MAZIWA ZAIDI
Policy Actions for Climate Smart Dairy Development in Tanzania

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IFAD Investing in rural people | ILRI International Livestock Research Institute | Alliance Bioversity International CIAT | CGIAR Research Program on Livestock | Maziwa Zaidi | More Milk in Tanzania SNV Solidaridad

Maziwa Zaidi

Investing in rural people

Alliance

RESEARCH PROGRAM ON Livestock

Maziwa Zaidi

More Milk in Tanzania

Maziwa Zaidi R4D Program

Background

- Testing how to improve AR4D to be more impactful
  - Using capacity across CGIAR Centres and NARS partnerships
  - Researchers working coherently with development partners (Govt, NGOs,) and private sector
  - Exploiting increasing demand for win-win for food (& nutrition) security and poverty: **by and for the poor**
  - An 'experiment' to improve AR4D

Maziwa Zaidi lessons on inclusive and sustainable VC upgrading….

More meat, milk and eggs by and for the poor

- Lots of lessons after nearly a decade of research
  - Lots of lessons guided by theory of change https://maziwazaidi.org/publications/
  - Focus on generating evidence to **catalyze** an inclusive and **sustainable** development of the dairy value chain benefiting all value-chain actors: farmers' access to inputs and services; reliable and well coordinated marketing arrangements, and consumers' access to safe and affordable milk
  - Appropriate entry points to upgrade the smallholder dairy value chain
  - Research across **livestock & environment**, feeds & forages; genetics, animal health, food safety
  - Partnerships and capacity strengthening
  - Latest focus on integration
  - Today marks the beginning of sharing of key lessons from nearly a decade of MZ R4D
  - More lessons to be shared before end of Maziwa Zaidi in Dec 2021

Agribusiness
An International Journal

Regional Environmental Change (2020) 20: 138
https://doi.org/10.1007/s10113-020-01723-5

ORIGINAL ARTICLE

Towards environmentally sound intensification pathways for dairy development in the Tanga region of Tanzania

Eur J Dev Res (2019) 31:388–412
https://doi.org/10.1057/s41287-018-0158-z

ORIGINAL ARTICLE

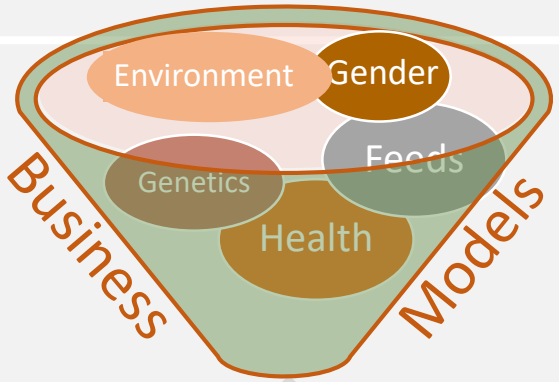
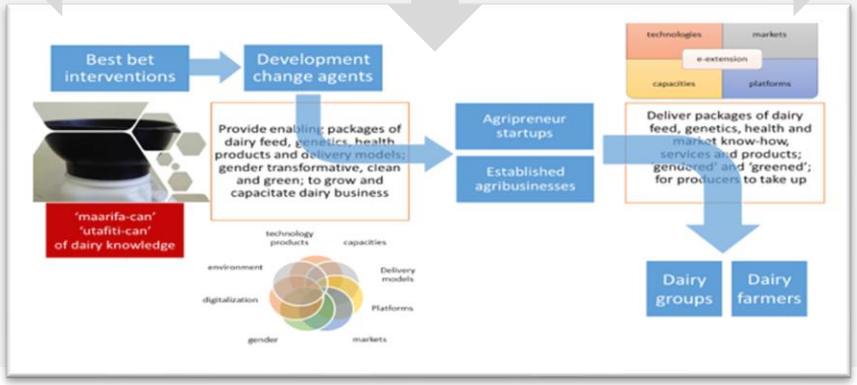
Journal of Dairy Research

Upgrading the smallholder dairy value chain: a system dynamics ex-ante impact assessment in Tanzania's Kilosa district

Using "theory of change" to improve agricultural research: recent experience from Tanzania

Amos Omore, Michael Kidoido, Edgar Twine, Lusato Kurwijila, Maureen O'Flynn & Julius Githinji

Maziwa Zaidi II: Latest focus on generating evidence on integration and agri-entrepreneurship as drivers for technology uptake and inclusive upgrading

Strategy	Integrated components: demand – driven	Key changes
a. Increase capacity of dairy agribusiness (focus on youth and women) to: ➢ Incubation ➢ Bundle technologies, e.g., AI, ECF vaccine, Brachiaria, manure mgt… ➢ Strategic alliances ➢ Grow their agri-businesses		i. Increased agribusiness performance: ➢ Increased product portfolio ➢ Bundled products/services ➢ Client orientation/outreach
b. Package and test profitable & environmentally sustainable technologies	Maziwa Zaidi partnership	ii. Value chain actors adopt innovative packages
c. Influence policy and investment		iii. Improved business enabling environment.

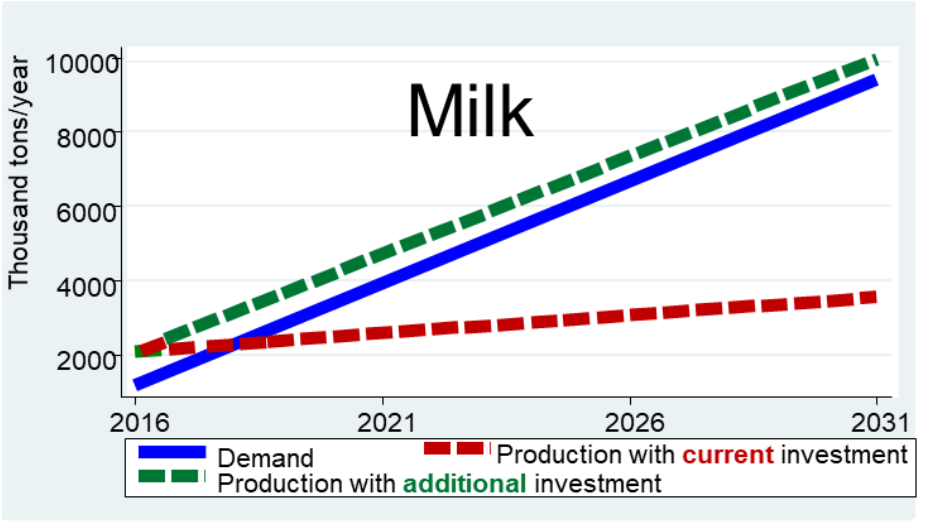
Increased Productivity, income & consumption

Goal: Investors replicate and catalyze an inclusive and sustainable development of the dairy value chain

Maziwa Zaidi and environmental management

- **Climate change is now an emergency!**
  - Latest IPCC report (released yesterday): A red alert showing urgent action is needed:
    - The last decade was hotter than any period in the last 125,000.
    - Almost as emission cease, heating will cease, and temps will stabilize in a couple of decades
  - Increasing adverse weather events in the news
  - Maziwa Zaidi factored climate change among other environmental issues in its R4D
  - Need to make our cows more efficient
  - Looking forward to achieving today's objectives on dairy & environment with your active participation:
    - Increased awareness of the issues and impacts in Tanzania
    - Actions we can commit to in our settings
    - Win-win solutions given increasing demand for milk

