Feeding strategies to curb GHG emissions from livestock in Bangladesh

“বাংলাদেশে গবাদিপশুর খাদ্য ব্যবস্থাপনা ও GHG নিরসন কৌশল”

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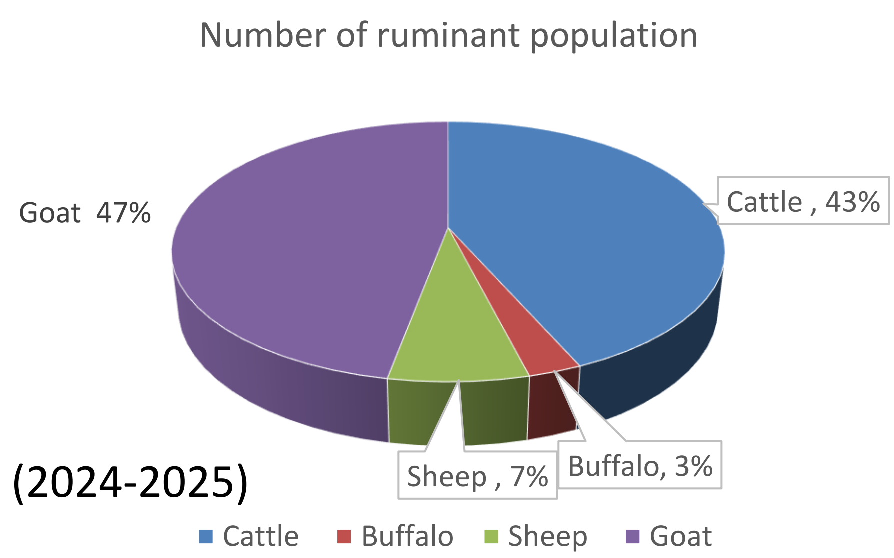
SAARC Regional Training on “Development of Inventory for Livestock Origin Greenhouse Gases and its Mitigation by Appropriate Feeding Strategy in South Asia” 23rd December 2025

1. Introduction

- **Bangladesh is an agricultural country where livestock production plays a vital role in food security, nutrition, employment, and poverty alleviation.**
- **However, ruminant animals—particularly cattle and buffalo emit methane (CH4) through enteric fermentation, which accounts for a large portion of the country's total agricultural GHG emissions.**
- **Scientific feed management has become essential to ensure environmental sustainability alongside increasing production.**



Source: DLS (2024-2025)

1.1 Economic Importance

- ❑Contribution of Livestock in Gross Domestic Product (GDP) (Constant Prices) 1.81 %
- ❑% of livestock in agricultural GDP 16.54
- ❑Employment (Directly) 20 %
- ❑Employment (Partly) 50 %

1.2 Emission Profile

- Agriculture emits **61.86 $MtCO_2e$ (29% of national emissions)**.
  - Livestock: **~37 $MtCO_2$**
  - Rice cultivation: **~15.224 $MtCO_2e$**.
- Together, rice + livestock = **>84% of agricultural GHGs**, making them central to Bangladesh's.
- **36.6 million total:** 27.76 $MtCO_2e$ from enteric fermentation + 2.46 $MtCO_2e$ (CH_4) and 6.40 $MtCO_2e$ (N_2O) from manure management.

2.Context and GHG Emission Challenges

- **Dependence on Low-Quality Feed:** Livestock in Bangladesh are still primarily dependent on low-quality grasses, rice straw, and residues from various crops.

- **Nutritional Inefficiency:** Inadequate nutrition and unbalanced feed rations lead to inefficiencies in rumen fermentation, which significantly increases enteric methane (CH4) intensity.

- **Limited Adoption of Technology:** There is currently limited use of improved feed, silage, Urea-Molasses Blocks (UMB), and balanced rations among small and medium-sized farms.

2.1 Impact of Climate Change

The effects of climate change are reducing the production of green fodder, further exacerbating the scarcity of dry matter for livestock.

