Improved livestock feeding and tropical forages for low emission livestock development in West and Central Africa

Regional Awareness-Raising Workshop on Low Emissions Livestock: Supporting Policy through Science in West/Central Africa

26-28 March 2019 - Dakar, Senegal

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Outline

1. **CIAT's Tropical Forages Program**

2. **Showcase research relevant to low emission livestock in West/Central Africa**

- Feeding systems and improved forage testing in *DR Congo* and *Benin*
- Reducing (potential) GHG emission intensities through livestock interventions at minimal trade-offs in *Rwanda* and *Tanzania*

3. How science can underpin low emission livestock policy

LivestockPlus - the sustainable intensification of forage-based systems

Rao et al., 2015. DOI: 10.17138/TGFT(3)59-82

Three innovative/ intensification processes:

GENETIC
Improved yield, quality, stress resistance

ECOLOGICAL
Better management of mixed crop-forage-tree-livestock systems

SOCIOECONOMIC
Better management of mixed crop-forage-tree-livestock systems

Livelihood benefits:

FOOD
and nutrition security

MANURE
Organic fertilizers

ADAPTATION
To climate change

INCOME
generation

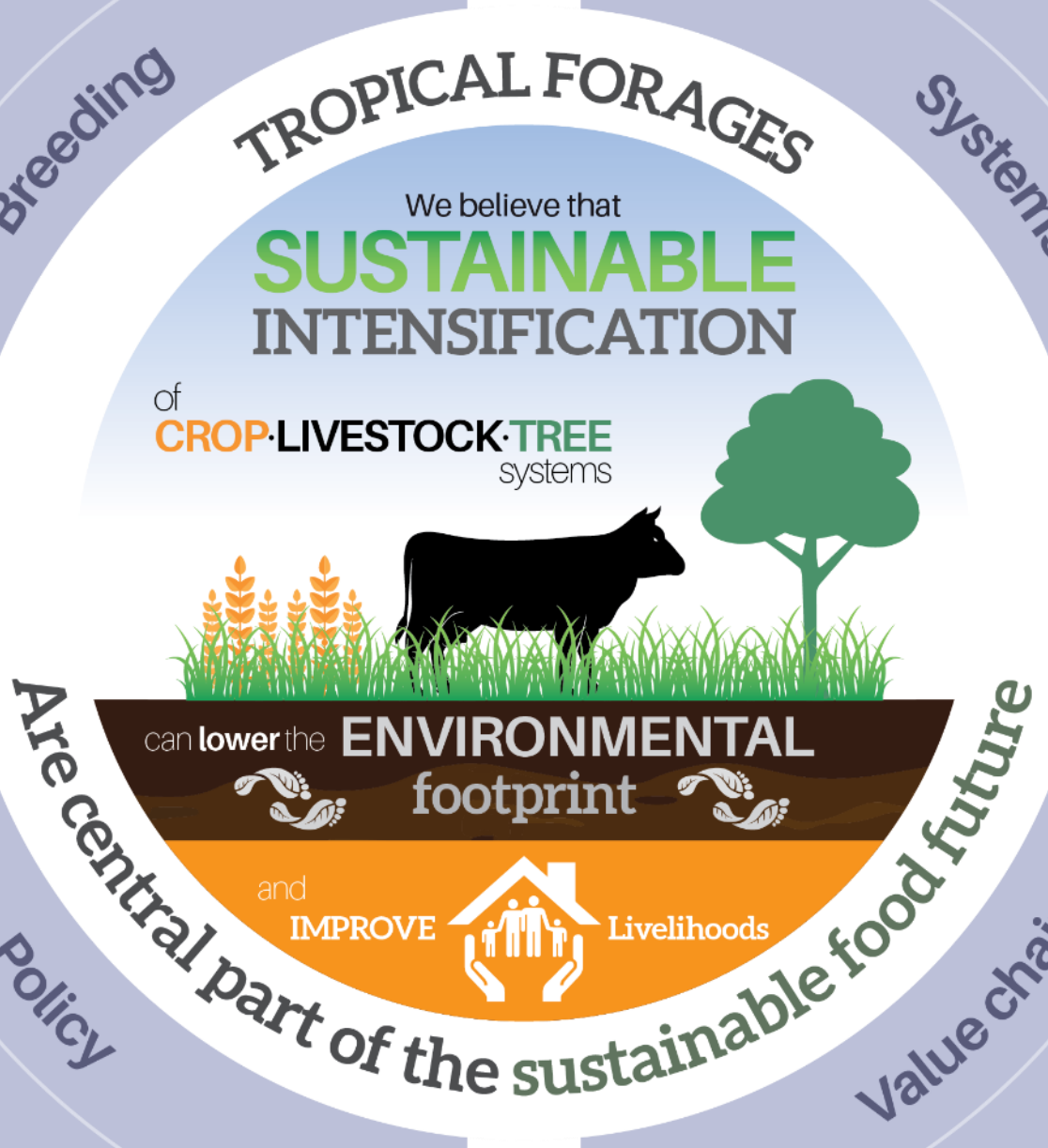
POVERTY
Alleviation

Ecosystem services

- Resource use efficiency
- Restoration of degraded lands
- Reduced per unit animal GHGs
- Mitigation of climate change
