWS tool predicts edible vegetation and surface water availability, using data from a GeoEye satellite, excluding values for inedible species, to produce a Forage Condition Index (FCI). PLEWS has enabled decision-makers to mobilise resources to scale up support (through livestock emergency feed rations) to prevent livestock losses and protect development gains in pastoral and agro-pastoral communities in Kenya. In addition, the FCI as a baseline against which other indicators (such as malnutrition, livestock prices and predominant sources of income) can be compared has provided an exceptionally useful insight into the relationship between available feed for livestock, predominant source of income and malnutrition. The potential for this to be used in enabling timely and informed decisions in the future is significant. In Kenya, PLEWS is used in conjunction with a vegetation condition index and monthly data collection to trigger government-led drought responses. It is recommended to scale up the application of PLEWS to all the countries in Eastern Africa alongside the pictorial evaluation tool (PET) and the feed balance calculations. The FCI data and other data regularly collected by NDMA (such as livestock price, grain price, malnutrition and source of income) will help to inform timely, market-based drought interventions.

7. Assess and Map Infrastructure and Enablers

Infrastructure and enablers include feed suppliers, processing facilities, feed storage facilities, feed analytical laboratories, roads, markets, transport, storage facilities, and the security situation. Understanding these is fundamental to influence and guide longer-term development of the sector and informs emergency feed response during

drought events. In Ethiopia, for example, feed suppliers are concentrated within the Addis Ababa-Adama corridor in Oromia (Makkar, 2018), which has implications for pre-positioning and feed supplies in an emergency context. The uneven distribution of feed processing plants limits the pre-positioning of feeds during emergencies and widespread use of compound feeds by livestock producers due to high cost of transport and inadequate roads and infrastructure.

In order to bring suppliers closer to needs, it is important to create an enabling business environment by facilitating access to foreign currency and duty free privilege for purchase of feed processing machinery, equipment and tools across the country, which would help to also modernise the feed industry and facilitate both commercialisation of the sector as well as preparedness for and rapid response to frequent droughts, which create high demand for processed feed to protect livestock assets during emergencies. It is also important to establish feed storage facilities at strategic locations of drought prone areas for temporary storage of feeds destined for emergency response purposes. In addition, the provision of technical services (including establishment of advanced accredited laboratories to support analyses) to the commercial feed sector is paramount to ensure feed quality and safety.

8. Map Actors in Animal Feed and Water Development, Production and Supply

Various actors are involved in the development, production and supply of feed and water. These include farmers, fodder producers, forage seed producers, feed manufacturers, feed aggregators and formulators, commercial transporters, cooperatives, traders, importers, exporters, extension service providers, financial service providers, insurance companies, corporations and public agencies, and development partners.

Output 1.2: Early Warning and Early Action Mechanism Strengthened or Established

Activities

1. Develop/Strengthen Animal Feed Information Systems for Early Warning and Early Action

Real-time data and information on livestock feed in terms of production, processing and marketing would allow producers, traders, and policy-makers to make informed decisions early and chart the next course of action. Successful national feed early warning mechanisms are critical in countries where natural disasters are frequent. In the IGAD region, drought and climate-related events have increasingly become the norm. Given the success of the PLEWS in Kenya, this would be an important tool to expand across the region to facilitate early action linked to early warning, especially alongside the PET and feed balance sheet. The PET is a tool to score livestock body

condition and the availability of grazing biomass, which can also assist in determining the extent of a crisis and informing early warning and early response.

2. Incorporate Livestock and Pastoral Crisis Indicators in the National Emergency Contingency Plan

Possible pastoral crisis indicators include livestock status, market conditions, et cetera – for example, a 25 per cent reduction in the average price of animals due to drought-induced increases in the number of livestock being sold; unusual food price hikes in pastoral areas; and a sudden drop in milk production, which could be a proxy indicator of the immediate impacts on the nutritional status of pastoral populations, particularly children. When the FCI generated by early warning tools like PLEWS or PET is integrated and used in national emergency contingency planning, it enables accurate triggers for early warning and early drought responses. Given the direct relationship between forage availability for livestock and human malnutrition, such planning would assist in reducing the impacts of drought on pastoral livelihoods and communities.

3. Develop Institutional Capacity for Coordinated Emergency Response at Regional and National Levels

National and regional preparedness and response capacity is fundamental to successful livestock emergency action at country and regional levels. Government institutions and other actors responsible for emergency response action should examine their capacity, preparedness plans and institutional readiness to respond to livestock emergencies. The assessment of the readiness and response capacity of the emergency response actors is vital to facilitate advance decision-making on human and financial resources, coordination and communication procedures, and a range of technical and logistical actions. At the regional levels, these assessments would enable the development of a cross-border management tool involving all partners.

Emergencies often occur in remote pastoral and agro-pastoral areas with access restrictions and far away from sources of feed supply. This poses major challenges to the rapid and cost-effective provision of feed supplies. To reduce the time between crisis and response, governments, the private sector and other relevant actors must ensure the storage of critical livestock feeds at strategic locations or along livestock migratory routes. Pre-positioning feeds would support production continuity, reduce feed delivery lead times, cut the cost of transportation and overall contribute to a timely response and safeguard livestock-based livelihoods in times of crisis (Logistics Cluster, 2015). Setting up feed banks/reserves would make feed and fodder available in at-risk areas in a timely manner when crisis hits and even during normal periods, given the shortage of biomass in areas recurrently hit by drought. Governments must assess

livestock feed storage capacity, including examining various storage facilities already in strategic locations and the conditions for their use as feed storage. Successful pre-positioning would also involve vendor agreements that make a provision for access when the need arises, means of transport, and loading and discharge costs.

Output 1.3. Reporting and Communication System Strengthened or Developed

Activities

1. Develop Standard Reporting Format and Communication Templates

The results of the feed security assessment must be communicated in time to allow producers and the private sector to prepare for anticipated shortages. Complete and harmonised communication templates indicating the current and projected feed situation should be provided. The template should also include the date the feed assessment was completed and the validity period of the projection. The reporting template should include the distribution map of feed resources and brief statements on key findings and issues; recommendations for next steps for analysis and decision-making; and indications for response planning.

2. Develop Comprehensive Reporting and Communication Framework/Mechanisms

A comprehensive reporting and communication framework or mechanism is essential for real time information sharing and preparedness for timely response action. Here, it is important to map the location of worst affected areas, show the magnitude of the problem and the demand for intervention, and potential areas for sourcing emergency feed supplies. It is advisable to have a unit responsible for effective and timely communication of emergency situations.

3. Digitise and Digitalise Generation and Access to Information

The generation and access to information should be digitised and digitalised. Digitisation means to convert something into a digital format, and usually refers to encoding of data and documents whereas digitalisation means to convert business processes over to use digital technologies, instead of analogue or offline systems such as paper or whiteboards. In a nutshell, digitisation refers to information, while digitalisation refers to processes. Digitisation is the first step before progressing to digitalisation, which involves leveraging digital technologies. Digitisation increases productivity and efficiency while reducing costs. Digitalisation improves an existing business process or processes but does not change or transform them. That is to say, it takes a process from a human-driven event or series of events to software-driven.

4. Develop MRVs for Animal Feed Early Warning Systems

It is important to develop measurement, reporting and verification systems (MRVs) for animal feed early warning systems. The aim of developing the MRVs is to identify the key factors that need to be standardised to ensure consistency in the way the early warning system is determined and used.

Priority Area 2: Develop Sustainable Animal Feed Supply Chains

This priority area is aligned with Strategic Objectives 2 and 3 of the Eastern Africa Livestock Feed and Feeding Strategy.

Outputs

There will be four outputs under this priority area and they include the following:

Output 2.1: Feed value chains identified and analyzed to inform development intervention.

Output 2.2: Establishment of local feed production supported.

Output 2.3: Feed supply chains strengthened/established and emergency mechanism specified.

Output 2.3: Institutionalization of Livestock Emergency Guidelines and Standards (LEGS) supported for livestock emergency intervention design and implementation.

Output 2.1: Feed Value Chains Identified and Analyzed to Inform Development Intervention

The feed value chain involves the full range of activities required to bring a feed product to livestock, from production to processing and delivery, taking into account the physical, social and economic enabling environment around the value chain.

Activities

1. Undertake Selection and Analysis of Feed Value Chain

Feed value chain analysis is the first step in understanding markets, their relationships, participation of different actors, and the critical constraints that limit the growth of the feed sector (and hence livestock production) and consequently the competitiveness of smallholder farmers or pastoralists. This must also seek to understand variations by gender in access to markets and distribution of risks and gains along different stages of feed value chains of producers; processors (access to processing technologies and information); market agents (access to transportation, safe market spaces, etc.);

and according to the economies of scale (bringing producers together to improve their market position). Traditional marketing channels should be further developed by creating coordinated links among farmers, processors, retailers and others. A balanced approach that takes into accounts both competitiveness and equity issues are paramount.

Depending on the context, the value chain development may have to be restricted to a given area or product (For example, concentrates). A prioritisation process may then be applied to assess value chains of interest on the basis of inefficiencies identified, relevance, and potential for change and impact through well-designed intervention. The selected value chain should be characterised and mapped, based on the predefined objectives and scope of intervention. This involves:

- Defining a value chain's overall size;
- Identifying pathways from source to end-market(s);
- Measuring how costs rise as the product moves along the value chain;
- Considering the market chain's previous and potential development; and
- Identifying the value chain's comparative advantage and areas of potential growth for sales or profitability, as well as its resilience to economic and environmental shocks.

This analysis should also seek to better understand the value chain's governance, economic, social and environmental sustainability, and the incentives and capacities of value chain actors.

A variety of different economic and non-economic tools, including from the livestock sector, can be used according to the scope of the analysis and the data available. A diagnosis should be made of the root problems, leverage points and opportunities for upgrading the targeted value chain.

Value chain development should address the following:

- How to empower poor and vulnerable men and women to produce high-quality, sustainable feed with an identified market destination; for example, by ensuring adequate access to basic production inputs, credit, capacity-building, market-related information;
- How to improve access to markets as a catalyst for rural poverty reduction; for example, by improving business management skills and marketing strategies, ensuring that they have the knowledge and technologies required to meet feed quality and sanitary standards, providing adequate infrastructure; and

- How to ensure that the economic gains in feed value chains are fairly distributed among the various actors, including poor farmers and pastoralists; for example, by reducing marketing distortions, building relationships among various actors, strengthening farmers' organisation and livestock traders' associations.

Major challenges facing value chain development include:

- Insufficient feed processing machinery, equipment and tools, which are currently supplied by just a few companies. Given the demand to modernise the feed industry from an increasingly commercialised livestock subsector, there will be high demand for such equipment.
- Feed safety and quality: weaknesses in or absence of analytical labs for feed quality and safety and the lack of or inadequate regulatory systems for feeds produced locally is a bottleneck to the successful development of the livestock value chain. There is thus a need to establish reliable and decentralised laboratory services.
- Inadequate appropriate feed and enforcement mechanisms: for example, lack of enforcement of proper labelling guidelines that enable customers to assess the quality of feeds. There is no enforcement of the feed industry to mention important quality parameters such as CP and ME on the labels as set out in the feed standards of each country.
- Weakness of research and extension to support the feed industry and feed value chain development, including alternative feed resources as feed supplements.
- In some countries there is no strong national institution that can bring together all actors in the feed sub-sector.

2. Design and Implementation of Feed Supply Chain

Actions should be appropriately sequenced so as to build capacity and address constraints in a logical manner. Project design should also be flexible enough to adapt to changing circumstances. For example:

Establishment and strengthening of feed production cooperatives/feed marketing associations: This involves setting up or strengthening cooperatives and associations engaged in feed production, storage and marketing of the feeds, including focusing on input services, relationships, quality standards, business development services, market information, knowledge (capacity building), equity, competitiveness, communication and transport.

