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CIAT
International Center for Tropical Agriculture
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Environmental ex-ante impact assessment with

CLEANED

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THE ROLE OF MODELLING IN NATIONAL ESTIMATION OF LIVESTOCK EMISSIONS

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Bioversity International and the International Center for Tropical Agriculture (CIAT) are CGIAR Research Centers.
CGIAR is a global research partnership for a food-secure future.

The CLEANED model

- Compares baseline environmental footprints of different livestock production systems with footprints after “intervention scenarios”

		Productivity		Land requirements		Water use			GHG emissions		
		Total supply (FPCM)	Productivity (FPCM/ha)	Land used (ha)	Land used per product (ha/MT FPCM)	Total water use (m3)	Water use per area (m3/ha)	Water use per product (m3/MT 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	Baseline	*1,157*	*525*	*2.2*	*1.9*	*1,234*	*560*	*1.1*	*2,647*	*1,202*	*3.7*
	Genetics		-	-	-	-		-	-		-
	Feed	+++	+	---	+	---		+	---	-	++
	Health	+++	+	---	+	---		+	---		+
	Combined	+++	++	---	++	---		++	---	-	++
Agro-pastoral enterprise	Baseline	*10,862*	*195*	*55.7*	*5.1*	*28,570*	*513*	*2.6*	*36,271*	*652*	*7.7*
	Genetics	++	+++	++	++	++		++	+	-	++
	Feed	++	+++	++	+++	++	-	+++	--	---	+++
	Health	++	+++	++	+++	++	-	+++	--	---	+++
	Combined	+++	+++	-	++	-		++	--	-	+++
Tanga VC	Baseline	*135,372,101*	*235*	*576,462*	*4.3*	*299,119,461*	*519*	*2.2*	*413,748,868*	*718*	*6.6*
	Genetics		+		+			+			+
	Feed	++	+++	++	++	+		++		--	++
	Health	+++	+++	++	+++	+	-	+++	---	---	++
	Combined	+++	+++	+	+++		-	++	---	---	++

---: negative change of more than 50%, --: negative change of 20-50%, -: negative change of 5-20%, +: positive change of 5-20%, ++: positive change of 20-50%, +++: positive change of more than 50%

- Static
- On-farm production

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The CLEANED model

IN

PER SYSTEM

- Per species/ category
  - Numbers of animals
  - Animal weights and productivity
  - Feed baskets
- Manure management system
- Crop mngt (fertilizer use, crop yields, nutritional values)

(- Waste along the VC)

(- Costs of interventions)

OUT

- GHG emissions and carbon sequestration (CO_2eq, CO_2eq/ha, CO_2eq/kg product)
- Land requirement for feed production (ha, ha/kg product)
- Nutrient balance (N, % of feed producing area with mining/leaching)
- Water use (mm, % of annual precipitation)

(- for intervention scenarios only: return on investments/payback period)

The CLEANED model

GHG emissions

- Ruminants and pigs
- following IPCC 2006 guidelines

- Sources:
  - Enteric fermentation
  - Manure
  - Soil
  - Rice
  - Burning

- Sinks:
  - SOC
  - Trees

Where and how used?

- CIAT-ILRI-CSIRO-SEI collaboration (with original support from BMGF)
- Further developed in the framework of the CGIAR Research Program (CRP) on Livestock

- Case study application:
  - Kenya, Tanzania , Burkina Faso, Ethiopia, Nicaragua, Honduras and Vietnam in dairy, beef and dual-purpose cattle systems

- Open access tools:
  - Pfeifer, C., Morris, J., Ouedraogo, S. and Ensor, J. 2018. CLEANED documentation: Conceptual overview of CLEANED and parameterisation of a CLEANED tool for Lushoto, Tanzania. York, UK: Stockholm Environment Institute.
    - Simplified: https://ilri.shinyapps.io/cleaned-r-resless-lushoto-tza/
    - Expert: https://ilri.shinyapps.io/cleaned-r-resless-lushoto_tza_ex/
    - Stand alone: https://github.com/ilri/CLEANED-R
  - Notenbaert, A. M. O., Mukiri, J., Van der Hoek, R., Paul, B., Koge, J., & Birnholz, C. (2019). CLEANED X-Version 2.0. 1. https://doi.org/10.7910/DVN/G0G8IY , Harvard Dataverse, V1

Next plans

- Further applications:
  - Livestock CRP priority countries (Uganda, Vietnam, Ethiopia, Tanzania)
  - Link with TZ and Rwanda Livestock Master Plans

- Model development:
  - Move to R
  - New IPCC guidelines
  - Regional/national aggregator
  - Review everything, correct errors, …
  - Sensitivity analysis

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Thank you!

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