- Biodiversity conservation
- Water flows and quality
- Reduced erosion & sedimentation
- Reduce pressure to the forest – Reduce deforestation

Farmers adopt improved forages options package - management practices and adequate germplasm – to improve productivity and lower environmental footprint.

Data, tools, approaches and recommendations on efficient and environmentally friendly resource management practices in mixed crop livestock systems.



Recommendations on sustainable intensifications of crop-livestock systems, environ- mental impacts of livestock production, and on diets: Policy analysis, technical evidence for policy formulation, modeling and foresight.

Innovations for efficient and sustain- able value chains (germplasm, data on prices/ supply/ demands/ actors, value chain optimization, management practices, business models, extension approaches and financial mechanism).

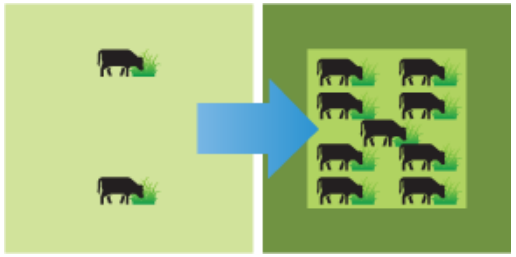
CIAT's Tropical Forages Breeding Program

Our goal

Identify and produce **improved pastures** resistant to extreme conditions…

…that contribute to **increase animal (and crop) productivity**

and reduce **environmental impacts**…



…by **reducing the areas** required to respond to livestock demand

As well as reduce the **methane and nitrous oxide emissions**

Release of 200 advanced genotypes, 4 hybrids commercialized (Cayman, Cobra, Mulato, Mulato II) – 800,000 ha worldwide