Facilitation of animal feed/private sector investment: Once business opportunities have been identified, information on investment opportunities should be disseminated to

relevant stakeholders, primarily potential investors in the animal feed sector. This could be supported by various actors, including United Nations (UN) agencies, development banks, large non-governmental organisations (NGOs), resource partners, international and national professional associations, governments and regional bodies (For example, IGAD, AU), et cetera, with a particular emphasis on small-scale producers to ensure a more inclusive and equitable approach to sustainable development of the feed sector.

3. Identify and Map Scope for Biomass Collection and Conservation Where Seasonal Excess Exists

The collection and conservation of excess biomass for animal feed is constrained by several technological, institutional, legal, logistical, socio-economic and policy-related challenges. Other challenges include: failure of technology to meet farmers' expectations exacerbated by the lack of participatory and inclusive approaches in technology development and absence of farmer-centred research and extension programmes; limitations in partnership among relevant stakeholders (government, private and farmers), including the lack of long-term commitment by key players; limited access to land for feed production and competition for land between crop and forage production; degree of market orientation; and income of farmers also influence the adoption of improved forage production technologies. Countries should create incentives for improving availability of machineries and tools (for feed production, harvesting, processing, and conservation) and improve the technical capacity and know-how of feed producers. Establishing animal feed producers' cooperatives or associations and improving road network infrastructure and transport will also lead to improved and cost-effective feed distribution. All these actions should be supported by appropriate policy and regulatory framework with the development of a national animal feed policy, strategy and implementation arrangement and an enabling policy environment for private sectors in the feed value chain at scale.

4. Identify Potential Areas for Establishment of Strategic Animal Feed Reserves and Feed/Fodder Banks

During emergencies, the ability of East African countries to provide feed supplies quickly and cost effectively is often a great challenge; a long process of organising logistics and access restrictions in pastoral and agro pastoral areas. Although most countries in the region have strategic grain reserves for providing emergency human food supplies, they do not have a similar reserve for livestock feed/fodder. Given the increasing frequency and severity of drought events in the region and its impact on forage availability for livestock feeding, there is a need for establishment of strategic animal feed reserves and feed/fodder banks in drought prone areas similar to the grain reserve. Strategic feed reserves in good storage facilities will ensure that animals have access to quality feeds when the demand arises. Setting up feed banks/reserves would

make feed and fodder available in at-risk areas in a timely manner when crisis hits and even during normal periods, given the shortage of biomass in areas recurrently hit by drought. The feed banks should be as near as possible to the areas frequently affected by droughts.

To reduce the time taken to respond to livestock feed emergencies, it is important that all responsible actors, including governments, private sector and organisations are able to quickly distribute feed stored in feed banks. Pre-positioning of livestock feed with due consideration of shelf life would support production continuity, reduce feed delivery lead times and cut the cost of transportation, contributing to saving of livestock-based livelihoods in times of emergency. An assessment of the infrastructure and capacities to establish and manage feed banks and to distribute the feed as well as assessment of accessibilities must be undertaken and adequate steps taken to strengthen them.

In order to avoid the transport of bulky roughage feeds from the highland and distant places, countries in the region should identify areas where irrigated forage crops can be produced in the drought prone pastoral areas. The effort should focus towards selection of drought tolerant forage crops with high biomass yield and good quality and species suitable for conservation as hay and storage for the dry season or drought period. The irrigated forage production can be targeted around major river banks or in strategic areas suitable for water harvesting.

Output 2.2: Capacity for Local Feed Production and Marketing Established and Strengthened

Each country should identify and map potential biomass, disaggregated by type of feed resources. Taking advantage of novel and little-used feed resources would also broaden the feed resource base and help alleviate the feed deficiency in the region.

Activities

1. Knowledge and Skill Enhancement of Feed/Fodder Market Actors (Including the Indigenous Feed/Fodder Utilizations)

The knowledge and skills of all feed and fodder market actors regarding the handling, management, quality and safety feed and fodder resources should be enhanced through targeted training and capacity building programmes. The possible actors include farmers, pastoralists, forage and forage seed producers and suppliers, feed manufacturers and distributors, transporters as well as government and development partners' staff involved in emergency livestock feed and water supply in one way or another.

2. Identify and Adopt Viable Best Practices, Innovations and Success Stories from Existing Animal Feed Producers and Processors

There are a number of good practices that could be up- or out-scaled, which could be shared, for example, through an annual animal feed knowledge sharing event and using the existing IGAD-established regional animal feed platform to document lessons and good practices in animal feed interventions. Some good practices include densifying feed; preparing urea-molasses multi-nutrient blocks; formulating total mixed ration; providing urea and molasses and concentrate during dry periods; using lesser-known and locally adapted feed resources. The participation of local communities and key stakeholders should be promoted in the design and mapping of locations for establishing feed banks and densifying units, with the government's local extension system leading the process. Other opportunities for considerations include:

- Promote supplementary feeding of livestock with concentrate feed and improved forages to diversify from dry season feeding strategies that largely depend on grazing pastures and browses. Animals should be given a balanced diet in order to improve the efficiency of feed utilisation. Producers of concentrate feed and commercial forages/forage seeds should thus be identified and mapped, particularly in relation to need.
- Some of the countries in the region have huge land and water resources that could be used to counter the seasonality and severe shortage and high prices of feed ingredients. In countries where there is a potential, it is recommended to promote the production of feed raw materials to supply feed ingredients for commercial feed processing. This could revolutionise livestock production through increased production of compound feeds. In Ethiopia, for example, opportunities exist to produce maize and soya bean for feed production using existing varietal choices and production packages. Surplus animal feed could then be exported to neighbouring countries facing regular animal feed deficits.
- Support local governments to establish fodder/feed banks near places frequently affected by droughts, ensuring the full participation of potential beneficiaries.
- Further develop spate-irrigation for fodder-producing enterprises in river banks and major flood plains. In addition to fodder reserves, spate-irrigated forage once released at the most critical periods could reduce the need for expensive trucking of feed from other areas. Spate-irrigated fodder production provides five times more biomass than natural pasture as shown in Sudan; Afar and Somali Region in Ethiopia; in Somalia, the potential of spate-irrigated fodder production is significant.

- Develop an organised system to secure biomass in a region of excess, for example, grasses to produce hay, densified blocks or pellets, and sugarcane tops and bagasse for preparing densified complete feed blocks. Start with feasibility and feed market studies of target excess biomass regions and develop business model that ensures profitability and sustainability.
- Promote fodder production as a profitable enterprise (as a cash crop) with private sector involvement, including the manufacturing of mechanisation tools such as fodder shredders, fodder balers, silo compressors. Commercialisation of improved forage production has great potential to improve the quality and quantity of forage available to livestock producers and simultaneously to contribute to the employment of youth and women generating valuable income for improved household resilience.
- Support agricultural mechanisation in the country and at local levels through local production of hydraulic presses, forage harvesters, high-throughput balers, and forage choppers. In doing so, stimulate the establishment of commercial units for multi-nutrient block production, forage chopping, forage densification and pre-mix production.
- Develop strategies to efficiently use AIBPs, for example, use of: dryers for increasing shelf-life of brewer's grains, and molasses tanks for storing molasses for use as animal feed, among others.
- Promote the use of urea-molasses multi-nutrient blocks in the rangelands, near water points, especially when the quality of grazing pasture decreases in dry periods.
- Develop low cost feeding troughs and promote their use to decrease feed wastage.
- During extreme drought when pasture is unavailable, use polyethylene glycol (PEG)-containing multi-nutrient block to enhance the use of in-situ browses.
- Develop public-private partnerships with the feed industry and assist the industry in using good manufacturing and good hygiene practices; and promote strategic establishment of animal feed manufacturing plants in feed-deficient regions.
- Harvest and crush Prosopis pods for use in the diets, as ingredient in total mixed ration – total mixed ration to not exceed 50 per cent for cattle and 25 per cent in small ruminant diets.
- Plant thornless cactus species in rehabilitating degraded rangelands, including in the areas where mostly invasive Prosopis species has been uprooted.

- Encourage private sectors in forage seeds production and distribution (include drought- and saline-tolerant varieties).
- Promote agroforestry, focusing on multipurpose trees that are useful as animal feeds.
- Integrate cultivated forage production with soil and water conservation activities.
- Encourage the lease of ideal land for fodder production and provide policy framework supporting the action.

3. Identify and Support Potential Priority Areas for Irrigated Fodder Production and Strategic Areas for Water Harvesting

Irrigation in the countries under consideration is very limited. Most of the few irrigated areas are for production of crops and very little is for fodder production. Even then the irrigation rates in some of the countries are very limited, with most crop production being rainfed. Countries should be encouraged to map out the areas that can be put under the irrigated fodder production. Actions on improving forage seed production and distribution system and coupling it to livestock production need to be undertaken, to enhance availability of improved cultivated forages. However, these efforts must not neglect to conserve and develop drought tolerant local pasture species for example, *Cenchrus ciliaris* and *Eragrostis superba*, among others. Strategic areas for water harvesting should be identified and water harvested used for production of cultivated forages and other crops.

The main constraints to small-scale irrigation include institutional, technical, financial, socio-economic and marketing related issues, including lack of technical know-how on water collection and irrigation technologies and operations, mainly in pastoral settings. Where irrigation is practiced, there are insufficient spare parts and support services to maintain equipment, like motorised pumps. As a result, farmers report frequent breakdowns, which lead to delays in agricultural activities and dissatisfaction with the technologies. Smallholders also lack technical capacity to construct and manage rainwater harvesting infrastructure.

To support and implement appropriate irrigation for fodder production at scale, there is therefore a need to:

- Undertake technical and financial feasibility studies of water collection systems, particularly for micro-irrigation to inform water harvesting and irrigation planning.
- Support clear organisational goal setting and planning for irrigation departments at various levels, as well as structural support to ensure

coordination among institutions working on irrigation development. Overall, inter-sectoral and inter-ministerial collaboration is needed to ensure efficient natural resource management and environmental sustainability.

- Provide adequate on- and/or off-the-job training for small fodder producers on irrigation use and maintenance of equipment.
- Ensure access to credit to allow poor farmers and pastoralists to access irrigation technologies through microfinance institutions; such opportunities should consider credit arrangements and supportive initiatives to enable farmers to access these technologies without collateral or proof of future income.
- Extend and reinforce market and road infrastructure.
- Assign adequate budgets to modernise irrigation schemes where farmers cannot afford to manage these costs themselves. This is especially important where diversion schemes from rivers with large width and deep gorges are too costly for small-scale farmers and pastoralists.
- Support the establishment of producers' or water users' associations, which will have better bargaining power for inputs and prices. In addition, water users' associations can play an important role in managing any potential conflicts over the use of water resources, especially with proper training and adequate support in conflict resolution and negotiation.
- Encourage the lease of ideal land for fodder production through public-private partnership.
 - ◆ Establish rental markets, encouraging the private sector to engage in the sale of spare parts and after-sale services, particularly in water-lifting technologies, would counter price bottlenecks for smallholders.
 - ◆ Support micro, small- and large-scale private sector engagement in feed industry (fodder production and feed processing):
 - ◆ Identify incentive mechanisms to encourage private sector participation (tax, energy, machinery).
 - ◆ Apply affirmative action to encourage private sector actors engaged in feed business. This could include strategic support mechanisms such provision of tax holiday, duty free import of machineries and other feed production inputs for example.