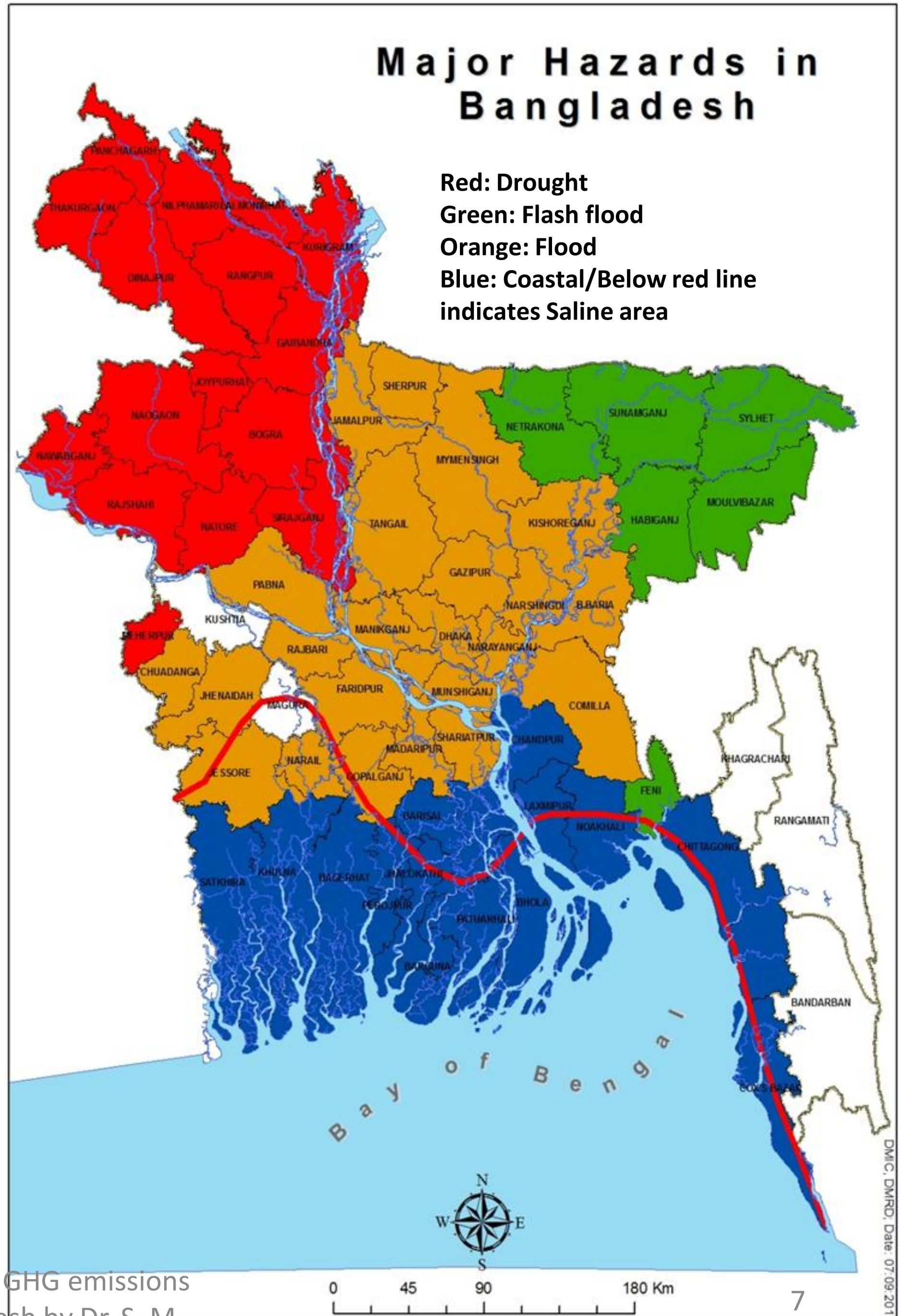
- Rising temperatures and erratic rainfall patterns.
- Salinity intrusion in coastal grazing areas.
- Drought and flood events reducing pasture growth.
- Increased disease prevalence in livestock
- Reduce nutrient level in Meat and Milk.