Our vision, a sustainable food future

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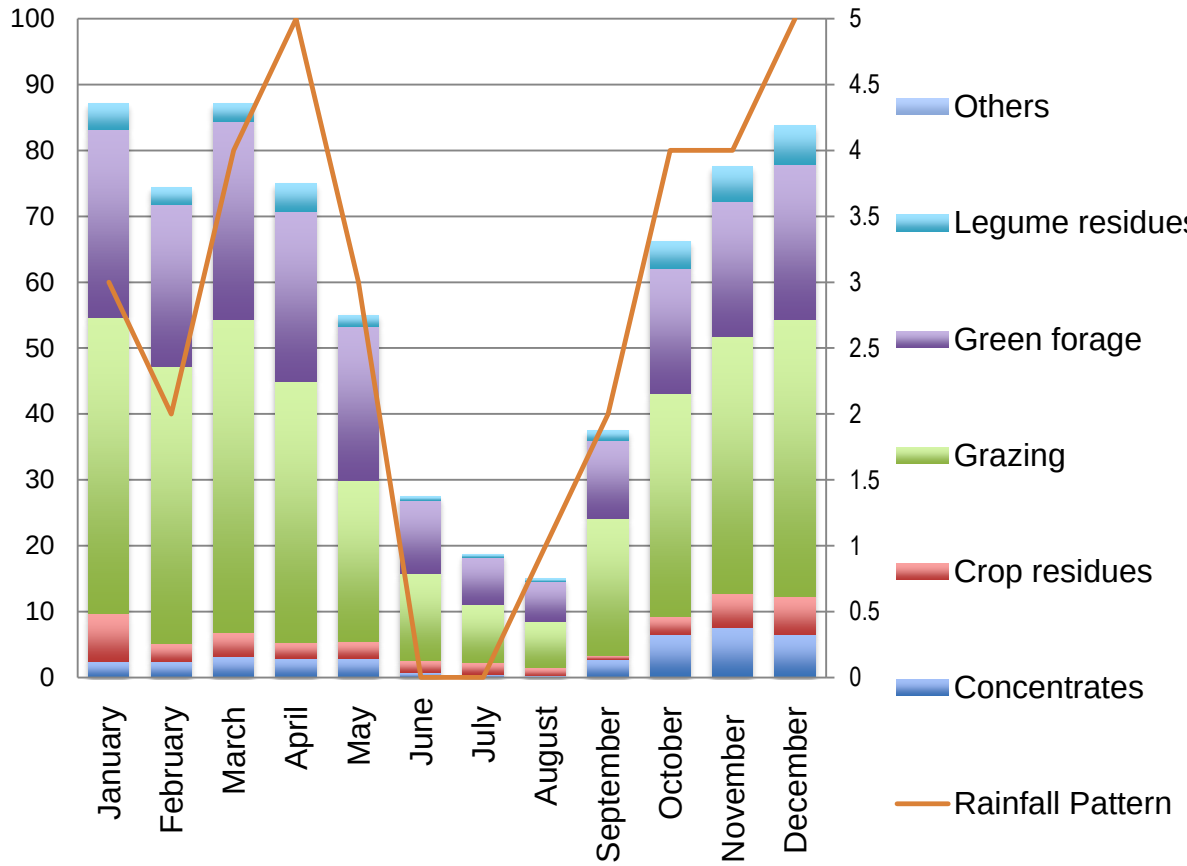
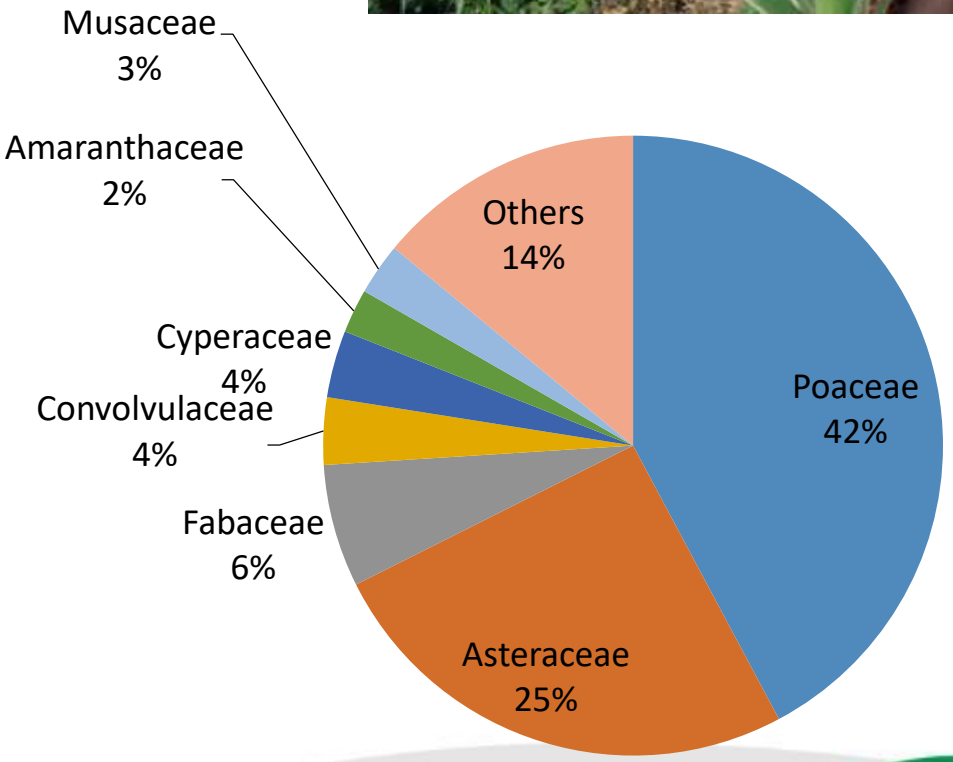
Feed availability in Eastern DR Congo