4. Facilitate and Strengthen Market Linkages for Fodder Producers

In Eastern Africa, a number of issues influence the way fodder producers, market actors and supporting markets do business and secure their livelihoods. To reinforce market linkages, countries and the region should:

- Facilitate linkages between fodder producers and input markets through negotiation with seed companies/input dealers, and implementing programmes that strengthen input dealers, especially at local level.
- Link fodder producers to output markets through creating linkages directly to dairy farmers and livestock export traders or traders' agents. For example, establishing a network in cross-border areas and in the region would facilitate a fodder marketing business model that links livestock traders and fodder producers to build trust and transparency.
- Link fodder producers with financial services, for example, through mainstreaming village community banking and village savings and loans within fodder producers' organisations and providing additional training to strengthen their capacity.
- Support fodder producers' groups with other training focusing on good agricultural practices, linking to related projects and awareness campaigns, as well as behaviour change communication mediums such as radio and pictorial-based curricula on the importance of growing pasture for enhanced year-round livestock production and income.
- Connect fodder producers' groups and cooperatives to market information through information and communications technology (ICT) providers, as well as other ongoing projects or programmes that are using ICT to facilitate these linkages.

Building these linkages would help increase the income and strengthen the livelihoods of rural, smallholder fodder producers by improving fodder production and post-harvest handling and enhancing access to buyers willing to pay a premium for quality products.

5. Encourage Development of Alternative Feed Resources

Our capacity to sustainably meet the increasing demand for feed is constrained by several factors, including expansion of cropland, land degradation, extreme weather events, drought and demand for bioenergy. Under these circumstances, it is important to look for alternative and novel feed resources.

Production of insects as food and feed has recently attracted the attention of scientists, feed industry and development workers due to increasing demand for protein for both animals and humans. Insects such as black soldier fly, housefly, locusts, grasshoppers and crickets are being researched and, in some places, used as animal feed. A review by Makkar et al (2014) showed that the protein content of insect meal is comparable to that of soybean meal but slightly lower than fish meal and that the protein content would be higher in defatted insect meal. Insects such as locusts recently (2019-2021)

caused a huge damage to crops and grasslands in the Horn of Africa. Their harvesting and use as animal feed would have a double advantage of enhancing feed availability while at the same time contributing to the control of the locusts. However, more work is needed for establishing systems for safe and cost-effective rearing, processing and using insects as animal feed. Furthermore, there is a need for developing regulatory framework and legislation for safe and effective use of insects as animal feed.

Recently, several other novel resources have been explored as animal feed. Some examples include: use of single cell protein, algae, spineless cactus, by-products of the biofuel industry, prosopis and acacia pods, and vegetable and fruit wastes, especially from the wholesale market as animal feed. Their widespread use would also decrease food-feed competition in the region. Use of appropriate dual-purpose food-feed crops (For example, cassava, sweet potato, maize, sorghum et cetera) in the region would also contribute to both food and feed availability.

6. Promote Local Production of Vitamin Mineral Premixes

When the diet of animals is mainly based on low quality dry pastures and crop residues, deficiency of vitamins and minerals are likely to develop. In most Eastern African countries, vitamin and mineral pre-mixes are largely imported, which makes them expensive, besides, the quality may not be assured. Creating an enabling environment to encourage local entrepreneurs or to attract foreign investors to engage in local production of quality premixes will overcome these constraints. In addition, the import substitution will result in higher availability of hard currency for national economic growth. Deficiency of these nutrients, even if protein and energy requirement are met, is known to decrease livestock production and adversely affect animal health. Local production of quality vitamin and mineral mixes will help increase livestock productivity and income of farmers, and contribute towards decreasing environmental problems associated with inefficient use of protein and energy sources in the animal body and their excess excretion in absence of vitamins and minerals.

7. Develop and Promote Drought Feeding Strategies

The use of multi-nutrient blocks in the rangelands enhances the nutrient availability from low-quality grazing biomass, especially during droughts. During droughts, the only biomass available on the rangelands is the browse species, which remain green despite scarcity of water. However, these are not normally consumed by livestock due to high levels of tannins (polyphenolics) concentration. These polyphenols can be inactivated by an inert compound, polyethylene glycol (PEG) – also termed as browse plus. A number of studies have shown increases in the utilisation of browses, leading to increased livestock productivity when PEG was given to animals. The context-specific development of PEG-based feeding strategies and their application during droughts

will enable the use of biomass in the form of browses available *in situ*, preventing or decreasing the transport of bulky and costly feeds from outside to the drought-affected areas. Use of such browse enhancers could possibly be exploited for making efficient use of Acacia and Prosopis leaves as animal feed. Salt-rich browses such as Atriplex also survive in droughts. Consumption of such salty bushes along with cladodes of cactus (another drought tolerant plant) by animals could also save them during droughts. Cactus is a drought tolerant plant adapted to arid and semi-arid areas. It is a very valuable feed resource particularly during drought or prolonged dry season. It produces high biomass yield with acceptable palatability to animals. It can remain succulent during drought or long dry seasons and could be a source of ample water for animals.

8. Enhance Feed Availability Through Reduction in Feed Wastage

Studies conducted recently in Kenya, Uganda, Sudan and Somalia have demonstrated a huge wastage and loss of feed resources. Some of the reasons for these losses are improper storage, burning in the field, improper harvesting and feeding practices, among others. The losses can be reduced by taking appropriate measures such as use of feeding troughs, chopped fodder and total mixed ration; prevention of crop residue burning; and storage of feeds under roof cover, among others. Wastage of agro-industrial by-products could take place because of fungal infestation due to improper storage conditions. Mycotoxins produced by fungus decrease animal intake, cause impaired animal immunity and reduced reproductive efficiency, decrease animal productivity and also make animal products unsafe for human consumption. A typical example is the presence of aflatoxin M1 (a metabolite of aflatoxin B1 present in feed) in milk, which is carcinogenic. High fungal-infestation of feeds such as agro-industrial by-products and silage leads to their rejection and elimination, having negative environmental and economic impacts. There are substantial losses in wholesale vegetable and fruit markets. Some of these can be converted to animal feed through silage and block making, as examples.

Output 2.3: Feed Supply Chains Established and Emergency Mechanism Specified

In times of drought induced feed crisis, a number of preparations and interventions are required to establish emergency feed and forage supply chains at country, region and county levels depending on the level of emergency and complexity.

Activities

1. Make Use of Available Guidelines for Feed Supplementation

This involves identifying and using existing fodder banks (and identifying new ones),

as well as producing feeding blocks and densified feeds. To minimise the time lost in procuring and transporting feed across long distances during a crisis, feed densification and processing should be promoted alongside setting up of feed and fodder banks in or near crisis-prone areas, enabling a supply of feed in the shortest possible time. Given that biomass shortages are common in drought-prone areas even during normal periods, the feed reserves in fodder banks would be available on demand at all times. Densified straw-based complete feed rations or compacted hay could be prepared (FAO 2007, 2011b, 2012) in seasons of biomass availability and transported to the fodder banks.

Urea molasses multi-nutrient blocks should be prepared and stored well in advance to be distributed as supplementary feed during droughts. There are a number of useful documents available on animal feed processing, as well as guidelines on feed and forage supplementation (Thorpe and Duncan, 2012, and Negash, 2017), including FAO's Manual for Good Practices for the Feed Industry to implement the Codex Alimentarius Code of Practice on good animal feeding and the Livestock Emergency Guidelines and Standards (LEGS, 2023). Each country should customize the guidelines to their local contexts and develop a national guideline to guide emergency feed supply and feeding management to drought affected livestock herds. Support should also be provided to local research organizations to adapt established feeding technologies to local conditions using locally available resources.

2. Organise Regular Stakeholders' Consultations and Collaboration Platform to Define Roles and Responsibilities in the Feed Supply Chain Management

This involves identifying and building trust among all stakeholders (including government, private sector, communities and other actors in the sector) to ensure their ownership of the initiative. The stakeholders include government Ministries responsible for livestock development, feed manufacturers and producers' organisations, private laboratories and others. These stakeholders could establish a joint platform to discuss the state of the feed value chain and the feed industry and identify interventions to address constraints, such as the raw material supply chain, feed laboratories for quality control and implementation of feed regulations, establishment of feed manufacturers' registration, licensing and enforcement of good manufacturing practices (ABS TCM, 2013).

3. Procurement and Distribution of Feed Aid

A flexible and fast track procedure should be formulated to hasten the process of procuring and distributing animal feeds to protect livestock assets of the poor during crises. Under current circumstances, the average time from purchase requisition to

purchase order is 30 days. If a re-delegation is requested, procurement lead time could take from 45–50 days. Field delivery takes from 1–4 weeks. It is, therefore, recommended that procurement process is initiated as early as possible once emergency is declared. The purchase requisition and purchase order should provide a clear and unequivocal description of the specifications of the types and quality standards of the feed items to be ordered.

4. Pre-Purchase and Post-Distribution Assessment of Emergency Feed

Experiences show that some feed suppliers take advantage of the emergency situation and supply sub-standard feeds. Thus, there should be a mechanism for checking the safety and quality of the feed supplied. Inspection of feed quality and safety is often conducted by taking representative samples from the feed and making appropriate tests depending upon the nature of the feed. It is important to check the feed during receiving, paying particular attention to important physical attributes such as colour, texture, odour, moisture content and presence of foreign materials. If the situation allows, it is also recommended to take samples and get analysed in a laboratory. Laboratory tests are important tools for assessing and controlling feed quality. Depending on the condition and the nature of the feed intended to be distributed, the feed should be checked for possible content of aflatoxin or other toxic substances that may harm the target animals.

The post-distribution assessment should examine the timeliness of the feeds distributed, the regime given, palatability of the feed and forage supplied, the quantity of waste generated, the quality of the feed and forage received, the cost of distribution of the feed to beneficiaries, et cetera. This should be done at the right time and at local level to ascertain the effectiveness and benefit–cost of the intervention and document lessons learned to enhance future interventions.

Output 2.4: Support Institutionalization of Livestock Emergency Guidelines and Standards (LEGS) in the Livestock Emergency Interventions Design and Implementation

Activities

1. Access to Water for Livestock and Livestock Feeding

Water and feed are the two critical determinants of livestock survival in dry areas and during droughts. The distribution and type of water points and watering schedules are major determinants of range use. In the region, pastoralists and their livestock have remained mobile, largely dictated by water and feed availability. Traditional practices have often involved unrestricted livestock access to rivers and seasonal surface water ponds, pans and dams used to provide water and feed within reach of these water

resources. However, unrestricted stock access causes disturbance and pollution, resulting in environmental degradation and loss of productivity. Alternative outlets along the canals can restore river and ensure clean water for livestock. Water points for livestock are key sites or locations for delivering livestock extension services, such as vaccination, treatments, marketing points or defining trade routes.

They have also been used to regulate the density of livestock grazing in a particular time; a strategy for managing rangelands and pasture by evenly distributing livestock across pastures and rangelands. Any water development project should, thus, consider drought-proofing of communities and pre-positioning watering facilities within particularly vulnerable areas, for example, along or near livestock migration routes, near markets, et cetera.

This Plan of Action proposes that countries in the region promote the use of PEG (a tannin-binding agent), which can be added to water or blocks to enhance the use of unconventional feed resources such as *Prosopis* and *Acacia* pods, and browses. This is important, as during drought the quality of range feeds reduces significantly. In addition, multi-nutrient blocks can be supplemented in the rangelands near water points, especially when the quality of grazing pasture decreases. Livestock watering points can be established along canals, with careful monitoring of the salinity. Dry pastures and high protein supplementary feed may reduce the salinity tolerance of the animal due to the lower moisture content of the feed and higher salt content (Ayers and Westcot, 1985). In terms of water requirements, for example, about 50 litres of water are required for each TLU (Peden *et al.*, 2003). The calculated requirement of water for all Ethiopian livestock (camels, cattle, sheep and goats) was 4.2 billion litres of water each day. During droughts, as a complement to feeds/seeds, water could be distributed using bladder water tanks on trucks (For example, in Somalia) or specialised water- transport trucks in areas with critical water deficiencies.