Milk demand and supply projections 2016 - 2031



Source: TLMP (2019)

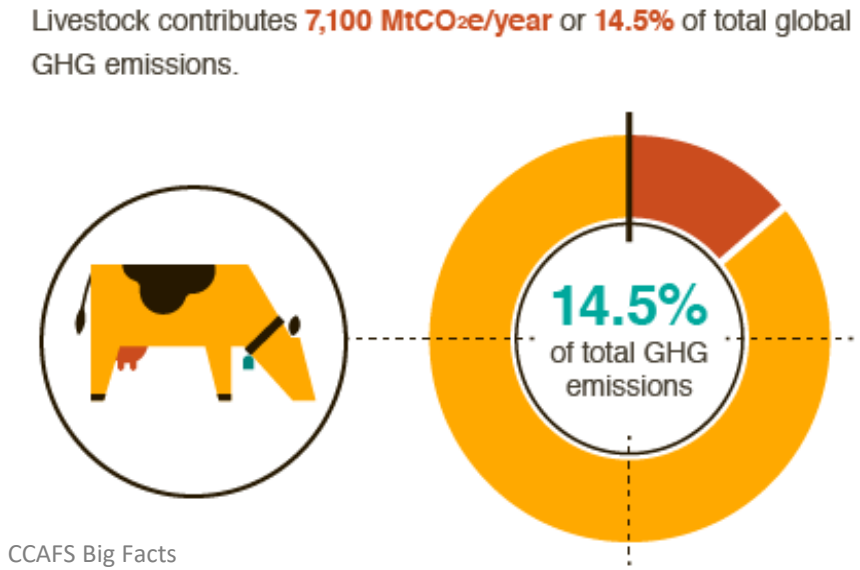
Supply-demand gap for milk will widen by 77% over the next 5 years without intervention.

Background

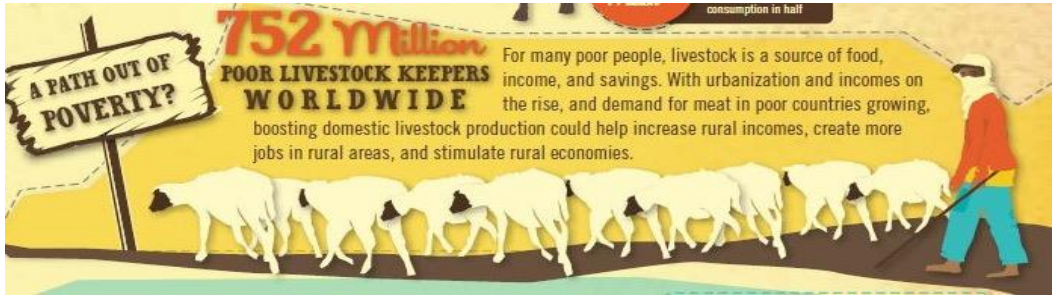
Economic opportunity from dairy development

- The livestock sector is an **important source of livelihoods** and provides food, income, and employment for many millions of people in Tanzania
- Dairy farming offers **multifaceted benefits** in close integration with crop production: human food and nutrition, employment creation, improvement of household incomes, provision of draught power, and nutrient cycling through manure
- Although the Tanzanian livestock sector is expanding, the **rate of growth does not match the increased demand** for livestock products. Low livestock productivity is one of the principal reasons why domestic production is unable to meet this demand.
- Despite the opportunities and benefits that increased dairy production could bring to Tanzania, **livestock systems are also widely recognized as key drivers of global environmental degradation, including increased nutrient loads, greenhouse gas (GHG) emissions**, water use, grassland degradation, and land-use conversion.
- To contribute towards the achievement of the Tanzania Development Vision, the government, led by the Ministry of Livestock and Fisheries (MLF), launched the **Tanzania Livestock Master Plan (LMP) in 2017**.

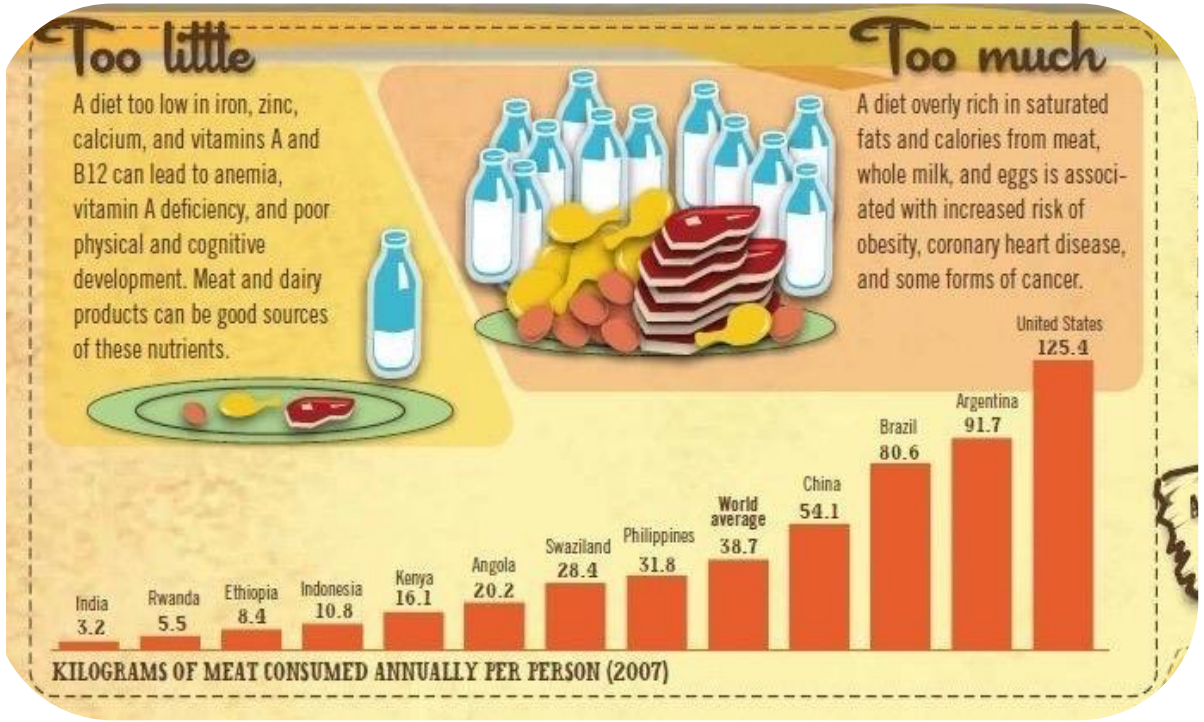
Livestock: the good, bad and complicated