Research carried out with Université Evangelique en Afrique (UEA) and INERA

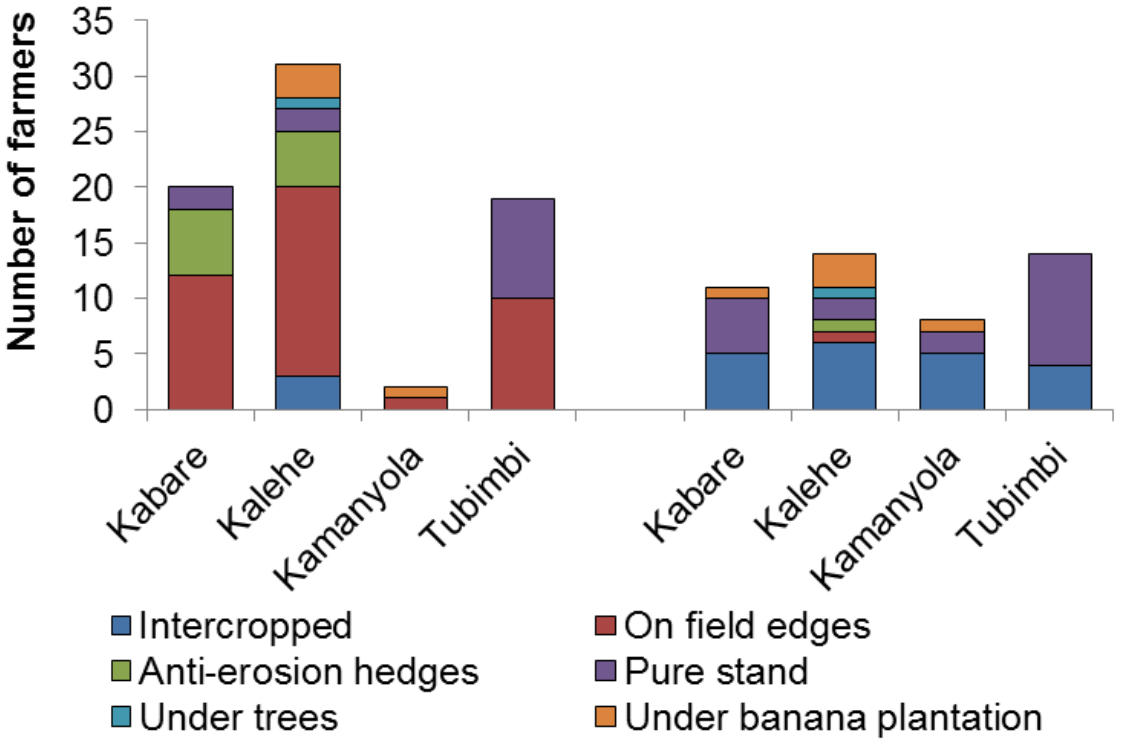




Source: Bacigale SB; Paul BK; Muhimuzi FL; Mapenzi N; Peters M; Maass BL. 2014. Characterizing feeds and feed availability in Sud-Kivu province, DR Congo. Tropical Grasslands-Forrajes Tropicales 2:9–11. doi: 10.17138/TGFT(2)9-11