2. Animal Health Services and Livestock Feeding

A major challenge in pastoral areas is limited animal health services and extension advice, including inadequate supplies and quality of veterinary vaccines and drugs, and poor-quality control of these. Efforts to strengthen animal health services in rural areas need to take into account alternative service providers such as community-based animal health workers, private sector actors and livestock value chains, while the regulatory role is played by relevant government authorities for animal resources.

In emergency contexts, animal health services must take into consideration livestock body conditions. Key animal health activities should include internal and external parasite control, while others such as emergency vaccination should be carefully considered at the peak of animal feed and water deficiencies when livestock body

condition is poor, and are probably better implemented at the recovery stage. If such assistance is combined with animal identification and recording systems (FAO, 2016b), it would assist in distinguishing the vaccination status of herds or individual animals as well as monitoring the impacts of animal health interventions and feed supplementation on the performance of the herds/flocks. For example, there is sufficient evidence that good nutrition mitigates secondary bacterial infection, hence decreasing the need for animal health services, and enhances the efficacy of clinical approaches including vaccination (Makkar, 2016).

3. Cash Injections in the Target Area/Cash-for-Work and Livestock Feeding Interventions

Various humanitarian and development actors, including FAO, have cash and voucher programs (FAO, 2016c) that benefit smallholders affected by natural hazards, market volatility, conflicts and protracted crises. These play a critical role in response to crises when smallholders can no longer purchase food, agricultural inputs or livestock because their assets have been damaged or depleted. They include cash-for-work and voucher schemes that enable affected people to identify for themselves what their most pressing needs are and decide which goods and services they wish to purchase in local markets. Such interventions provide relief to farmers, while also helping them to protect their livelihoods from future shocks, overcome cash shortages and improve their food security and nutrition. They can be used to distribute animal feed, as well as to promote labour-intensive activities, such as spate irrigation for pastures and forages, clearing invasive species from irrigation canals and rangelands, rehabilitating water points, et cetera.

4. Commercial Destocking

Destocking during drought has the advantage that livestock keepers receive cash/ food from the sale or slaughter of destocked animals that would otherwise require continued feeding, management, and veterinary medicines, or might die from nutritional stress or disease. Impact assessments show that where animals are sold for cash in times of drought, most cash is used within the local economy to purchase food and protect remaining livestock through the purchase of veterinary medicines and fodder, and by transporting shock-affected animals out of the affected area. This reduces the demand for fodder or grazing of the remaining herd, which may result in improved rates of survival of core breeding livestock. Commercial destocking forges links between pastoral communities and livestock traders. When destocking is commercial, fewer external inputs are required, making this a cost-effective and sustainable option, and traders may become involved in purchasing and positioning fodder at buying sites, which is beneficial in the longer term. To consider destocking as

an option, the availability of fodder or closure of a market should be assessed, among other information, including the availability and purchase price of different types of feed (fodder, concentrates and by-products); the projected increase in feed prices, based on the result of previous shocks; current accessible markets and the associated costs of moving the livestock to the markets; and market prices for different livestock species and types.

Priority Area 3: Identify Status of Rangelands and Grazing Areas and Disseminate Best Management Practices

This priority area is aligned with the Regional Rangeland Management Strategic Framework for Arid and Semi-Arid Lands and in the IGAD Region.

Outputs

Output 3.1: Status of rangeland and grazing areas determined.

Output 3.2: Evidence-based best practices on rangeland and grazing management disseminated and adopted.

Output 3.3: Improve governance and management of rangelands.

Output 3.1: Status of Rangeland and Grazing Areas Determined

Activities

1. Mapping Out the Key Ecological Rangeland Resources of the Region

Efforts should be made to map the key ecological rangeland resources of the Eastern Africa region through the use of earth observatory tools (satellite maps). The mapping should indicate distribution of water resources, minerals, livestock population, trade and grazing migratory routes. It should also indicate the different ecological zoning in the rangeland such as the locations of wildlife, marine, livestock, and mining. It is important to identify and prioritise potential interventions in key strategic rangeland potentials through private, public and or PPP investments and management modalities

2. Collect Information on Current Range Condition in Rangeland and Grazing Areas

Range condition is used as a guide to ensure sustainable rangeland use, determine rangeland carrying capacity and adjust stocking rates, as well as identify potential responses to rangeland improvement programs. On the other hand, the rangeland trend refers to the change in the status of rangeland resources at a site detected by

monitoring and is usually expressed as improving, declining or stable. Understanding the responses of vegetation to different biotic and abiotic factors is crucial to facilitating the management of arid and semi-arid rangeland ecosystems for both biological conservation and sustainable use. Proper rangeland management is the manipulation of rangeland components to obtain optimum goods and services on a sustainable basis through protecting and enhancing the soil and vegetation complex in a given rangeland ecosystem (Holechek et al. 2005). Therefore, a thorough knowledge of the status, trend, and future dynamics of rangeland ecosystems is essential for a better understanding of rangeland management problems or to overcome degradation or deterioration of rangelands.

Overall, there is a general consensus that the rangelands in the region are denuded due to overgrazing. The latter is severe where water is available whereas areas without access to water are often under grazed. Water points often lead to mushrooming of settlements that cause disruption of grazing patterns and livestock migratory routes. The traditional grazing pattern is based on livelihood zoning, where the lowlands and riverine areas are used for cattle and shoats grazing whereas the bush lands/hinterland plateau are used by browsing camels and shoats. Because of increasing population pressure, encroachment of rangelands by settlements and agro-farmers, disorientation of the traditional grazing patterns and livestock migratory routes are becoming increasingly common. Water scarcity is a major problem and the available water is often hard or saline. Invasion of the rangelands by invasive plant species such as *Prosopis juliflora* and *Lantana camara* is rendering large parts of the rangelands difficult to use for livestock grazing. In addition, resource-based conflicts (water and pasture-based conflicts) are also common problems.

Rangeland degradation/deterioration refers to soil and vegetation and is generally defined as the reduction of the economic or biological productivity of the land. Loss of plant cover, undesirable change in herbaceous species composition (For example, annual grasses replacing perennials), soil erosion associated with intensification of grazing and bush encroachment have been dominant features in the rangelands of IGAD countries, which have different implications for pastoral productivity. Rangeland degradation is not a spatially uniform process; there are substantial off-site effects. Some landscapes are more prone to degradation than others because they have erodible soils and palatable species, which attract more grazing activity or both. In general, degraded rangelands are characterised by reduced biological and economic productivity associated with improper or unsustainable land uses.

The major factors that cause rangeland degradation include climate change and variability, fire ban (For example, Ethiopia), decline of traditional resource managements practices, inappropriate rangeland management, land-use change (encroachment

of cultivation), overexploitation, inappropriate extension service, privatisation and/or sedentarisation, encroachment by native and invasive species, population pressure, government policies, governance systems, and institutions (Fentahun et al. 2018; Harris, 2010; Roselle et al. 2011).

Several techniques are available for assessing the level of rangeland degradation. A combination of satellite imagery and grazing pressures assessment is advocated (Prasad and Andersen, 2010). Scientific knowledge when supported by experiences of indigenous communities (Behmanesh *et al.*, 2016) would provide the facts, especially when the rangeland situation is assessed with the following indicators: the rate of decrease of vegetation yield, loss of phyto-diversity, removal of palatable plants, increase in poisonous plants, emergence of invasive species, decrease of shrubs, increase in annual plants, decrease of ground cover, increase in the distance between plants, soil salination, loss of litter mass, soil muddiness, decrease of plants height, decrease of soil sandiness, decrease of soil infiltration, increase in soil looseness, increased risk of wildfires, increased risk of pest damage. Data and information sharing mechanisms need to be designed and operationalised so that delivery institutions can access reliable data and information when designing interventions.

3. Assess Agro-Ecological Zones for Restoration and Rehabilitation of Rangelands

Before any restoration or rehabilitation, agro-ecological zones and production areas in which the rangeland restoration is to be conducted must be identified. It is important to assess limitations associated with land tenure and access for grazing, which may have affected stocking rates (spatial and temporal) with negative impact on rangelands' rehabilitation and sustainability of the system. The following are critical interventions, depending on the situation of the rangelands and grasslands.

Manage, restore or rehabilitate degraded rangelands by targeting the underlying causes of degradation:

- Prevent rangeland degradation and enhance productivity through comprehensive rangeland management techniques (for areas that have not yet degraded or are in fair condition).
- Reseed or allow the progression of natural regeneration.
- Undertake soil and water conservation measures. Implement water harvesting techniques.
- Introduce appropriate rangeland management laws.
- Monitor rangelands so that timely and appropriate measures could be taken.

- Restore degraded habitats by ceasing activities that are causing degradation (where the damage is not severe) or use biotic manipulation such as reintroduction of animal or plant species that have been eradicated from an area (where the damage is too great).
- Collect and document evidence-based good practices.

Re-vegetate degraded rangeland in areas where prolonged heavy grazing pressures combined with recurrent drought have changed the rangeland to bare soil. In such extremely degraded rangelands, reseedling is mandatory (Musimba *et al.*, 2004; Van den Berg and Kellner, 2005; Opiyo *et al.*, 2011). Reseeding of Rhodes grass (*Chloris gayana*) with simple tillage and manure application has been successful. Reseeding involves collecting seeds from existing grasses and then sowing them on bare ground. The reseedling approach would involve ground preparation using fertilisers and ongoing nurturing, as well as encouraging pastoralists to collect enough seeds in the growing season to sow the land when needed. Use native grasses when re-vegetating degraded grasslands (Oba and Kotile, 2001).

Prescribed fire can rehabilitate degraded rangelands. For example, plots burned at Dida Hara pastoral association of Borana rangeland, Southern Ethiopia in 2005 demonstrated that the cover of highly valued grass (*Themeda tiandra*) increased from 18 to 40 per cent of the basal cover and the amount of bare ground was accordingly reduced after burning (Gebru *et al.*, 2007). Pastoralists traditionally use fire to control the expansion of bush cover and ticks, to improve pasture quality, and to facilitate livestock movement.

Bush encroachment control (through a combination of rangeland management, mechanical, biological and chemical methods) disrupts the invasive woody plant community structure through transformations of biotic environments and habitat conditions in which colonisation of the disturbed microhabitat takes place (Lesoli *et al.*, 2010 and Belachew and Tessema, 2015). In doing so, a suitable habitat can be created for grazers as herbaceous vegetation increases with reduction of woody species. Collecting and grinding the seeds or pods of *Prosopis juliflora*, one of the notorious invasive plant species in Eastern Africa, and using as a component of animal feed could also contribute to the control of further spread of the species.

Rangeland enclosures have been successfully tested in restoring degraded rangelands, whereby grazing is excluded for a specified period of time. For example, enclosures in Ethiopia restored degraded rangeland but needed defined users, resource boundaries and realistic bylaws or rules (Mohammed *et al.*, 2016). Long-term enclosures can also lead to proliferation of bush encroachment compared to regularly grazed rangelands.

Moreover, individual enclosures lead to privatisation of communal rangelands and could pose a problem in a system which works on reciprocity and sharing of grazing resources, triggering conflict over grazing and water resources and boundary claims among different pastoral communities or resource user groups. A combined scientific and indigenous knowledge in managing rangeland enclosures would prevent unintended results. There is a need to strengthen and empower the customary institutions to tap into their rich indigenous knowledge and governance systems in regulating access to- and use of communal resources; and as a mechanism of resolving conflict over rangeland resources.

Grazing management involves maintenance of livestock numbers with available forage supply, uniform distribution of animals within the range, vegetation maintenance through alternating periods of grazing and rest, and use the most suitable kinds of livestock. Therefore, promote grazing management as a best practice to sustain productivity and health of rangelands through reducing stock numbers and controlled grazing to lower grazing pressure in order to facilitate rehabilitation. Controlled grazing management is beneficial in conditions of poor vegetation cover, overgrazed and degraded soils and is the most promising sustainable land management practice to restore degraded rangelands, enhance the vigour of mature perennial grasses, and improve the functioning of hydrological systems in drylands, contributing to the protection and restoration of biodiversity (Woodfine, 2009).