CCAFS Big Facts



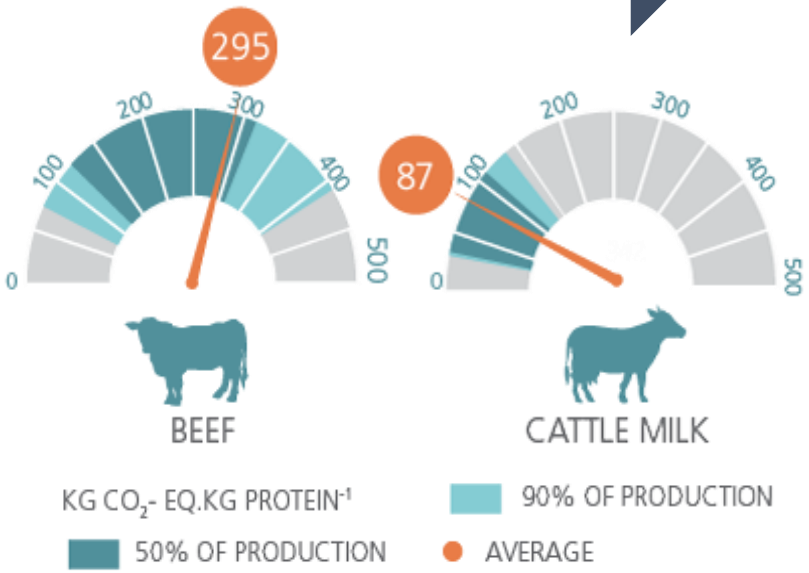
ifpri Insights



Low productivity and resource use inefficiencies

Poor feeding, husbandry, breeds, health…

…limits milk productivity



…and causes high greenhouse gas emission intensities

Tanzania policy response

In response, the Tanzanian government has undertaken several initiatives including national policies, strategies, and plans; some of the most important include the following:

- The Tanzania Development Vision (2025): *By year 2025 there should be a livestock sector, which to a large extent shall be commercially run, modern and sustainable, using improved and highly productive livestock to ensure food security, improved income for households and the nation while conserving the environment*
- The Livestock Policy (2006)
- The National Environmental Policy (1997): Vice President's office coordinating a review
- The Agriculture Policy (2013)
- The National Climate Change Strategy (2012): objective is to enhance Tanzania's technical, institutional, and individual capacity to address climate change challenges; acquiring appropriate technologies for climate-smart livestock production systems, promote integrated rangeland management; elaborates mitigation and adaptation options
- The Land Policy (1995)
- Internationally, Tanzania ratified the ***United Nations Framework Convention on Climate Change and the Kyoto Protocol*** in 1996 and 2002 respectively, and engaged in a legally binding emission reduction commitment and actions to address climate change.
- The National Livestock Research Agenda

The need for climate-smart dairy development

In Tanzania, there is a pressing need for the development and scaling of climate-smart dairy production, one that leads to win-win environmental and productivity benefits and can be a future-proof model to other countries

Research insights

Investing in rural people

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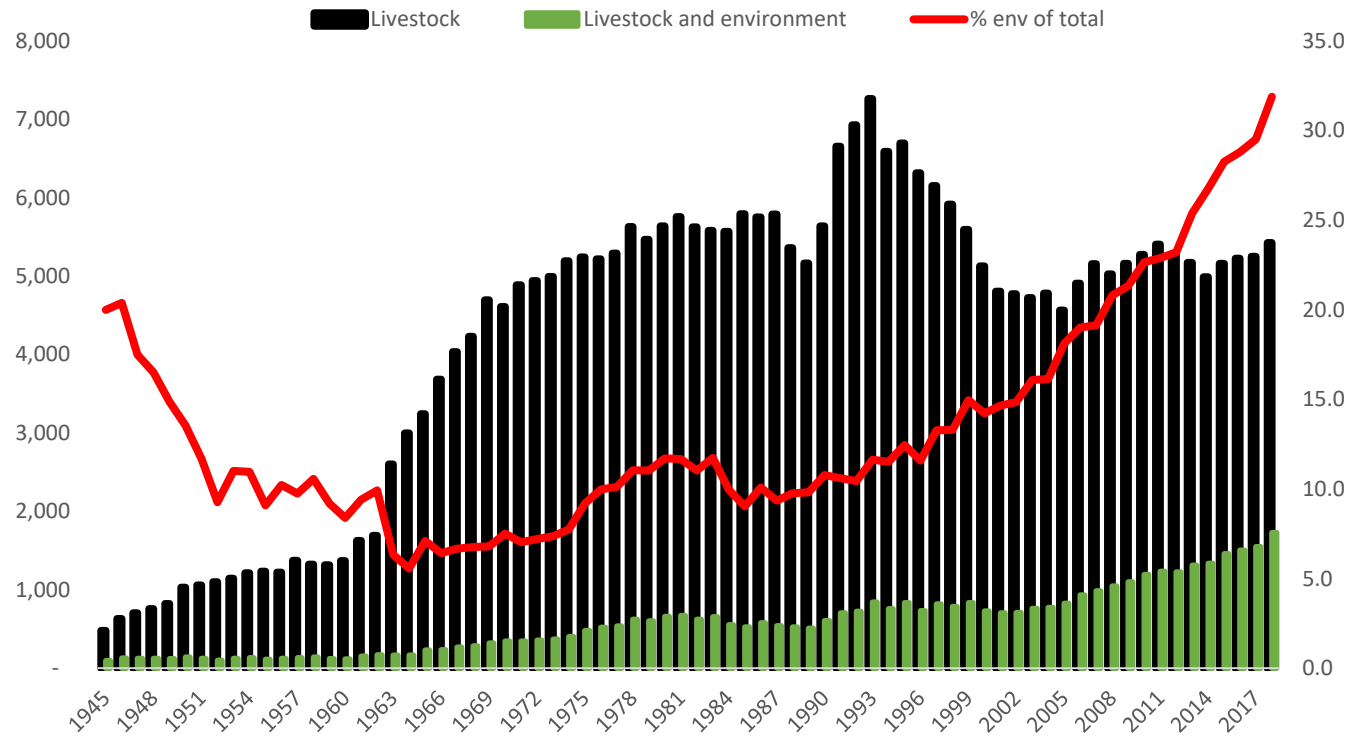
More Milk in Tanzania