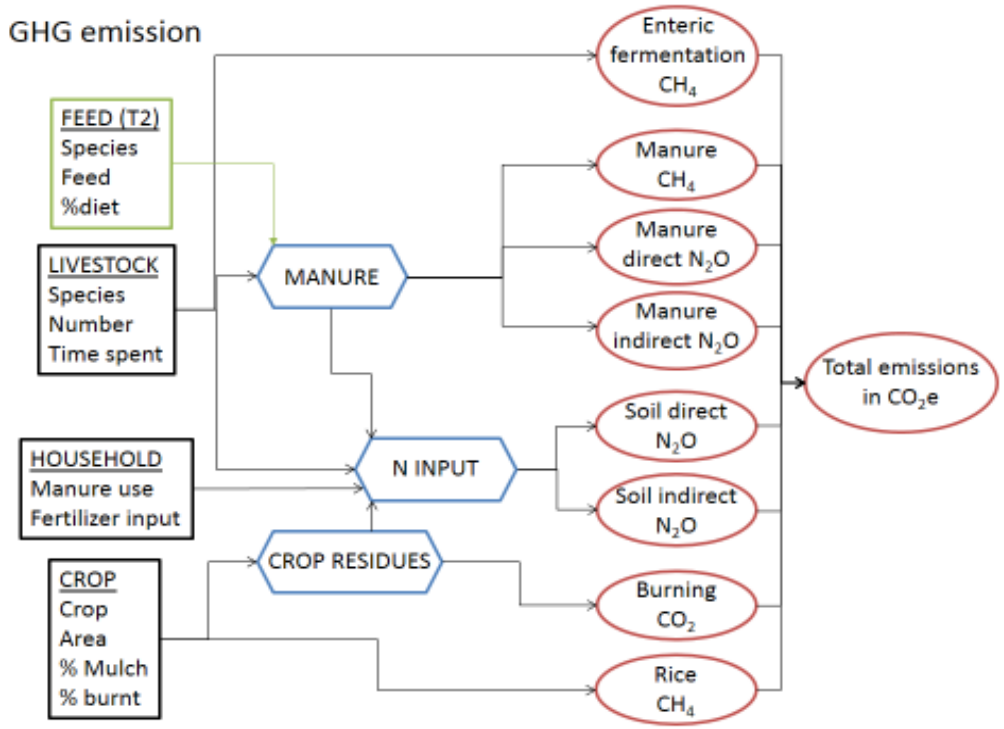
Farmer forage experimentation in Eastern DR Congo