4. Apply Practices that Increase Access to Water for Livestock

Water and feed are the two critical determinants that ensure survival of livestock in dry areas and during droughts. The distribution and type of water points and watering schedules are major determinants of range use. In the region, pastoralists and their livestock have been kept in mobility, which is dictated largely by water and feed availability. Strategies, approaches, and methods for sustainable use of water resources that keep a balance among natural resources need development and application are required. Adequate availability of clean drinking water to animals is a requisite for enhancing the efficiency of use of feed resources, increasing livestock productivity and maintaining animal health. Besides, pastoralists often share water with their livestock and vice versa. Hence, any projects to supply livestock water should also have provision for humans to access safe water. Joint working of the agriculture/livestock and irrigation ministries to increase availability of water, including clean drinking water for livestock would be highly fruitful. Rehabilitation of deep-water wells in dry season grazing areas and implementation of the traditional watering schedule of livestock would be important in improving availability of water and proper use of the available water. In addition, national irrigation master plans should give due importance to clean water availability for livestock.

Output 3.2 Evidence-Based Best Practices on Rangeland and Grazing Management Adopted and Disseminated

Activities

1. Scale Up Good Practices for Pasture Restoration and Improved Grazing Management

Strategies could include climate smart technologies and use of watershed approaches (early maturing, drought and pest tolerant forage species), in situ rain water harvesting (half-moon structures, aquifer protection, contours pans, gully protection) and irrigation, solar powered irrigation systems, reseeding, over-sowing, fertilisation, rotational grazing, grass and legumes enrichment. Guidelines on how to manage grasslands and rangelands are available, as are key considerations and best practices on: (i) grassland development, improvement and rehabilitation; (ii) pasture development methods; (iii) herd management; and (iv) social, economic and environmental factors. The following recommendations are based on consultations with stakeholders in the region:

- Community-based Participatory rangeland management and controlled grazing patterns and migratory routes for different seasons.
- Community-owned and managed rangeland conservancies – wildlife, watersheds, and grazing fields.
- Protection of strategic water and rangeland reserves – through enacting of laws, bylaws, policies and other regulatory mechanisms.
- Plant thornless cactus as part of rangeland rehabilitation (including in areas where Prosopis is being uprooted) and develop local businesses around this because of its multiple uses.
- Through fodder producers and cooperatives, facilitate fodder production in the identified sites including sites from where Prosopis bushes have been cleared; use Prosopis and acacia pods and leaves as animal feed by applying browse-enhancers; and use Prosopis-pod crushing machines to disintegrate the pods before using as animal feed.
- Use browse-enhancers to efficiently use in situ browse biomass available during droughts.
- Map specific area-size and intensity/volume of the flood for potential irrigation in a spate irrigation system to be devoted for fodder production; establish spate irrigation to facilitate fodder production by cooperatives and commercial entities and make provision for livestock water outlets along canals; support production of cultivated fodder through spate irrigation and

around perennial rivers, and transport after chopping, drying and baling to reduce bulk and thus transport costs.

- Map areas along the river most suitable for production of improved forage crops, and support communities in planting and managing upgraded fodder production (alfalfa, Sudan grass, green panic grass, Rhodes grass et cetera).
- Within the developed schemes, promote agroforestry with the introduction of dual-purpose crops, legumes, horticulture, dates, fruit trees and nuts within and between fodder production to enhance income from cash crops, food security and dietary diversification; and support integrated fodder production with soil and water conservation (terracing, soil bunds, check dams).
- Where physical infrastructures cannot be developed for forage/feed storage, identify potential retreat areas where the growth of pasture under natural condition will allow the conservation of fodder in situ for use during short or extended dry spells.
- Through community consultations, design and implement sustainable community-based management systems for fodder production, conservation and sustainable use in the enclosed potential retreat/contingency areas; and build capacity of the communities in these operations.
- Support the establishment of pastoralist grazing cooperatives and community groups to manage community contingency grazing, fodder production and use in the conserved areas.
- Map blocks of land for rangeland rehabilitation (preferably using dry grazing areas and along traditional stock routes) with legumes and grasses.
- Promote best traditional practices for managing grazing lands focusing on productivity improvement and halting degradation.
- Where possible, use best local varieties for reseeded and production of high biomass on degraded rangelands.

2. Scale Up Drought-Tolerant Grass and Legume Varieties for Feed Production

Drought-tolerance is an inheritable trait and some varieties of grasses and legumes are drought-tolerant (For example, white clover, *Festuca spp.*) and can be used to improve the productivity of rangelands and fodder production. There are a number of efforts by governments, partners and communities to improve rangelands and fodder production; for example, in Mandera and Dollo, Somalia communities are producing fodder for commercial purposes. These initiatives need to be scaled up

into a sustainable and business model. The pastoral and agro-pastoral areas would benefit from the introduction of drought tolerant forage species and from improved understanding of the available browse species.

Output 3.3 Improve Governance and Management of Rangelands

Activities

1. Map Existing Governance Structures and Identify their Challenges and Gaps

Most pastoralists manage their rangelands communally, benefiting from greater flexibility and seasonal access to resources. Inadequate knowledge and understanding of local governance structures and their role in the (mis)management and use of rangeland resources, however, has prevented evidence-based technical, institutional and policy support to the pastoral system. Good governance at community, state, and international levels is needed not only to prevent degradation of rangelands but also to reverse the degradation and ensure sustainability of the ecosystem. For this, systematic mapping of existing governance structures is needed, identifying bottlenecks and gaps to be addressed. This must take into account the traditional role of customary institutions in the management of range and water resources, the unique features of rangelands, issue of scale, ecological disequilibrium and seasonality, et cetera.

2. Incorporate Lessons Learnt into Good Governance

Lessons learnt and best practices, when contextualised and shared, can support a significant change in rangeland governance (see Herrera *et al.*, 2014 for some lessons), including:

- Strengthen participatory methods for community-based natural resources management.
- Protect transhumance mobility corridors.
- Rebuild pastoral governance (invest in human, social and political capital).

Strengthen pastoral governance (compile basic information, recover ancestral knowledge, update traditional systems, recognise and respect the role of customary institutions, empower women, enhance social cohesion and grassroots organisations among pastoralists, develop bylaws based on traditional rules and regulations, approve specific pastoralist laws, build on pastoralist professionalism, improve image of pastoralists, support collaborative perspectives of rangeland management, promote multiple functions of rangelands, preserve pastoral heritage and properties, et cetera).

3. Establish or Reinforce Management Structures (Water User Associations, Communal Grazing Committees)

In Ethiopia, most pastoral communities used to allocate livestock water points to different clans, and used to observe clearly defined livestock mobility between wet and dry season grazing areas. This system of resource management was followed for generations in order to exploit and forage and water resources in different landscapes. The customary institutions used to check and manage natural resources and resolve resource use conflicts among communities. However, the weakening of such indigenous institutions has been blamed for land use changes, serious overgrazing and land degradation. Sustainable development of (agro)pastoralist-managed rangeland systems in Eastern Africa requires empowering the customary institutions, where applicable, to play their traditional regulatory roles and the establishment of legally-recognised cooperatives or users' associations capable of sustainably managing, operating and maintaining grazing areas in a democratic manner and to the satisfaction of users (Lempériere *et al.*, 2014). A number of such committees exist in the region. Strengthening their capacity and linking to a national support structure is key to reinforce and spread their mandate at community level.

Priority Area 4: Strengthen Enabling Environment for Feed Production and Marketing in the Region

This priority area is aligned with Strategic Objective 4 of the Eastern Africa Livestock Feed and Feeding Strategy.

Outputs

Output 4.1: Policy, institutional, strategic frameworks and standards and quality control system supported.

Output 4.2: Capacity for feed production, processing and marketing infrastructure and information system strengthened.

Output 4.1: Policy, Institutional, Strategic Frameworks and Standards and Quality Control System Supported

Activities

1. Assess Existing Mechanisms for Quality and Safety Control and Propose Improvements

Quality and safety control for animal feeds is crucial to ensure they meet international standards. Knowledge of the infrastructure and human skills available in-country,

including at subnational levels, is needed to guide improvements to enforce these quality and safety standards. FAO has published a number of guidelines (de Jonge and Jackson, 2013) on animal feeds quality control to support these activities. Thus, countries must strengthen their human and institutional capacity for undertaking feed quality and safety assessment and control measures. These include strengthening the knowledge, skill and competence of animal feed analysis laboratory personnel, equipping the labs with the necessary equipment and ensure timely procurement of chemicals, reagents and other supplies needed for reliable and timely analysis of feeds.

2. Develop Harmonised Regional Feed Quality and Safety Standards' Certification Procedures

Countries in the region must align their practices to existing protocols on transhumance and identify gaps in their compliance with international standards, such as the sanitary and phytosanitary standards, toxicity norms, and Codex Alimentarius for feed safety and quality requirements. The Code of Practice for Good Animal Feeding approved by the Joint FAO/World Health Organisation Codex Alimentarius Commission must be followed. Given the direct links between animal feed and the safety of foods of animal origin, feed production and manufacture must be considered an integral part of the food production chain. Like food production, feed production must be subject to the quality assurance of integrated food safety systems. The FAO/International Feed Industry Federation (IFIF) Manual on Good Practices for the Feed Industry (FAO and IFIF, 2010) assists producers and all stakeholders along the production and distribution chain to apply the Codex Alimentarius Code of Practice on Good Animal Feeding.

The FAO manual on quality assurance for animal feed analysis laboratories provides a comprehensive account of good laboratory practices, quality assurance procedures and examples of standard operating procedures. The adoption of these practices and procedures will assist national laboratories to acquire the recognition of competence required for certification or accreditation, and enhance the quality of data reported by feed analysis laboratories. In addition, ensuring good laboratory practices will enhance the safety of laboratory workers, protect the environment from laboratory-discharged pollutants and increase the efficiency of laboratories. There is therefore a need to harmonise official certifications for feed quality in compliance with international standards in Eastern Africa and at local levels. Similarly forage seed quality standards and certification procedures should be developed by the member states and harmonised among the countries in the region.

3. Support National Institutional Building and Policy Development

Factors that contribute to low levels of adoption of new technologies include the failure

of the technology to meet producers' expectations, a lack of participatory approaches in technology development and absence of producer-centred research and extension programmes, limited partnership among stakeholders (government, private and farmers), and lack of long-term commitment of key players. On the other hand, key factors that influenced the adoption, for example, of improved forage production technologies have been availability of land, land tenure system, degree of market orientation, and income of producers.

Enabling policy and institutional arrangements are critical to ensure a sustainable feed sector. For the National Feed Inventory and Balance to be conducted annually, there should be an identified institution (Makkar, 2018) that leads this work. The inventory and balance require data to be collected on annual crop production (all seasons), animal numbers and herd structures – originating from the lower administrative level across the country. In Ethiopia, data is collected at *woreda* (district) level (equivalent of a district) and fed into zonal level, then collated and transmitted to the regional institution. This then feeds into the national feed inventory and balance by a designated institution or feed directorate (in a line ministry). For Kenya, sub-counties collect similar data to be collated at county level to be then passed on to the designated institution for updating the national feed inventory and balance.

Evidence-based animal feed policy-making requires a review of the agriculture and livestock sector policies and analysis of constraints and opportunities facing the animal feed industry, including benefit–cost of such policies on the national economy, natural resources and the environment.

Formulated policies should promote the participation of the private sector, provide a conducive environment for good manufacturing practice and quality control, promote and stimulate a competitive animal feeds industry, provide a conducive fiscal and regulatory basis for the growth of the industry and put in place a suitable institutional framework and infrastructure for delivery of support services.