Negative narratives overshadow livelihood contributions

More meat, milk and eggs by and for the poor

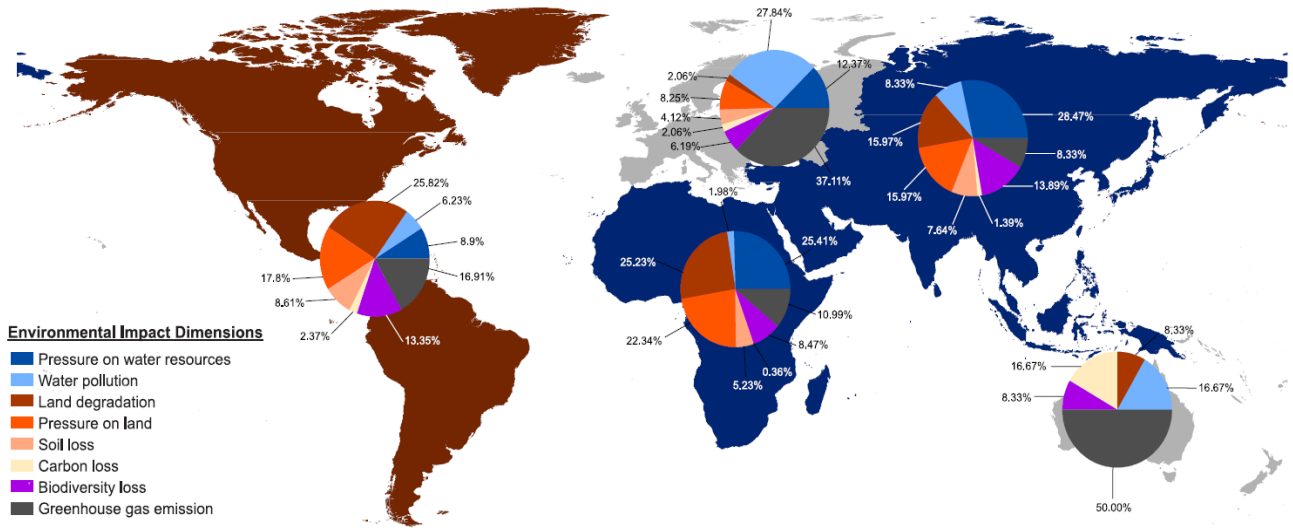
- The livestock sector and its environmental impacts have been a subject of growing global concern**. Livestock has been universally criticized** for its large contribution to GHG emissions, air pollution, high water consumption, land-use change, and a loss of biodiversity
- **Overconsumption of animal source foods is also linked to adverse effects on human health**. A diet overly rich in saturated fats and calories from meat, whole milk, and eggs is associated with increased risk of obesity, coronary heart disease, and some forms of cancer.
- However, these **negative narratives overshadow the various complex and often positive roles livestock plays in low and middle-income countries like Tanzania**. A singular focus on livestock-associated environmental impacts ignores livestock's crucial livelihood function in smallholder systems related to nutrition, income, asset provision, insurance, and nutrient cycling.
- The negative narratives have contributed to **a lack of public and private investments in research, policies and projects centered around livestock**.

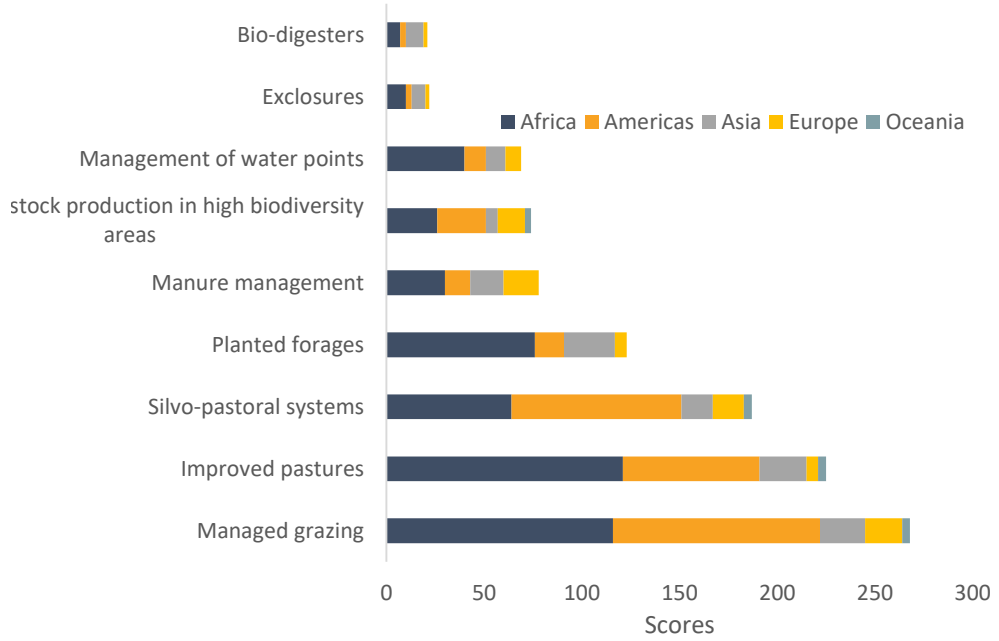
Livestock and environment research from Africa is limited



Paul, B.K., Butterbach-Bahl, K., Notenbaert, A., Nderi, A.N., Ericksen, P. (2020). Sustainable livestock development in low and middle income countries – shedding light on evidence-based solutions. *Environmental Research Letters.* https://iopscience.iop.org/article/10.1088/1748-9326/abc278

Environmental impacts and solutions – what experts say





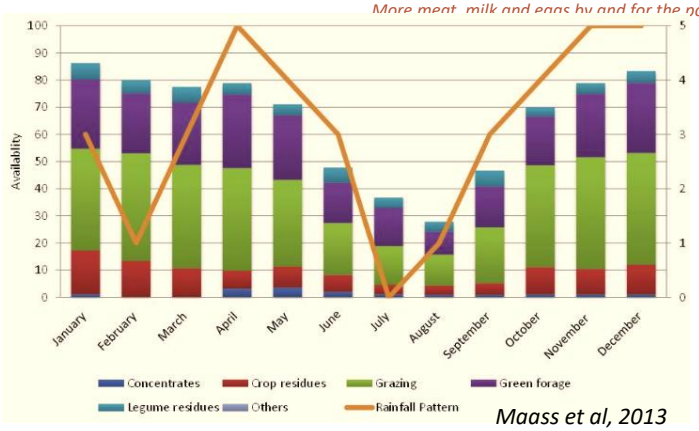
Paul, B.K., Butterbach-Bahl, K., Notenbaert, A., Nderi, A.N., Ericksen, P. (2020). Sustainable livestock development in low and middle income countries – shedding light on evidence-based solutions. *Environmental Research Letters.* https://iopscience.iop.org/article/10.1088/1748-9326/abc278

Improved feeding and forages can deliver win-win solutions for people and planet

More meat, milk and eggs by and for the poor

- In Tanzania, the primary aim is to improve smallholder livelihoods; **mitigating negative environmental impacts is a co-benefit**

- Consistently **scarce quantities and inadequate quality** of livestock feed challenge Tanzania's mixed-crop-livestock farmers especially during the dry season
- Feed also constitutes a significant dairy production **cost** and is generally cited as one of the biggest **risks of climate change**
- **Tanzania has one of the lowest feed conversions** for milk globally (i.e. the highest amounts of feed are needed to produce milk, mainly due to poor livestock diets - crop residues, grazing, collected vegetation, and other opportunistic feed)
- One key approach to address feed scarcity and low productivity has been to develop improved feed and forage options. **Feeding improved forages benefits farmers** with higher milk production for consumption and sale



Maass et al, 2013

Tropical forages…






Paul, B.K.; Groot, J.C.; Maass, B.L.; Notenbaert, A.M.; Herrero, M.; Tittonell, P.A. (2020) Improved feeding and forages at a crossroads: Farming systems approaches for sustainable livestock development in East Africa. Outlook on Agriculture 8 p. https://cgspace.cgiar.org/handle/10568/107432