2.2 Climatic Vulnerable Landscapes of Bangladesh

- Flood prone areas: Char island, River basin
- Coastal areas: Saline soil and water, Cyclone and Tidal
- Drought prone areas: Semi-arid areas

Climate-Smart Practices

- ❑ Rotational grazing for sustainable pasture use.
- ❑ Fodder banks and Silage & Hay making.
- ❑ Integration of crop-livestock farming.
- ❑ Cultivation of saline/drought-tolerant fodder crops.
- ❑ TMR, Balanced concentrate mixture with buffer bypass protein & fat; Use of feed additive, Floating Fodder Cultivation, Modification in feeding pattern and schedule; Use climate resilience breed .
- ❑ Provision of shade and water i.e., Raise pith, floating pens, Solar power, Insulator, Water therapy and Mechanical cooling and water harvesting.
- ❑ Proper manure collecting, preservation, and composting.



3. Importance of Feeding Strategies in GHG Mitigation

- **Optimized Nutrition & Efficiency:** High-quality nutrition not only boosts productivity but also makes rumen fermentation more efficient.
- **Emission Intensity:** Improving feed quality reduces the amount of methane (CH4) produced per liter of milk or per kilogram of meat.

- **Key Areas for GHG Mitigation:**
  1. **Improving Feed Quality:** Replacing low-quality crop residues with balanced diets and high-quality forage.
  2. **Enhancing Rumen Function:** Using supplements and additives to rebalance diets and improve digestibility.
- **Innovative Feed Management:** Adopting emerging technologies such as methane-reducing feed additives (tannins, or oils, 3-NOP)

4. Scientific Feeding Strategies to Reduce GHG

4.1 Development of High-Quality Feed and Roughage

- **High-Yielding Fodder Cultivation:** Promoting the cultivation of high-yielding grass varieties such as Napier, Pakchong, i.e.,C-3 and C-4 types .
- **Urea-Treated Straw (UTS):** Implementing Urea-Treatment on straw can increase digestibility by 30–40%.
- **Silage Preparation:** Preparing silage ensures a year-round supply of high-quality roughage, which improves rumen efficiency and reduces methane intensity.

4.2 Balanced Ration & Concentrate Management

- **Nutritional Standards:** Ensure that energy, protein, minerals, and vitamins in the ration comply with NRC (National Research Council) or country standards, i.e., BLRI (Bangladesh Livestock Research Institute) standards.
- **Propionate Production:** Incorporating grain-based diets (such as maize and wheat bran) increases propionate production in the rumen, which directly reduces methane (CH4) emissions.
- **Bypass Protein:** The use of bypass proteins (e.g., treated soybean meal or mustard oil cake) enhances productivity while lowering emission intensity.

4.3 UMMB and Feed Additives

- **Urea-Molasses-Block (UMB):** Maintains rumen microbial activity, resulting in improved Feed Conversion Efficiency (FCE).
- **Feed Additives:** Certain additives can reduce rumen methane production by **10–25%**. Examples include:
  - **Ionophores**
  - **Tannins**
  - **Yeast Culture**
  - **Essential Oils**
  - Emerging compounds (e.g., 3-nitrooxypropanol (3-NOP) :10–30% reduction in controlled trials (higher for 3-NOP)

4.4 Precision Feeding

- **Tailored Nutrition:** Overfeeding and underfeeding are reduced when feed is supplied according to the animal's age, weight, and production capacity.

- **Efficient Management:** Using weight bands and digital feeding charts increases feed efficiency and reduces Greenhouse Gas (GHG) emissions.