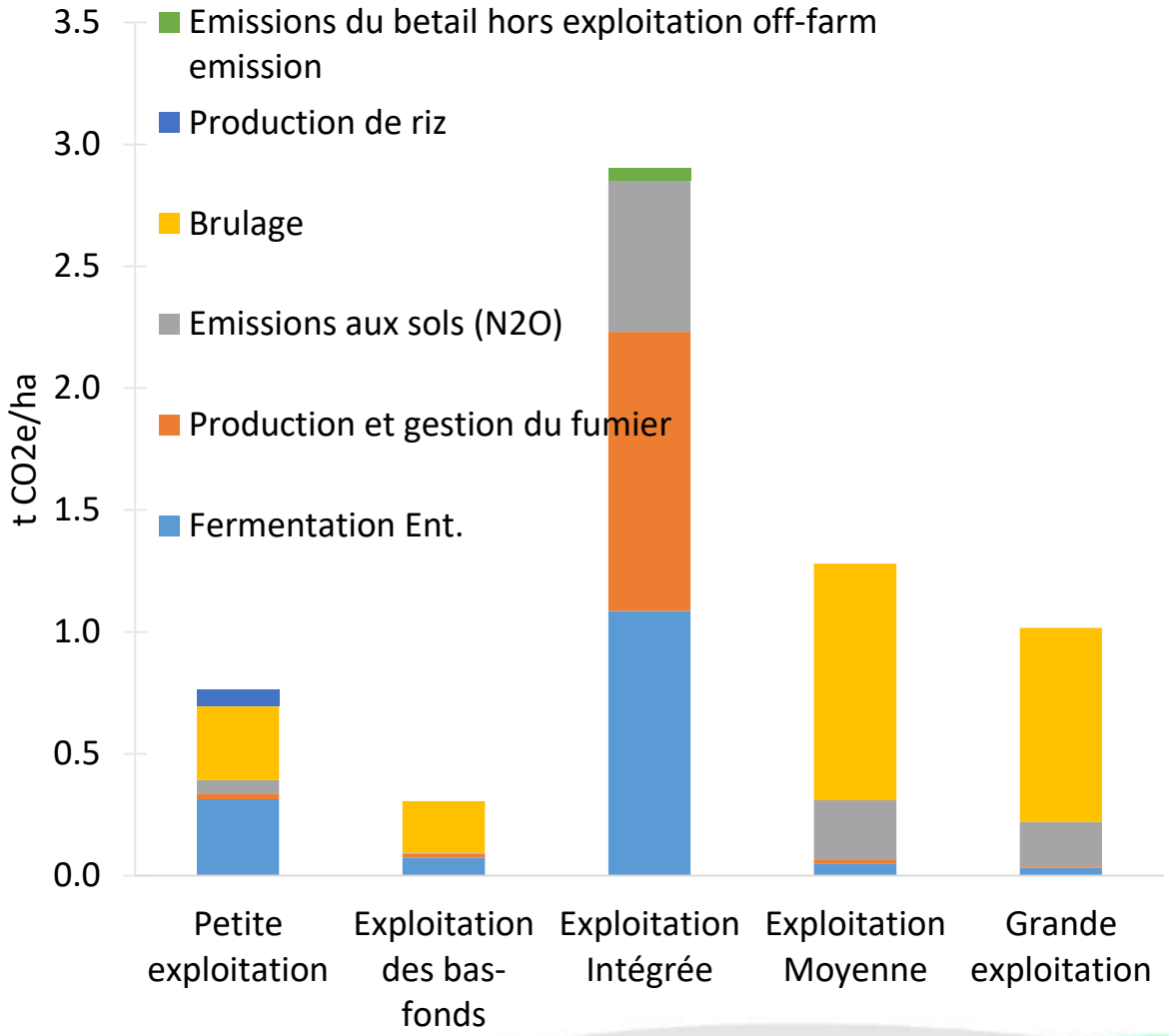
Integration of forage legumes (*Canavalia brasiliensis, Desmodium uncinatum, Stylosanthes guianensis*) and grasses (*Pennisetum purpureum, Tripsacum andersonii*) into farming systems.



Paul, B.K., et al. (2016). Towards On-farm Niches for Improved Forages in Sud-Kivu, DR Congo. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 117:2, 243-254.
URI: urn:nbn:de:hebis:34-2016092050939

GHG emissions in Zou and Collines in Benin





Birnholz, C. et al. (2017). La climato-intelligence des mesures de la GIZ pour la protection et rehabilitation des sols dans les departements Zou et Collines au Benin - Rapport d'Evaluation Rapide. Document de Travail. CIAT Publication No. 430. Nairobi, KE. 32 p. hdl.handle.net/10568/80677