Climate adaptation

Brachiaria grasses adapted to drought and low fertility

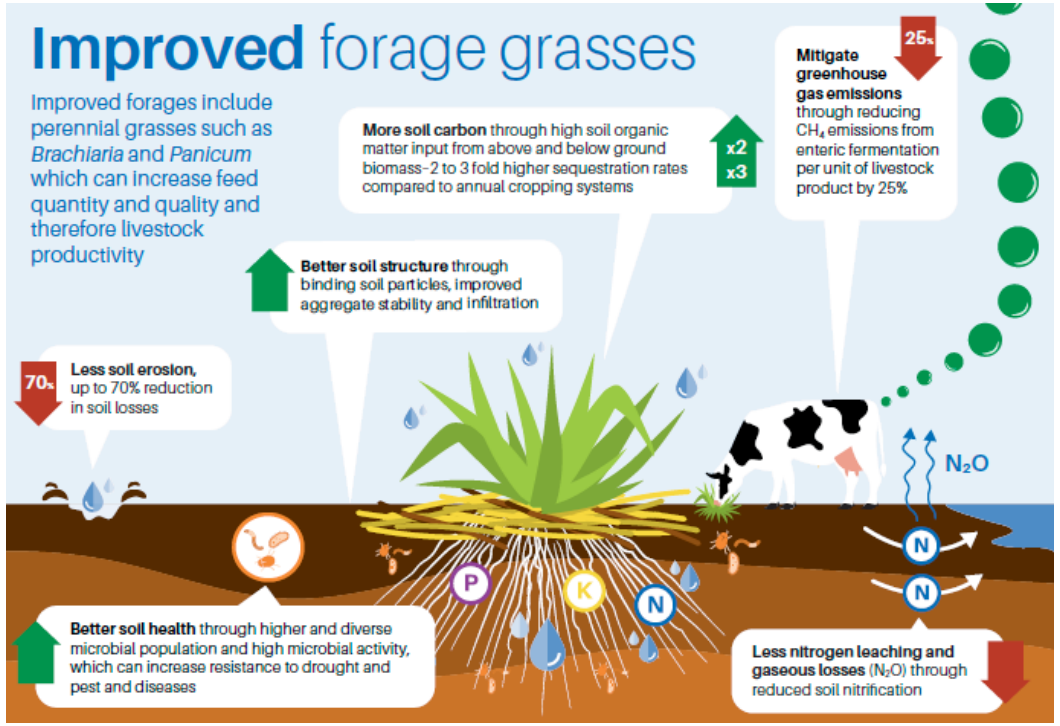
Background:

- *Brachiaria* grasses are well known for their adaptation to low soil fertility
- Great inter and intra-specific diversity in adaption to stresses, including drought

Assumptions

- *Brachiaria* grasses perform better under combined stress of drought and low fertility than Napier grass
- Adaptation to drought conditions is a achieved through increasing access to water by deep and large roots and or regulation of water loss at leaf level

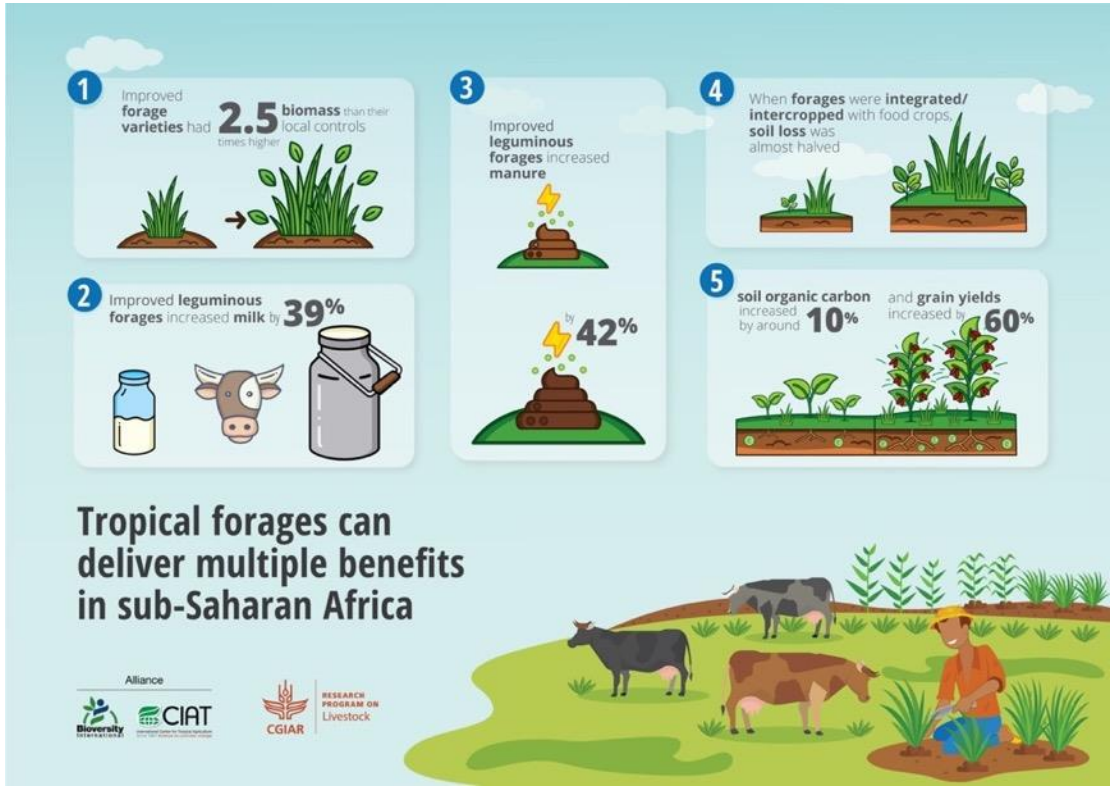
Climate and soil co-benefits



CIAT. 2019. Soil and climate benefits of improved forage grasses. International Center for Tropical Agriculture, Nairobi, Kenya. 1p. https://hdl.handle.net/10568/107153

- Higher-quality feeds mean livestock produces **less GHG emissions** because they are easier to digest and because proportionally less feed goes to maintaining the animal as compared to producing milk.
- In addition to shrinking GHG emissions per litre of milk planted **forages can boost soil organic carbon (SOC)** through their deep-rootedness and perennial nature, promote soil rehabilitation, and improve soil quality
- Soils under well-managed forage grasses exhibit **positive soil-health qualities** such as higher organic matter concentrations, efficient nutrient use, low susceptibility to erosion, and good structure

Multiple, synergetic benefits of tropical forages



Improved livestock feeding and forages can heighten productivity and incomes, decrease emission intensity as a co-benefit, increase manure quantity and quality, and improve soil fertility health. If well integrated with crop production, they can also heighten food productivity

Paul, B.K.; Koge, J.; Maass, B.L.; Notenbaert, A.; Peters, M.; Groot, J.C.J.; Tittonell, P. (2020) Tropical forage technologies can deliver multiple benefits in Sub-Saharan Africa. A meta-analysis. Agronomy for Sustainable Development 40:22. https://hdl.handle.net/10568/108642