The animal feed policy should reflect the key priorities and specificities of a country, including, stimulating increased feed production, ensure quality animal feeds on the market, reduce production costs and build capacity among private and public sector actors for the development of the animal feeds industry.

Challenges related to socio-economic, policy and regulatory framework include *lack of national animal feed policy, strategy and implementation arrangements*, and *lack of enabling policy environment for private sectors in the feed value chain at scale*. Despite the good natural resource base, favourable conditions and availability of ingredients for animal feeds, East African countries lack animal feed policies and strategies. Such policies would stimulate increased feed production, ensuring quality animal feeds on the

market, reducing production costs and building capacity among the private and public sector for the development of the animal feed industry. Strategies to achieve these objectives must take into account relevant national issues such as decentralisation, private sector participation, gender and protection of the environment (Makkar and Ankers, 2014).

The policy formulated should increase animal feed production through strengthening research, providing credit to the industry, promoting greater production of raw materials, encouraging the transfer of appropriate technologies and formation of associations (of farmers, pastoralists, and feed producers and manufacturers) and developing rural infrastructure to increase access to raw materials. Critical issues such as formulation of standards, rules and regulations to govern the industry as well as establishment of an institutional and legal framework to enforce these provisions could be included. Ultimately, the policy should facilitate a developed animal feed industry that contributes to improved animal production and productivity, thus improving the welfare of citizens and the national economy. Enabling policies are critical to facilitate the involvement of the private sector, which could fill the feed gap, especially in areas of processing (compound feeds, bales and feed blocks) and fodder seed production. These could include tax relief for importing appropriate machines, mobility of feeds from excess to deficit areas and cross-border, et cetera.

4. Establish or Strengthen a Regional Pastoral Unions/Federation and Associations or Cooperatives

Pastoral associations and unions can provide an effective means to manage and use animal feeds and other natural resources. They can be key players, alongside other pre-existing traditional institutions, in transforming the livestock and animal feeds industry in the pastoral system. In addition, they can work to justify forms of territorial anchorage and identity claims of pastoral territories, and compensate for the disengagement of the state from their socio-economic issues. In doing so, pastoral associations and unions can protect their communal resources through their increased bargaining power to counter new access systems and adaptation demands that may be imposed on transhumant livestock keepers (pasture lands, water points, river banks, boreholes, et cetera). Through local associations they can amicably resolve local issues, including trans-boundary ones, and make decisions about pastoral development and the protection of community spaces, irrigated forages (For example, floodwater/spate irrigation, groundwater, rivers, lakes, et cetera), or in-kind royalties from sugar plantations on pastoral lands (in the form of densified fodder). A number of initiatives on rangelands have been fragmented. Policies and strategies are limited or non-existent. Where they exist, they have not always been translated into action.

Existing forums such as Pastoralists' Day – celebrated regularly in some countries in Eastern Africa – can be an opportunity to strengthen pastoral unions. Such an important event should be introduced at IGAD level as a Regional Pastoralists' Day. Support must be provided to community-based organisations (CBOs) that are promoting collective actions in favour of natural resource management, including rangelands, pastures and water resources. A number of traditional pastoralist institutions exist whose roles need to be defined by lead ministries in the Action Plan priorities, taking into account local practices, customs and norms.

5. Establish/Strengthen Animal Feed Producers' Cooperatives or Association

Animal feed producers' cooperatives or associations are either weak or non-existent. Organised farmers and pastoralists could purchase choppers, mixers, and hammer mills and establish fodder banks, and collectively produce marketable forages (For example, spate irrigated forages).

6. Support the Development, Validation and Alignment of National Feed Strategies and Action Plans with the Regional Framework

Eastern Africa experiences frequent droughts, with the 2020-2022 droughts being the most severe in decades. Drought strains pastoral livelihoods, leading to loss of livestock, separation of families, migration, ecosystem disintegration and community conflicts, with considerable implications for the survival of the pastoral system. To implement this Plan of Action, technical, institutional and policy support are needed at local, national and regional levels. Countries, international organizations, NGOs, CBOs, public and private sector actors need to come together to realize this ambitious but immediate priority for East Africa.

7. Support the Scaling-Up of Weather Index Based (NDVI, PLEWS, et cetera) Livestock Insurance Schemes

A livestock-based insurance scheme that has been tested in the region is the Index-Based Livestock Insurance (IBLI), which has so far been used in northern Kenya and southern Ethiopia for pastoralists (CGIAR, 2018). IBLI uses the NDVI collected by satellites to develop an innovative new insurance scheme. NDVI has a high correlation with forage availability and serves as an indicator in the area. An index was calibrated using data on livestock mortality, collected at monthly intervals. The index was then based on the relationship between predicted livestock mortality and forage availability and triggers a pay-out when cumulative deviation of NDVI falls below the 15th percentile of historical vegetation growth in a given season. Studies confirmed that participating households are less likely to sell livestock, more likely to buy livestock from others, and more likely to become self-reliant for food consumption where the programme

was applied in northern Kenya and southern Ethiopia. IBLI has proven to enhance the resilience of pastoralists due a reduction in the short- term risk of asset loss or sale resulting from seasonal droughts in the arid and semi-arid lands of Kenya and Ethiopia. The approach could be scaled out, customised and modified as more and more data is made available to help arid and semi-arid regions in East Africa.

8. Promote and Advocate for Public-Private Partnerships Information Sharing and Harmonisation at the Region Level

Public-private partnerships and, where appropriate, multi-stakeholder partnerships would improve the production of quality and safe animal feeds. Opportunities for investment are considerable. However, promotion and advocacy are needed to develop effective partnerships – at local, national and regional levels – to ensure that sufficient and quality feeds are always available. Depending on the context, multi-stakeholder partnerships could be more useful at national and regional level, with more targeted public-private partnerships at local level. Capacity development is needed to ensure the capacity of individuals and organisations, and facilitate an enabling environment.

Feed safety multi-stakeholder partnerships are FAO-led capacity development initiatives that seek to strengthen the ability of relevant stakeholders along the feed and food value chain to produce and supply safer feed. These partnerships address feed safety across the feed and food continuum, including feed ingredients, inputs, feeding practices, feed handling, packaging, transport, storage and manufacturing, taking into account all relevant areas of capacity building (technical, institutional, social, economic and policy) must be taken into account. For example: technical capacities to ensure feed quality and safety, through using good agricultural, manufacturing, marketing and laboratory practices; and functional capacities to facilitate the uptake of and maintain changes at governmental, farm, industry and professional level to ensure that the technical know-how is embodied in local systems and processes in a sustainable way. Social capacities are developed at the individual level (through training, knowledge sharing and networking) and lead to changes in skills, behaviours and attitudes. Organizational capacity development involves improving the overall functioning and performance of an organisation or institution and directly impacts on how individuals within the organisation develop their competencies and use their capabilities. The enabling environment includes: political commitment and vision; policy, legal and economic frameworks; budget allocations and processes; governance and power structures; incentives and social norms.

Such partnerships result in:

- Closer collaboration among stakeholders (through multi-stakeholder policy and technical dialogues);

- Increased scientific information and data (e.g. on risks, hazards associated with animal feed);
- Effective communication and advocacy;
- Broader exchange of data and information and knowledge among all stakeholders (through the development of databases, case studies and the production of publications);
- Enhanced technical expertise and know-how (as a result of training); and
- Adequate legislations and their effective implementation.

Regional partners can be from the public sector, private sector, civil society or academia and research institutions. Each member country should identify and understand the roles of NGOs, schools, other platforms and associations and promote public-private partnerships in animal feeds.

9. Facilitate Harmonisation of Taxation/Tariffs on Feed, Ingredients and Test Kits in the Region

In order to promote feed and feed ingredients trade among member states in the region, it is important to harmonise the taxation system and tariffs. In addition, the feed and feed ingredients quality and safety standards and test kits also need to be harmonised. This allows the trading partners to have a common understanding and builds trust for smooth and more efficient business transaction among trading partners in the region. Moreover, it will also allow the regulatory bodies in both in the exporting and importing countries to have a commonly agreed upon sets of standards of feeds and feed ingredients.

Output 4.2 Capacity for Feed Production, Processing and Marketing Strengthened

Capacity development implies a number of different types of support, from training to facilitating access to the appropriate technologies and equipment to ensuring an enabling environment and strengthening value chain linkages. In particular, effective training and knowledge sharing would transform the sector at local and national levels. Trainees and the type of training most relevant would be determined at country or local levels, depending on needs, but would likely include communities themselves, extension providers, private sector actors and emergency support providers, among others.

Activities

1. Improve Conditions for Enhancing Availability of Feed Technologies and Technical Capacity and Know-How of Feed Producers

The technological challenges faced by the East African countries include lack of or

inadequate availability of machineries and tools, and lack of or inadequate technical capacity and know-how in feed technology. Machineries for densification of cereal straws, grasses, hays, et cetera and relevant processing machines such as harvesters (mowers), hydraulic presses, balers, choppers, hammer mills, mixers and pellet-making machines are not readily available in Eastern Africa. Feed technologies that reduce roughage feed bulk and improve the nutrient availability need to be introduced. Policies and incentives that encourage local manufacturing of these machineries will contribute to averting livestock feed crises in the region, as well as facilitating longer-term development. It would also be important to simplify the machines to make them suitable for small and medium scale farmers and also to reduce the cost. A South-South cooperation mechanism could enable the transfer of relevant expertise and technologies from countries such as China, India and Turkey that manufacture these machines. Currently the technical capacity and know-how in feed preservation, densification and processing is lacking or inadequate at local level, except in specialised farms, feed manufacturing companies or intensive dairy farms. Popularising the use of densifying machines among private entrepreneurs or youth groups, alongside building technical capacity for feed processing, would promote their wider use, including that could produce total mixed ration. At initial stage, machinery rental service arrangement could be initiated by proactive entrepreneurs or youth groups by providing chopping, grinding, baling or densifying service and charging the users for the service provided.

Densified straw-based complete feed rations or compacted hay could be prepared in seasons of biomass availability and transported to the fodder banks. Sudden high demand for feed in an emergency owing to relief interventions can cause an escalation in prices of feed even in regions unaffected by the crisis. Fodder banks improve and stabilise the availability of animal feed and fodder, as well as reducing the volatility of feed prices, especially during droughts. Most areas hit by droughts do not have good road network and, hence, are less accessible. Transporting trucks are not willing to travel to these areas owing to poor roads and if they travel, they charge very high price. In addition, surplus biomass is located far away from arid and semi-arid lands. This is exacerbated by the fact that most feeds are not densified, and transporting loose or uncompacted fodder is generally inconvenient and very costly. Thus, densification is one potential way to reduce these costs.

The Action Plan recommends that this training include:

- Approaches for estimating feed requirements for livestock in emergency situations (Makkar et al., 2018) – partners such as FAO and IGAD can support countries in resource mobilisation, as well as in providing technical assistance in preparing such trainings.
- Hands-on training on supplementary feeding in emergency contexts, for

example, using FAO's "how to do it" manual (FAO 2016a), which outlines important considerations in supplementary feeding of animals during crises. A number of factors need to be assessed before proceeding with supplementary feeding during drought and the Livestock Emergency Guidelines and Standards (LEGS) decision-making tree for feed options (LEGS 3rd edition) could help in deciding the appropriate intervention regarding provision of feed. A training module should be designed around this to meet the needs of target trainees.