4.5 Silvo-pastoral systems

Integrating agroecological approaches, such as silvo-pastoral systems that combine fodder trees with grazing lands, can sequester carbon while improving feed availability, creating a dual mitigation-adaptation benefit.

4.6 Innovation in Utilizing Agricultural Waste from Food Production

- **Scientific Processing:** Utilizing maize stover, rice straw, banana plants, and sugarcane bagasse as roughage through scientific processes such as **chopping** and **fermentation**.
- **Integrated Models:** Implementing **Crop–Livestock Integration** models to reduce the GHG footprint and lower overall production costs.

5. Breed Improvement & Selection of Feed-Efficient Species

- **GHG Intensity Reduction:** Utilizing high-yielding and feed-efficient crossbreeds (such as HF X Local or Sahiwal\Local) significantly reduces GHG emission intensity per unit of product.
- **Species Selection:** Buffaloes generally produce less methane compared to cattle; therefore, buffalo-based dairying serves as a climate-resilient and GHG-tolerant pathway.

6. Climate-Smart Innovations in Feed Management

1. **Climate-Resilient Fodder Banks:** Establishing reserves of durable forage to ensure feed availability during disasters or extreme weather.
2. **Community Silage Pits:** Shared facilities for fermenting and storing green fodder to maintain nutritional quality for livestock year-round.
3. **Hydroponic Fodder Systems:** Growing nutritious green feed using minimal water and no soil, providing a reliable food source regardless of land or climate constraints.
4. **ICT-Based Feeding Advisory:** Utilizing digital platforms and mobile apps to provide farmers with data-driven, precision feeding recommendations.
5. **Biogas Plants for Manure Management:** Implementing systems that capture methane (CH_4) from manure to generate renewable energy and reduce atmospheric emissions.

7. Policy & Institutional Actions

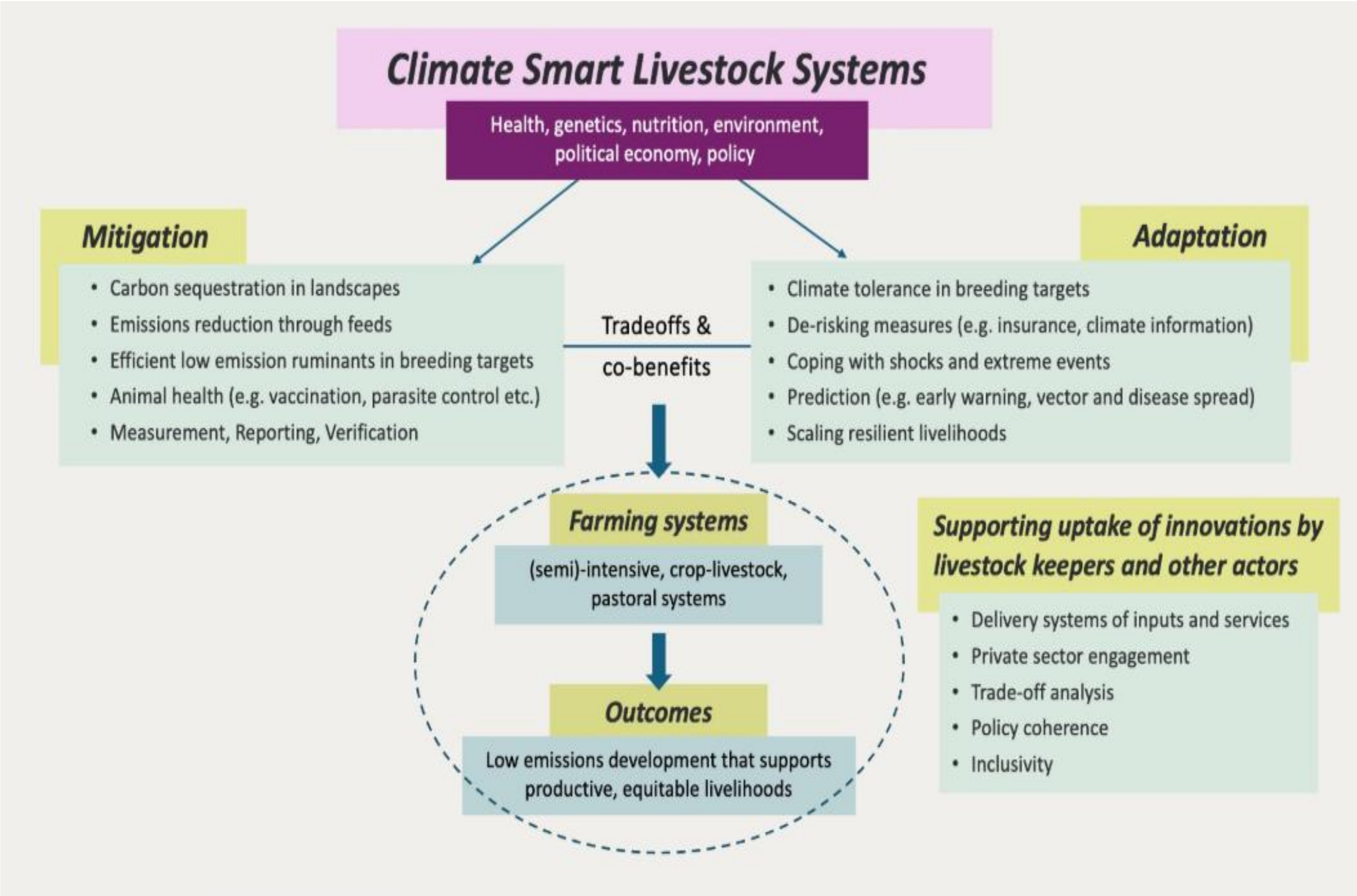
To successfully scale the feeding and management strategies discussed, the following institutional framework is required:

- **Financial Incentives:** Provide government subsidies to farmers for high-quality feed alternatives such as silage, Urea Treated Straw (UTS), and Urea Molasses Blocks (UMB).
- **Data & Monitoring:** Strengthen the national **Livestock GHG Inventory System** to ensure accurate measurement and reporting of emission reductions.
- **Localized Assistance:** Establish dedicated **Feed & Nutrition Support Units** at the Upazila level to provide technical guidance directly to smallholders.

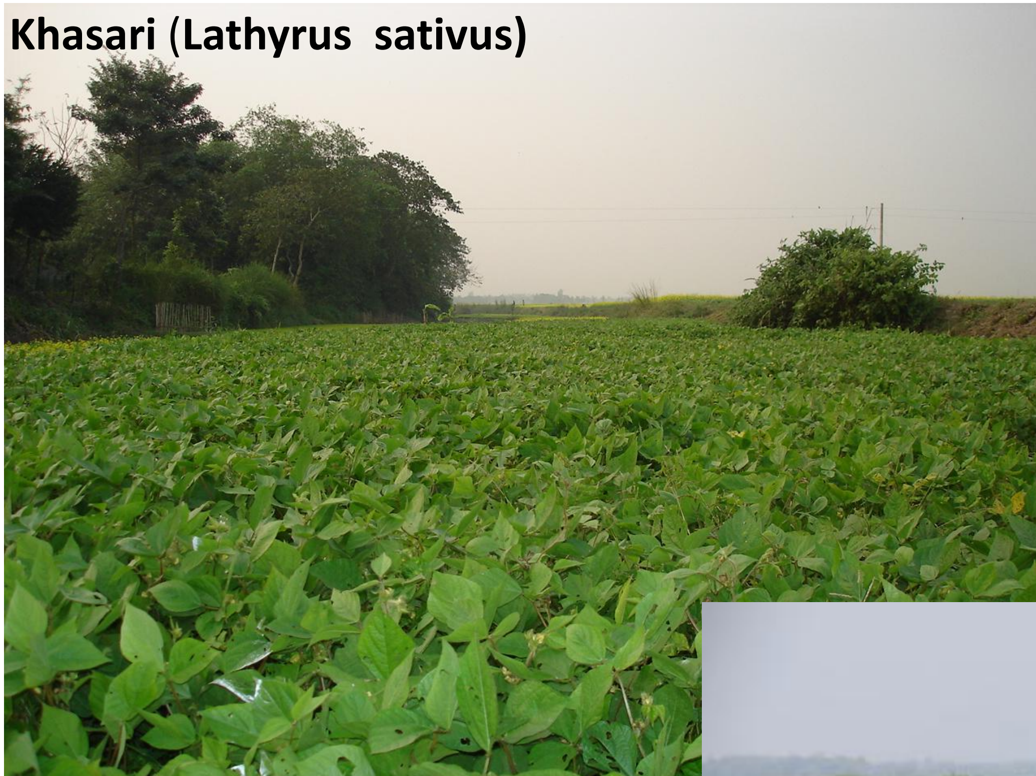
Knowledge Transfer: Expand farmer training programs and establish widespread **Field Demonstrations** to prove the viability of low-emission practices.