Flagging environmental impacts with CLEANED in Tanga region

		Productivity		Land requirements		Erosion			Nutrients			GHG emissions		
		Total supply (FPCM)	Productivity (FPCM/ha)	Land used (ha)	Land used per product (ha/MT FPCM)	Soil lost (kg)	Soil lost per area (kg/ha)	Soil lost per product (kg/MT FPCM)	N lost (kg)	N lost per area (kg/ha)	N lost per product (kg/kg FPCM)	Total emissions (kg CO2-eq)	Emissions per area (kg CO2-eq/ha)	Emissions per product (kg CO2-eq/MT FPCM)
Mixed crop-livestock enterprise	Genetics		-	-	-	-		-	-		-	-		-
	Feed	+++	+	---	+	---	+	++	---	+	++	---	-	
	Health	+++	+	---	+	---		+	---	+	+	---		+
	Combined	+++	++	---	++	---	+	++	---	+	++	---	-	+
Agro-pastoral enterprise	Genetics	++	+++	++	++	++		++	++		+++	+	-	++
	Feed	++	+++	++	+++	++	+	+++	++		+++	--	---	+
	Health	++	+++	++	+++	++	+	+++	++		+++	--	---	+
	Combined	+++	+++	-	++	-	+	+++	-	-	+++	--	-	++
Tanga VC	Genetics	+	++	+	+		-	+		-	+		-	+
	Feed	++	+++	+	++	+		++	+	-	++	--	---	+
	Health	++	++	+	++	+		++		-	++	--	--	
	Combined	+++	+++	-	++	-	+	++	-	+	++	--	-	+

- Economically feasible farm-level productivity increases of up to 140% go hand-in-hand up to 50% reduction in greenhouse gas (GHG) emission intensities
- Absolute increases in water, land and nitrogen requirements in mixed crop-livestock systems call for careful management of stocks and quality of these resources

Notenbaert, A., Groot, J.C.J., Herrero, M., Birnholz, C., Paul, B.K., Pfeifer, C., Fraval, S., Lannerstad, M., McFadzean, J., Dungait, J., Morries, J., Ran, Y., Barron, J., Tittonell, P. (2020). Towards environmentally sound intensification pathways for dairy development in the Tanga region of Tanzania. https://hdl.handle.net/10568/110323

Adoption constraints

Despite its large bio-economic potential, the adoption of climate-smart dairy practices including improved feeding and forages remains below potential

1. Lack of access to inputs and output markets, and knowledge and capacity building:

2. Dairy intensification can also bring increased production risk that needs to be buffered by the farmer.

3. Constrained land availability and access.

4. Adoption of intervention packages are challenging. Improved feeding needs to go hand-in-hand with a range of other technological changes including better animal breeds, appropriate animal shelters, the provision of drinking water, and the availability of veterinary services in order to reap satisfactory production responses

5. Dairy intensification can narrow the multi-functional potential of livestock and increase production risk.

To offset these issues, investments in knowledge transfer, more effective local authority and extension structures, stronger multi-stakeholder partnerships, access to loan and credit facilities, improvement of off-farm income possibilities, better access to input markets including for artificial insemination and forage planting material, and more favourable output markets can all boost future forage adoption rates.

Policy recommendations – action for various stakeholders

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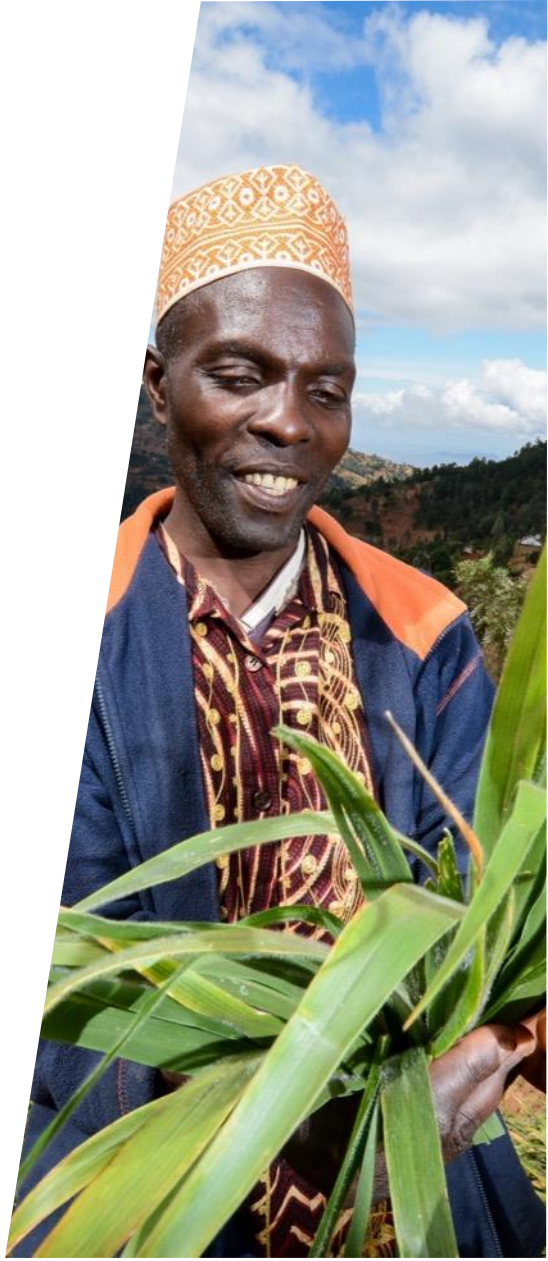
Policy recommendations I

National and local government

- Foster cross-sectoral policy cooperation at local and national level between ministries working at the livestock-environment nexus
- Strengthen the role of dairy/livestock in land restoration and climate-smart agriculture planning, making them part of the solution
- Allocate resources to strategic priorities in climate-smart dairy development
- Guide and coordinate investments from other actors in climate-smart dairy development

Non-governmental organizations and civil society

- Make improved, climate-smart livestock management an integral part of rural development programmes targeting dairy farmers
- Increase training and capacity building in the use and management of improved feeds and forages to increase community adoption
- Enhance land use planning processes and explicitly consider intra-household decision making to allocate land for feed production



Policy recommendations II

Research

- Attract accelerated investment in research for climate-smart dairy development
- Invest in the science-policy interface to translate research into practice and policy action
- Develop, target and tailor context-specific practices and technologies to heterogenous smallholder farming landscape across Tanzania (e.g., Maziwa Zaidi experiment)

Funders and private sector

- Accelerate investment in programmes promoting climate-smart dairy production systems
- Advocate for climate-smart dairy production systems
- Showcase with investments how climate-smart dairy development can generate win-wins between profits and the environment
- De-risk private-sector investments in climate-smart dairy development using funds from public and non-governmental organizations.

Media and public awareness actors

- Create awareness of the win-win potential of the dairy sector in terms of productivity, environmental protection, and resilience with improved feeds.
- Disperse the knowledge that livestock keeping can be part of environmental solutions instead of the problem.

Key messages I

- Livestock generates **multifaceted economic and cultural benefits** in Tanzania – close to half of Tanzania's population depends on livestock, and 70% of milk and meat is produced in mixed crop-livestock systems.