- Feed processing and the use of densifying machineries and their use, targeted at private entrepreneurs or youth groups; tailored trainings on feed processing machinery (hydraulic presses, balers and pellet making machines) could also address the considerable logistical challenges and costs associated with this equipment.
- Production of urea-molasses multi-nutrient blocks to be stored before drought.
- Alternatives to increase the feed resource base, for example, through planting and propagating thornless (spineless) cactus, which is rich in carbohydrates and water, yields a high biomass in harsh conditions and when consumed decreases animals' daily drinking water requirements; or in the processing and use of Prosopis and acacia pods.
- Sustainable rangeland management and associated conflict prevention. A clear guideline on how to manage grasslands and rangelands should be developed and made available. Other manuals can be used as a reference (see Annex 1). Best practices identified are in areas of: (i) grassland development, improvement and rehabilitation; (ii) pasture development methods; (iii) herd management; and (iv) social, economic and environmental factors. Capacity building and training along with structural support to improve communities' capacity for resources management, coordination among institutions working on the development and rehabilitation of rangelands is paramount.
- Simple technologies such as the use of appropriate feeding troughs and chopping of fodder, as they reduce wastage of feed and increasing nutrient use.
- Backyard forage production using fodder trees, which could also contribute to addressing the shortage of conventional feed that generally occurs during times of drought.
- Market-oriented animal feeding – this requires specialised guidance notes to train communities on identifying the potential of such feeding in

improving their income and resilience in the face of climate change and increasing droughts.

- Improved community capacity for rangeland management and conflict.
- Developing capacity of: (i) feed manufacturers on good manufacturing practices, and (ii) feed regulators on enforcement of quality and safety standards.

2. Promote Large Scale Fodder Production in Strategic Border Areas

Capacity for large scale fodder production, for example, using spate irrigation, would be necessary to alleviate the feed shortage problems in the region. The produced fodder could be conserved or converted into hay, baled and stored in fodder banks. Incentive mechanisms such as land allocation for companies that are capable and willing to engage in commercial fodder production would be important. It is also important to facilitate the setting up of production, transportation and marketing infrastructure. Manuals for fodder production and complementary feed processing technologies are available and should help to up- and out-scale training to increase the availability of feed in the countries in the region. The guidance should enable the incorporation of fodder conservation and fodder and seed production by commercial producers and smallholder farmers. Training should also consider issues such as access to finance so that individuals or associations embarking on such an activity know where and how to access and manage such resources.

3. Promote Strategic Feed Storage Reserves in a Location that is Accessible to both Domestic and Export

Strategic feed reserves should be established in strategic locations that are accessible to both the domestic and export market would be very important to easily mobilise the reserves during emergencies within the country or for sale across the border based on the demand. For example, establishment of molasses tanks and storage facilities for concentrate feeds and hays at strategic location will enable storage of these feed resources close to the areas where the demand for emergency intervention is high.

4. Facilitate Information Sharing and Strategic Experience Sharing Within and Among Countries as Part of Capacity Building

Over the years, the dissemination of research outcomes, technologies and innovations has stalled due to limited policy support and insufficient linkages between research and extension services, exacerbated by inadequate communication means among

extension officers and their frontline workers. Comprehensive capacity building throughout the research-farmer/pastoralist-extension system is, thus, needed. This would be reinforced by efforts to continuously disseminate the latest technologies, adapt and apply existing tools like the LEGS and PFS, and the development of simple manuals and guidance notes on topics, including use of browse enhancers, spate irrigation, agroforestry with dual-purpose crops, and community-based management of natural resources, among others.

The Action Plan also recommends that investments be made to improve extension services in terms of transport and use of modern technologies (mobile applications) to make the flow of information to field staff more effective. Traditional, but still useful methods, include research, extension, farmers/pastoralists and relevant stakeholders participating in joint tours, field days, demonstrations, pre-extension trials, fodder bulking sites, visits to research centres, correspondence with farmers, media, lectures, seminars, scientific papers, publications, agricultural shows and Advisory Committees. Such activities could be further adapted, for example through the use of new approaches (mobile applications) to deliver trainings tailored for farmers, pastoralists, private sector, traders, et cetera on new and existing technologies for feed processing, storage, feed bank, business model and overall feed resources management and use.

In addition, exchange visits to learn from best practices from different locations within each country or from neighbouring countries would be vital to have first-hand exposure to best practices wherever they exist.

Implementation of the Action Plan

1. Implementation Arrangements

The implementation of the Animal Feed Action Plan requires a concerted effort on the part of the governments in the Eastern Africa region, international and national NGOs, research institutions, academia, private sector, civil society organisations, pastoralists, farmers, for example. Within the countries, there is a need for high-level inter-sectoral and inter-ministerial collaboration. An inter-sectoral/inter-ministerial joint platform on animal feeds and feeding, led by a designated line ministry, may also be needed. The platform would discuss the feed security situation (or including feed industry and livestock sector), constraints, timely interventions (including this plan of action) necessary to address issues such as raw material supply chain, feed laboratories and implementation of feed regulations, feed manufacturer's registration, licensing and enforcement of good manufacturing practices, forage and forage seed production and marketing etc.

2. Partnership and Stakeholders

This Plan of Action requires that all stakeholders are engaged throughout its implementation, including public and private sector entities and communities involved in the subsector. The first step is to identify and document stakeholders, including roles and responsibilities, and build trust around the Plan to ensure their ownership of the process.

3. Coordination and Technical Support

This Action Plan defines the framework for countries to intervene in the animal feed sector for the purposes of ensuring a continuous, steady supply of quality animal feed to facilitate a strong, productive livestock subsector.

At regional level, implementation of the Plan will be coordinated by IGAD and FAO through the IGAD regional range and feed platform. FAO will provide the required technical support for implementation of the Plan, while IGAD will ensure coordination and policy support is provided to their Member States in the adaptation and implementation of the framework in their own contexts. Through the regional range and feed platform, IGAD and FAO will organise annual stakeholders' meetings to review progress by members and partners in the implementation of the Action Plan. Through the regional livestock and pastoralist coordination group, co-chaired by IGAD and FAO, lessons learnt and best practices derived from the implementation of this Action Plan will be regularly shared.

4. Resource Mobilisation

Implementation of the Action Plan will rely on resources mobilised through multi/bilateral cooperative arrangements led by Member States with strong support from FAO and IGAD. For regional activities, FAO and IGAD will take the lead in coordination with their Member States. Resource mobilisation activities include identifying resource partners and matching the various priorities of the Plan with those of resource partners, as well as preparing grant-winning proposals in a coordinated manner to avoid competition among partners. Capacity building trainings should be organised to assist Member States and decentralised office personnel in mobilising resources.

A resource mobilisation advisory group may be needed to ensure scaled-up and balanced interventions, which would allow a more meaningful resource partnership that can be sustained over time and that is sufficiently flexible to accommodate additional innovations/aspects that emerge in the course of implementation. The Action Plan should be integrated into national agricultural development strategies, strategic programmes on livestock development, food security and national disaster risk reduction strategies.

5. Monitoring and Evaluation

The Plan will be used largely as a framework for countries to adapt to their own specific context and needs. Depending on local capacity and resources, a phased approach could be used for implementation.

In monitoring, the following can be developed:

- Protocols to measure impact of feed and forage supply chains on livestock and household vulnerability;
- Protocols to measure impact (cost-effectiveness) of emergency response on household livelihoods, related to livestock survival and performance;
- Protocols to measure impact of improved rangelands and grazing management on resilience of livestock farmers and herders; and
- Protocols to measure the impacts of adoption of best practices in feed and forage development on the performance of the livestock sector.

6. The Roles of the Private Sector in the Feed Action Plan

- a. The private sector can participate in generating information on availability and requirements of animal feed and water (For example, service provision and providing data). They can utilise the information to drive innovations and

technology generation in animal feed sector and to translate the information into investment in the animal feed value chain. They can also participate in building contingency systems and emergency response action. This includes investing in aggregation of feed reserves, insurance, credit finance and supply of goods during emergencies.

- b. The private sector can play pivotal role in the development of the feed sub-sector. The private sector can play a vital role in the feed value chain (production, processing, storing, transporting and marketing). The private sector can also play an important role in forage seed and forage production and marketing. Commercial producers can support smallholders as out growers by providing them with seeds and technical support to grow on their small farms and increase fodder and fodder seed production. They can support small scale producers through contract farming and out grower schemes. They can work with and support cooperatives/unions in the feed value chain and technical and financial supports. In rare cases, the private sector may engage in research and link with research institutes to try new products and disseminate the outcomes.
- c. The private sector can play a critical role in the transfer of knowledge, technologies and innovation. They can identify niche areas where they can provide services linking with the public and civil societies. They can facilitate last mile delivery of feed in times of emergency. They can enhance the processing and distribution network
- d. The private sector can inject capital investment in the feed business. By injecting capital investment in the feed business, the private sector can introduce new technologies and innovations and create jobs. They can serve as drivers of market systems and resilience building and drivers of economic growth. They can provide resources and influence regional and international trade and investment regimes and market linkages. They can invest in value addition such as production of special feeds for different animals.

6.1 Incentives and Enabling Environments for Private Sector Engagement in the Feed Business

The following were listed by the stakeholders during the validation workshop as incentives that can attract the private sector into the feed business.

- Tax incentive (Tax holidays, zero tax, no-tariffs protocols).
- Logistical support (Mechanisation, low energy tariff, connectivity, communication access, access to finance for example, Green Investment grants).

- Public-Private Partnerships for investment incubation.
- Security for enabling environment.
- Good political will-government support.
- National and regional support in market entry and investment opportunity.
- Support to business environment – policies and regulatory framework.
- Co-investment opportunities - from transactional into co-designing, co-investment, co-implementation and market guarantee.
- Access to finance – linking with the microfinance and financial institution.
- Information – market information and linking with market system actors in the livestock feed and fodder workers.
- Capacity development – technical skills, knowledge transfer (training).
- Subsidies – where and when appropriate – vaccines, heavy machineries and equipment.
- Access to land for production.

6.2 What is Missing? or What is Desired by the Private Sector?

The following issues were listed by the stakeholders as requiring immediate intervention.

- Lack of a regional platform for private sector networking in the feed business. There is no platform for regional networking of the private sector actors in the feed business. Such a platform is necessary for the development of a vibrant feed sub-sector and feed business development in the region.
- Ban on importation/exportation of feed/biotech products. The stakeholders demand the lifting such a ban to encourage local production of feed both for export and domestic use.
- Promote mechanisation of feed resources-no tax on importation of machinery and promote and encourage local manufacturers of machineries and equipment for feed production and processing.