Collaborative Research: Implement integrated research programs involving:

- Universities and Research Institutions (e.g., **BLRI**)
- Department of Environment (**DoE**) and Department of Livestock Services (**DLS**)
- Private Sector and NGOs.


Climate Smart Livestock Systems
Health, genetics, nutrition, environment, political economy, policy
Mitigation
• Carbon sequestration in landscapes
• Emissions reduction through feeds
• Efficient low emission ruminants in breeding targets
• Animal health (e.g. vaccination, parasite control etc.)
• Measurement, Reporting, Verification
Tradeoffs &
co-benefits
Adaptation
• Climate tolerance in breeding targets
• De-risking measures (e.g. insurance, climate information)
• Coping with shocks and extreme events
• Prediction (e.g. early warning, vector and disease spread)
• Scaling resilient livelihoods
Farming systems
(semi)-intensive, crop-livestock, pastoral systems
Outcomes
Low emissions development that supports productive, equitable livelihoods
Supporting uptake of innovations by livestock keepers and other actors
• Delivery systems of inputs and services
• Private sector engagement
• Trade-off analysis
• Policy coherence
• Inclusivity

Khasari (Lathyrus sativus)



Climate resilience animal

8.Proposed Strategic Considerations

Roadmap:

•**2–5 years:** Scale small-scale emerging additives (i.e., 3NOP) piloting

•**5–10 years:** Build feed/forage supply chains; run structured multi-site livestock feeding pilots.

•**10+ years:** Expand proven livestock feeding systems nationally, once evidence & markets are ready.

Technologies to Pilot (Not yet scalable, but promising)

- **Improved feed & ration balancing:** Pilot with cooperatives and commercial dairy clusters; generate local productivity + CH_4 data.
- **Improved forages (Napier, legumes, silage):** Pilot only where land + water access are feasible; build supply chains for planting material.
- **Enhanced UMMB/UMS feeding packages:** Test methane impacts and farmer economics before promoting nationally.

System-building actions (needed for future scaling)

Strengthen input markets:

- Seed systems for short-duration fodder
- Local feed ingredient distribution

Improve extension capacity:

- Feed/forage cultivation practices

Expand financing instruments:

- Cooperative credit for feed/forage pilots

9. Conclusion

The adoption of improved roughage, balanced rations, silage, UMB, feed additives, and modern precision feeding practices can increase productivity, reduce production costs, and significantly lower methane emissions.

A climate-smart livestock sector can be established through the collective efforts of farmers, policymakers, researchers, and development partners.

This will also prepare farmers to benefit from carbon finance mechanisms, creating additional economic incentives and improving the overall profitability of livestock farming.

Thank you for your cooperation