- Maziwa Zaidi (More Milk) is needed - **the demand for milk is projected to increase by 77% over 5 years in Tanzania**; however, the necessary rise in dairy production presents a substantial economic opportunity for smallholder farmers but also implicates potential challenges to ensure its environmental sustainability.

- **Livestock systems are the main contributor to agricultural greenhouse gas (GHG) emissions** and key drivers of global environmental degradation globally - in Tanzania, the agricultural sector is the second-largest contributor to national GHG emissions, with enteric fermentation and manure being main sources;

Key messages 2

- Research shows **combined intervention packages** including improved **animal genetics, feed, and animal health** can deliver synergetic outcomes between higher incomes and lower greenhouse gas emission intensities – if skillfully implemented, they can nearly double farm-level productivity and reduce greenhouse gas intensities by half;

- **Improved dairy feeding and forages are key entry points**, offering **win-wins between economics and the environment**; improved tropical forages can deliver multiple benefits, from boosting incomes to climate change mitigation and soil protection co-benefits, and positive impacts on food productivity if associated with crops;

- Despite its potential to deliver win-win solutions for climate-smart dairy development, the **uptake of improved forages remains relatively low in Tanzania and requires concerted action by stakeholders**.

More reading

All journal publications (open access)

1. Prioritizing climate-smart livestock technologies in rural Tanzania: a minimum data approach (cgiar.org)
2. Improved feeding and forages at a crossroads: Farming systems approaches for sustainable livestock development in East Africa (cgiar.org)
3. Sustainable livestock development in low and middle income countries - shedding light on evidence-based solutions – IOPscience
4. Tropical forage technologies can deliver multiple benefits in Sub-Saharan Africa. A meta-analysis (cgiar.org)
5. Reducing agro-environmental trade-offs through sustainable livestock intensification across smallholder systems in Northern Tanzania (cgiar.org)
6. Towards environmentally sound intensification pathways for dairy development in the Tanga region of Tanzania (cgiar.org)

Blogposts & websites

CIAT Blog (2018). Low emission livestock – how to quantify gains across Africa? https://blog.ciat.cgiar.org/low-emission-livestock-how-to-quantify-gains-across-africa/

CIAT Blog (2016). An unlikely weapon against poverty and drought. https://blog.ciat.cgiar.org/an-unlikely-weapon-against-poverty-and-drought/

CIAT Blog (2016). Livestock: Climate menace or opportunity for change? https://blog.ciat.cgiar.org/livestock-climate-menace-or-opportunity-for-change/

CLEANED website: https://ciat.cgiar.org/ciat-projects/environmental-assessments-of-livestock-systems-using/

RESEARCH PROGRAM ON Livestock

More meat milk and eggs by and for the poor

CGIAR Research Program on Livestock

The program thanks all donors and organizations which globally support its work through their contributions to the CGIAR system

The **CGIAR Research Program on Livestock** aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world.

This research was conducted as part of the CGIAR Research Program on Livestock and is supported by contributors to the CGIAR Trust Fund. Research used for this brief was also funded by the International Fund for Agricultural Development (IFAD) through the project ''Climate-smart dairy systems in East Africa through improved forages and feeding strategies: enhancing productivity and adaptive capacity while mitigating GHG emissions".

livestock.cgiar.org

Investing in rural people

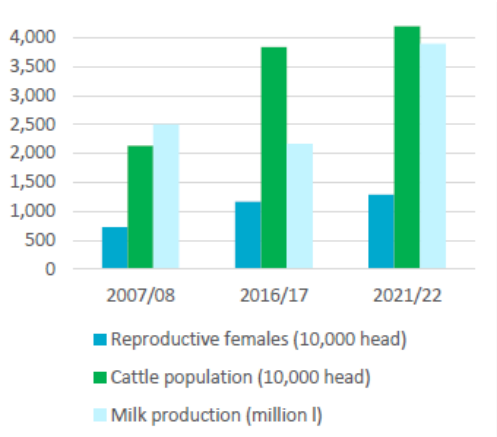
Maziwa Zaidi

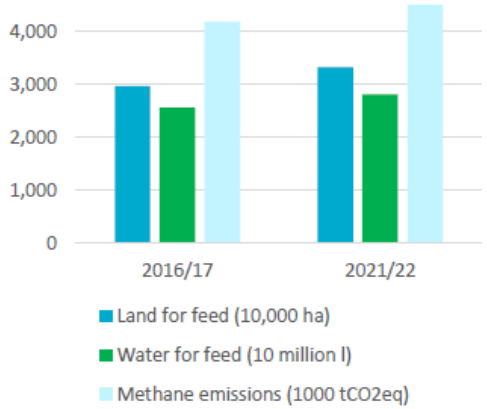
More Milk in Tanzania

…and at national level in Tanzania…

Waha, K. (2020). Feed-based dairy system intensification scenario development and national-level biophysical impact assessment. CSIRO Final Technical Report for Climate Smart Dairy Project.

- The Livestock Master Plan projects an increase number of reproductive females and national milk production by 80% from 2016/17 to 2021/22
- If improved livestock feeding alone (e.g. improved Brachiaria grasses, Desmodium and Rhodes grass hay) is to deliver this milk increase, the following is projected:
  - *Methane emissions* increase by 11% to 4.6 Mt CO_2e, but methane emission intensity decreases from 2.5 to 1.9 kg CO_2e/kg milk
  - *Land* required to produce feed increases by 12% to 33.3 Mio ha, but land required per unit milk decreases from 0.6 to 0.4 ha/kg milk
  - *Water* required to produce feed increases by 9% to 28.2 billion liter, but water required by unit milk decreases from 0.5 to 0.4 l/kg milk





More reading

Resources

Korir, M. J., Paul, B., & Nyawira, S. S. (2019). *Assessing soil health benefits of forage grasses—A review of methods* (CIAT Research Brief, p. 16). https://hdl.handle.net/10568/107097

Michael, S., Mbwambo, N., Mruttu, H., Dotto, M. M., Ndomba, C., da Silva, M., Makusaro, F., Nandonde, S., Crispin, J., Shapiro, B., Desta, S., Nigussie, K., Negassa, A., & Gebru, G. (2018). *Tanzania Livestock Master Plan*. International Livestock Research Institute. https://cgspace.cgiar.org/bitstream/handle/10568/92405/livestockMasterPlan_Tanzania.pdf?sequence=1