Forage germplasm testing in Benin

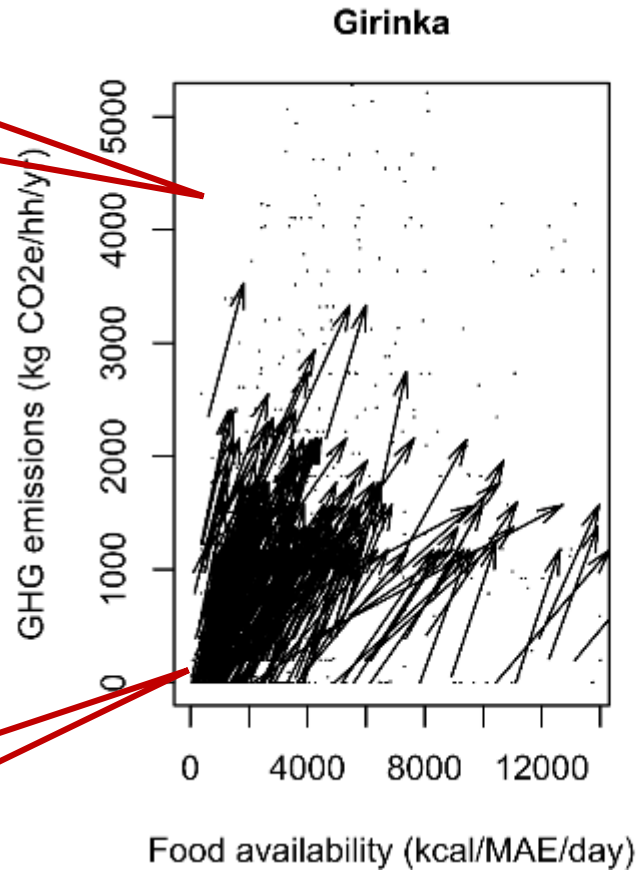
Testing in 3 different sites with INRAB and Université de Parakou

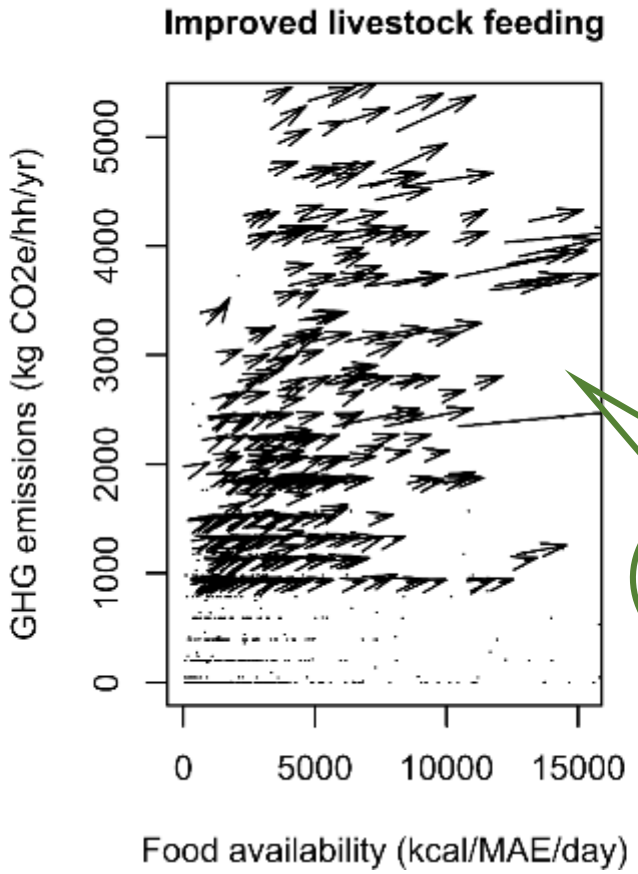
- *Brachiaria ruziziensis cv Xares*
- *Brachiaria ruziziensis cv Piata*
- *Brachiaria decubens cv Basilisk*
- *Brachiaria brizantha cv MG4*
- *Brachiaria hybrid cv Mulato II*
- *Brachiaria hybrid cv Cobra*
- *Brachiaria hybrid cv Cayman*
- *Panicum maximun cv Massaï*
- *Panicum maximum cv Mombasa*
- *Panicum maximum cv Tanzania*

Role in increasing resilience to climate change, reducing conflicts between farmers and livestock keepers, and preserving biodiversity reserves?