References

- ABS TCM, Ltd. 2013. BLGG Report III – Feed sector policy issues study on the Kenyan animal feed and fodder subsectors. Kenya feed industry policy and regulatory issues (subreport III). (available at: https://cowsoko.com/publications/1453820122BLGG_Report_III_Feed_Sector_Policy_Issues.pdf)
- Ayers, R.S. and Westcot, D.W. 1985. Water quality for agriculture. Rome, FAO. (Available at: <http://www.fao.org/docrep/003/t0234e/T0234E07.htm>)
- Behmanesh, B., Barani, H., Sarvestani, A.A., Shahraki, M.A., and Sharafatmandrad, M. 2016. Rangeland degradation assessment: A new strategy based on the ecological knowledge of indigenous pastoralists. *Solid Earth*. Volume 7, 2016, pages 611–619. (available at: <https://www.solid-earth.net/7/611/2016/se-7-611-2016.pdf>)
- Belachew, K. and Tessema, T. 2015. Assessment of Weed Flora Composition in Parthenium (*Parthenium hysterophorus* L.) Infested Area of East Shewa Zone, Ethiopia. *Malaysian Journal of Medical and Biological Research*, Volume 2: pages 63-70. (available at: https://jmbr-my.weebly.com/uploads/1/3/4/5/13455174/mjmbr_4.9.pdf)
- CGIAR. 2018. CSA Guide. Index Based Livestock Insurance (IBLI) for nomadic pastoralists in northern Kenya and southern Ethiopia. (available at: <https://csa.guide/csa/index-based-livestock-insurance-ibli-for-nomadic-pastoralists-in-northern-kenya-and-southern-ethiopia>)
- Coppock, D. Layne; Gebru, Getachew; Desta, Solomon; Gizachew, Lemma; Amosha, Dadhi; and Taffa, Feyissa, “Stakeholder Alliance Facilitates Re-Introduction of Prescribed Fire on the Borana Plateau of Southern Ethiopia” (2007). *Environment and Society Faculty Publications*. Paper 209. https://digitalcommons.usu.edu/envs_facpub/209
- de Jonge, L.H. and Jackson, F.S. 2013. The feed analysis laboratory: Establishment and quality control. Setting up a feed analysis laboratory, and implementing a quality assurance system compliant with ISO/IEC 17025:2005. In Makkar, H.P.S. ed. *Animal Production and Health Guidelines* No. 15. Rome, FAO.
- FAO. 2007. Feed Supplementation Blocks: Urea-molasses multinutrient blocks: simple and effective feed supplement technology for ruminant agriculture. FAO

- Animal Production and Health Paper No. 164. Rome (available at: <http://www.fao.org/3/a-a0242e.pdf>)
- FAO and IFIF. 2010. Good practices for the feed industry – Implementing the Codex Alimentarius Code of Practice on Good Animal Feeding. FAO Animal Production and Health Manual No. 9. Rome. (available at: <http://www.fao.org/docrep/012/i1379e/i1379e.pdf>)
- FAO. 2011b. Quality assurance for animal feed analysis laboratories. FAO Animal Production and Health Manual No. 14. Rome. (available at: <http://www.fao.org/3/i2441e/i2441e00.pdf>)
- FAO. 2012. Crop residue based densified total mixed ration – A user-friendly approach to utilise food crop by-products for ruminant production. FAO Animal Production and Health Paper No. 172. Rome, Italy. (available at: <http://www.fao.org/3/ai2728e.pdf>)
- FAO. 2016a. Livestock-related interventions during emergencies – The how-to-do-it manual. (available at: <http://www.fao.org/3/a-i5904e.pdf>)
- FAO. 2016b. Development of integrated multipurpose animal recording systems. FAO Animal Production and Health Guidelines. No. 19. Rome. (available at: <http://www.fao.org/3/a-i5702e.pdf>)
- FAO. 2016c. Cash and voucher programmes. <http://www.fao.org/3/a-i5424e.pdf>
- Fenetahun, Y., Xu, X., & Wang, Y. (2018). Assessment of Range Land Degradation, Major Causes, Impacts, and Alternative Rehabilitation Techniques in Yabello Rangelands Southern Ethiopia.
- Herrera, S. M. ; Savón, L. ; Lon-wo, E. ; Gutiérrez, O. ; Herrera, M., 2014. Inclusion of *Morus alba* leaf meal: its effect on apparent retention of nutrient, productive performance and quality of the carcass of naked neck fowls. Cuban J. Agric. Sci., 48 (3): 259-264
- Harris, R.B., (2010). Rangeland degradation on the Qinghai-Tibetan plateau: a review of the evidence of its magnitude and causes. Journal of Arid Environments, 74(1), pp.1-12.
- Holechek, J.L., Pieper, R.D., Herbel, C.H., (2005). Range Management Principles and Practices. 5th edition. Pearson Prentice Hall, Upper Saddle River, New Jersey, USA. pp. 321.

- ICPALD (IGAD Centre for Pastoral Areas and Livestock Development). 2013: Policy Brief Series: The contribution of livestock to the economies of Kenya, Ethiopia, Uganda and Sudan. Nairobi. (available at: https://igad.int/attachments/714_The%20Contribution%20of%20Livestock%20to%20the%20Kenya,%20Ethiopia,%20Uganda%20and%20Sudan%20Economy.pdf) IGAD-ICPALD and FAO. 2022. Support to the establishment of Livestock Feed Security System in Kenya, Somalia, Sudan and Uganda (Letter of Agreement 2020/009 between FAO and IGA-ICPALD)
- Lempériere, P., Hagos, F., Lefore, N., Hailelassie, A., Langan, S. 2014, *Establishing and strengthening irrigation water users' associations in Ethiopia: a Manual for trainers*. International Water Management Institute. Colombo, Sri Lanka. (Available at: http://www.iwmi.cgiar.org/Publications/Other/training_materials/establishing_and_strengthening_irrigation_water_users_associations_in_ethiopia.pdf)
- Lesoli M.S., Gxasheka, M., Soloman, T.B. and Moyo, B. 2010. Integrated plant invasion and bush encroachment management on Southern African rangelands In: Price, A.J. and Kelton, J. (eds.): *Herbicides – Current Research and Case Studies in Use*. Chapter 11, 259-313 (available at <https://www.intechopen.com/books/herbicides-current-research-and-case-studies-in-use>)
- Livestock Emergency Guidelines Standards (LEGS) 2023
- Logistics Cluster. 2015. Logistics Cluster Operational Guide. (available at: <https://dlca.logcluster.org/display/LOG/Logistics+Cluster>)
- Makkar, H.P.S. and Ankers, P. 2014. Towards sustainable animal diets: a survey based study. *Animal Feed Science and Technology*, Volume 198, September 2014, pages 309- 322. (available at: <http://www.fao.org/3/a-au681e.pdf>)
- Makkar, H.P.S., Tan, G., Heuze, V. and Ankers, P. 2014. Review: State-of-the-art on use of insects as animal feed. *Animal Feed Science and Technology* (2014), <http://dx.doi.org/10.106/j.anifeedsci.2014.07.008>
- Makkar, H.P.S. 2016. Animal nutrition in a 360-degree view and a framework for future R&D work: towards sustainable livestock production. (available at: <http://www.publish.csiro.au/an/pdf/AN15265>)
- Makkar, H.P.S., Addonizio, E. and Gizachew, L. 2018. Characterization of feeding systems in Ethiopia with a focus on dry areas. *Broadening Horizons* No. 51, March 2018. (available at: <https://www.feedipedia.org/content/characterization-feeding-systems-ethiopia-focus-dry-areas>)

- Makkar, H.P.S. 2018. Support to Institutionalization of Livestock Feed Security System in Ethiopia. VSO Report to FAO.
- Mohammed M., Abule E. and Lissahanwork, N. 2016. Soil Organic Carbon and Total Nitrogen Stock response to traditional enclosure management in eastern Ethiopia, *Journal of Soil and Environmental Management*, Volume 7 (9): pages 561–570.
- Musimba, N.K.R., Nyariki, D.M., Ikutwa, C.N. and Teka, T. 2004. Dryland Husbandry for sustainable development in the southern rangelands of Kenya. OSSREA, Addis Ababa, 2004
- Negash, D. 2017. Review on compound animal feed processing in Ethiopia: Condition, challenges and opportunities. *Journal of Nutrition and Health*. November 2017, Vol. 3, Issue 2.
- Oba, G. and Kotile, D.G. 2001. Assessments of Landscape Level Degradation in Southern Ethiopia: pastoralists Versus Ecologists. *Land Degradation and Development*. Volume 12: pages 461–475.
- OCHA. 2023. Horn of Africa Drought: Regional Humanitarian Overview & Call to Action.
- Opiyo F.E.O., Ekaya, W.N. and Nyariki D.M. 2011. Seedbed preparation influence on morphometric characteristics of perennial grasses of a semi-arid rangeland in Kenya. *African Journal of Plant Science*. Vol. 5(8): pages 460–468.
- Peden, D., Tadesse, G. and Mammo, M. 2003. Improving the water productivity of livestock: An opportunity for poverty reduction. ILRI. Addis Ababa, Ethiopia. (available at: <https://cgspace.cgiar.org/bitstream/handle/10568/1714/Improving%20water%20productivity.pdf?sequence=1>)
- Prasad Paudel, K. and Andersen, P. 2010. Assessing rangeland degradation using multi temporal satellite images and grazing pressure surface model in Upper Mustang, Trans Himalaya, Nepal. *Remote Sensing of Environment*. Volume 114, Issue 8. August 2010, pages 1845-1855. (available at: <https://reader.elsevier.com/reader/sd/i/0994?token=175F32B58103A86289DADA4999F3A33A9B28B96C1DFD2B43441668CE90A22FFFD0F358F4E0DBE560BC1EB531440B558>)
- Roselle, L., Launchbaugh, K., Jones T., Babcock, L., Ambrosek, R., Stebleton, A., Brewer, T., Sanders, K., Mink, J., Haley, J., and Hyde, G. (2011). *Rangelands: An Introduction to Wild Open Space*

- Thorpe, W. and Duncan, A.J. 2012. Fodder and feed in livestock value chains in Ethiopia: Final report of the Ethiopian Livestock Feeds project. ILRI, Nairobi, Kenya.
- Van den Berg, L. and Kellner, K. 2005. Restoring degraded patches in a semi-arid rangeland of South Africa. *Journal of Arid Environment*. Volume 61, pages 497–511.
- Woodfine, A. 2009. Using sustainable land management practices to adapt to and mitigate climate change in sub-Saharan Africa: Resource guide version 1.0. TerrAfrica. (www.terrafrica.org).

Annex 1. Key Indicators per Output and Responsibility

Priority area	Output	Key indicators	Responsibility	Timeline	Resources	Deliverables/outputs
1. Establish and strengthen livestock and feed resources, data, information, and communication systems	1.1	Livestock population data disaggregated by species and animal classes	Member States' agencies responsible for national statistics	Updated yearly	Financial, human, technical capacity, statistical tools	Livestock inventory/population estimates
		Harmonised and disaggregated animal feed requirements data	Member States' ministries responsible for animal feeds	1 year	Financial, human, technical capacity, statistical tools	Requirements for animal feed resources
		Updated estimates of livestock feed availability and accessibility disaggregated by feed categories (types)	Member States' ministries responsible for animal feeds	1 year	Financial, human, technical capacity, statistical tools	Inventory of livestock feeds resources availability and accessibility
		Feed balance determined	Member States' ministries responsible for animal feeds	1 year	Financial, human, technical capacity, statistical tools	Livestock feed balance sheet

	Locations and systems of feed deficiency or excess mapped	Member States' ministries responsible for animal feeds	1 year	Financial, human, technical capacity, statistical tools	Location and systems with risks of feed deficiency or potential excess feed availability
1.2	Timely and quantifiable feed gap identified, disaggregated by unit of analysis	National disaster risk management agencies & ministries responsible for animal feeds and rangelands	Continuous	Financial, human, technical capacity, statistical tools, PLEWS, PET	Feed gaps identified
	Capacity for timely action for emergency livestock feed supply identified	National disaster risk management agencies & Ministries responsible for animal feeds and rangelands	1 year	Human, technical capacity	Capacity and preparedness for emergency response identified

1.3	Reporting format and communication templates developed	Member States' agencies responsible for national statistics	Continuous	Financial, human, technical capacity, statistical tools	Reporting format and communication templates
2. Develop sustainable animal feed supply chains	2.1	Potential for excess biomass collection and preservation identified and established	1 year	Human, technical capacity	Capacity for collection and preservation of excess biomass established
	2.2	Potential feeds and priority areas for feed production determined	3 years	Financial, Human, technical capacity	Potential feeds identified and capacity for local production established
	Strategic animal feed reserves or feed/fodder banks established	Ministry responsible for livestock or animal resources	1 year continuous	Financial, technical	Strategic animal feed reserves or feed banks/fodder banks established

2.3	Animal feed supply chain identified and analysed	Ministry responsible for livestock or animal resources, private sector, development partners	1 year	Human, technical capacity	Animal feed value chain opportunities identified
2.4	Feed supply chains established and emergency mechanisms specified	Ministry responsible for animal livestock, disaster risk management, private sector	1 year and updated every year	Financial and technical capacity	Feed supply chain and emergency response mechanisms
2.5	Emergency livestock feed supply coordinated with other interventions	Disaster risk management, ministries responsible for animal feeds, partners in emergency feed supply	During emergencies	Financial, human and technical capacity	Delivery of feed emergency in coordination with other interventions

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