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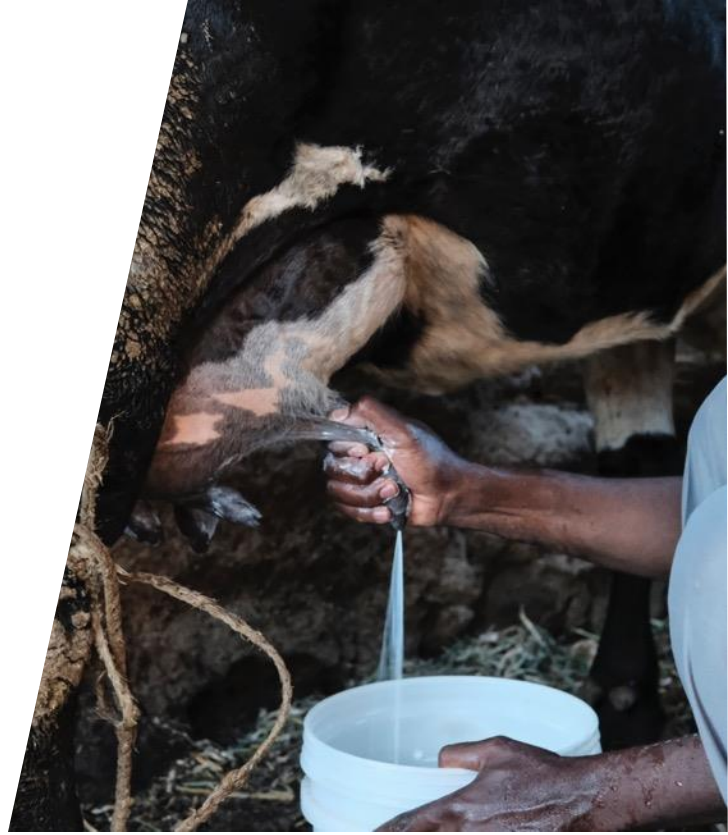

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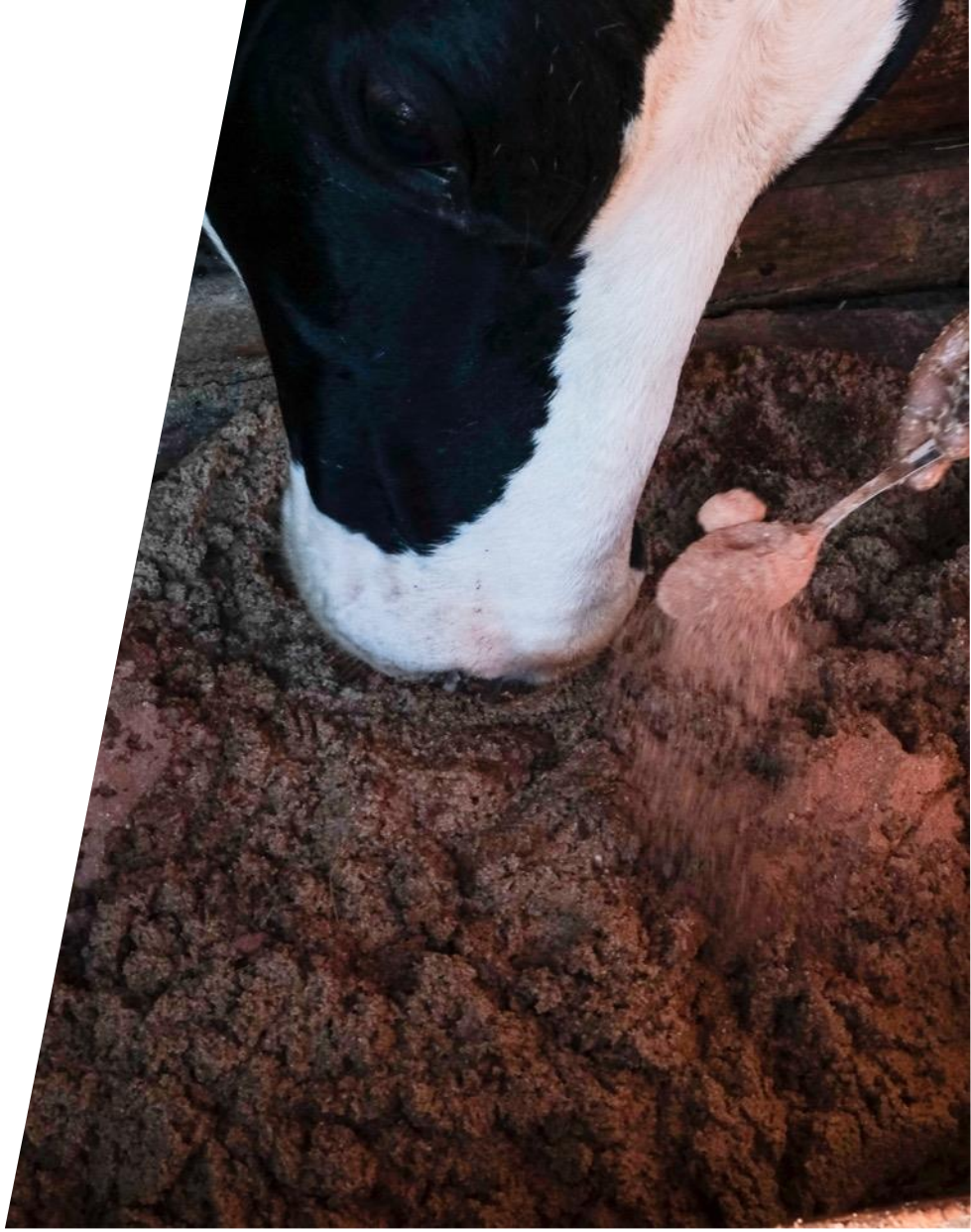

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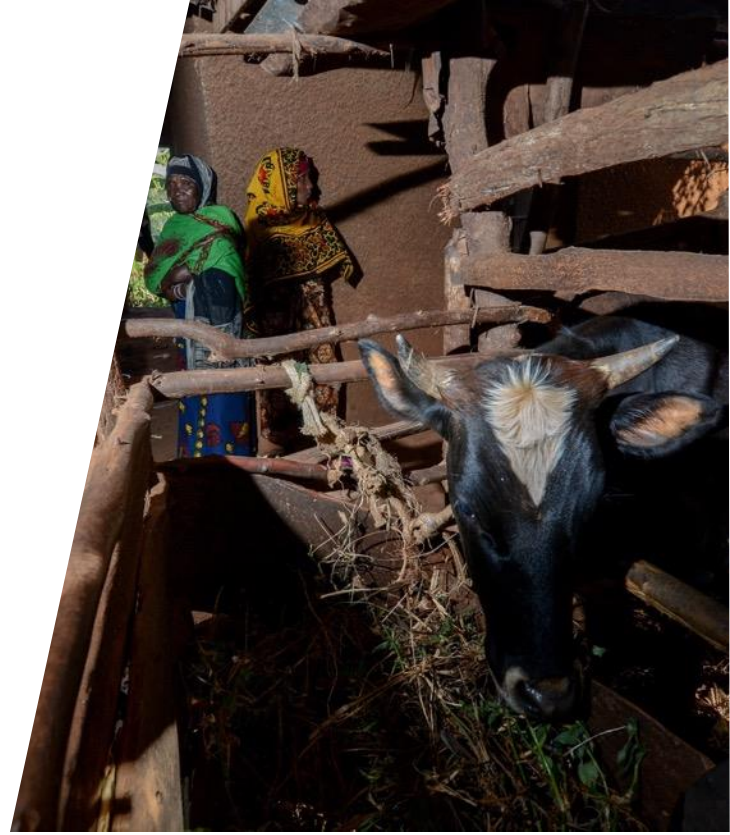

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