Potential impacts of livestock policies in Rwanda - GHG vs. food security trade-offs

GHGe increase





Pro-poor

Only small GHG increase

Study carried out with RAB and other partners

B.K. Paul, et al. 2018. Agricultural Intensification Scenarios, household food availability and greenhouse gas emissions in Rwanda: Ex-ante impacts and trade-offs. *Agricultural Systems*. DOI: 10.1016/j.agsy.2017.02.007

Food security and carbon hoofprints

THOMSON REUTERS FOUNDATION NEWS

by Georgina Smith | @georginalsmith | CIAT (International Center for Tropical Agriculture)
Tuesday, 21 June 2016 10:18 GMT

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At night, Rwanda's capital Kigali is a sparkling carpet of lights. Yet the tightly packed white beams throw light on a more serious circumstance facing the Rwandan government across the country. Population pressure.

How to feed more people with fewer resources was a topic much deliberated at the **Africa Agriculture Science Week last week** in Kigali. Rwanda is among the most densely populated countries in the world; its population is expected to double to 26 million by 2050.

Farm plots are already among the smallest in sub-Sahara Africa. Yet with declining plot sizes, it's not only food security which is at stake; but nutrition security too, say experts.

In Rwanda, reducing carbon emissions from livestock production can't come at the cost of lowering production – millions of farmers depend on it for their livelihoods.

But farmers need advice so they can make environmental choices that won't hurt their income or livelihoods. **This working paper just released outlines options** for integrating forages in Rwandan cropping systems to increase forage production.

In the meantime, research teams are weighing up trade-offs so that Rwanda's farmers can lower their carbon footprint without lowering their production. One way to do that is to improve feed quality for livestock.

Research is informing IFAD loan Rwanda Dairy Development Project (RDDP)

Potential to support other relevant policies in Rwanda? E.g. Green Growth and Climate Resilience Strategy; Climate Change and Low Carbon Development Strategy; NDCs; NAMA…

CIAT Website English

WHAT CIAT Blog WHERE

"One cow" program can cut poverty and pave the way for lower 'hoofprints' too

by Georgina Smith | Mar 24, 2017

CLEANED: minimum-data environmental ex-ante assessment tool

The quantification of

1. Production (absolute and per ha)
2. Land requirement for feed production (ha, ha/kg product)
3. **GHG emissions (absolute, per ha, per kg product, per protein)**
4. Soil health (Erosion, NUE, % area leached, % area mined)
5. Water use (absolute, per ha, per kg product, per protein)

+ simple Cost/Benefit calculations for intervention scenarios

In different livestock production systems; under different scenarios

Feed basket data (dry and wet season) is the core of the model – PGIS, survey data, expert opinion, empirical measurements

CLEANED X: Case study in Lushoto, Tanzania

		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	+++	+++	-	++	-	+	++	-	+	++	--	-	+

- **Productivity increases** go hand-in-hand with increased resource-use and GHG emission **efficiency**.
- **Absolute increases in natural resource use** point to the need for effective management of stocks and quality of these resources (e.g. appropriate manure management to prevent nutrient mining).

Notenbaert et al. (in prep).

How science can underpin low emission livestock policies

1. Developing and testing GHG reducing technologies – context-specific and targeted solutions
2. Quantifying GHG reduction impacts and associated trade-offs or co-benefits – including SOC
3. Quantify baselines and contributions at national level (MRVs, progress towards NDCs)
4. Training and capacity building

Strong science-policy partnerships are needed!

Merci!

Acknowledgements

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CGIAR | RESEARCH PROGRAM ON Livestock

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