Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

CLEANED – Validation Workshop

Dairy Value Chain Tanzania

Walter Mangesho, Birthe Paul, Jessica Mukiri, David Ngunga, Beatus Nzogela, Godfrey Ngoteya, An Notenbaert, Amos Omore

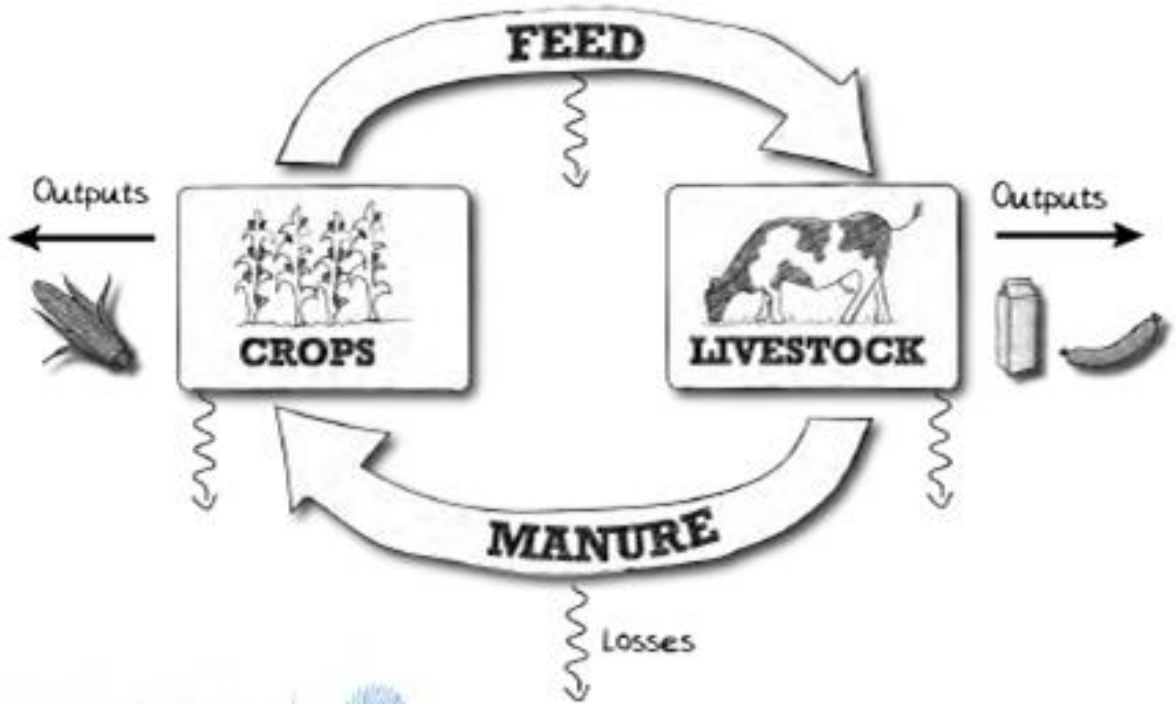
Email: cleaned@cgiar.org

CLEANED Validation Workshop: 25th – 26th March 2021

CGIAR

Welcome

- Introduction and Objectives – Jess
- Opening remarks – Godfrey
- Program overview
- Introduction + Expectations
- Start of Workshop



Objectives

Verify and discuss preliminary model results of the model CLEANED model to reflect intensive dairy livestock systems

To **assess** the relevance of CLEANED results and key decision **identify** makers/experts

Develop future best-bet integrated packages and scenarios to be modelled in CLEANED

Opening Remarks

MAZIWA ZAIDI PROJECT: About Phase I

- Maziwa Zaidi project is implemented under the CGIAR Research Program on Livestock (hereafter Livestock CRP)
- In a nutshell, the Livestock CRP is piloting integrated interventions in "**Priority Countries**", which are intended to serve as '**field laboratories**' where the Livestock CRP can test its 'Products; and take them to scale and contribute to designing integrated livestock interventions.

- The CRP Country priority program for Tanzania was branded as "Maziwa Zaidi (More Milk)
- The implementation of MZ phase I in Tanzania started in 2012-2018 to test multi-stakeholder processes (hubs and innovation platforms)

- The focus of Maziwa Zaidi Phase I was on establishing market linkages targeting farmer groups as an entry point to overcome market barriers, increase participation, improve revenue/income and livelihoods.
- It mainly targeted pre-commercial marginalized cattle keeping men and women in Tanga and Morogoro regions.

- From MZ I, it was observed that;
  - ✓ The hubs were found useful for intended purposes and progress towards sustainability.
  - ✓ Linkages starting with farmer groups are slow in terms of process and it's quicker to start with agripreneurs, who are service providers.
  - ✓ Skills training has proven effective and would scale-up by focusing more on personal self-starting entrepreneurial initiatives as well as future-oriented and proactive mindsets.

MAZIWA ZAIDI PROJECT: About Phase II

- In early 2019, the CGIAR's Livestock CRP provided additional resources to extend the work of the Maziwa Zaidi phase I to a second phase i.e., Maziwa Zaidi phase II.

- MZ Phase II entitled, "Agri-entrepreneurship, technology uptake and inclusive dairy development in Tanzania was designed to take place in between 2019 and 2021 in four districts of Kilimanjaro and Tanga region in Tanzania.

- The overall objective of the project is to pilot uptake of dairy technology packages through institutional approaches that involve inclusive agribusiness models for improved livelihoods of smallholders and environmental sustainability in Tanzania.
- This phase focuses on agribusinesses as an entry point in the dairy value chain

- The project will promote intervention packages that bundle and combine proven genetics, health and feeds technologies within institutional arrangements that not only have the potential to be profitably leveraged in various combinations by agribusinesses (depending on their demand and interest) but also that allow farmers to utilize and benefit from these bundles.

About Phase II cont'd……..

- The **delivery packages** to be profitably leveraged by agribusiness targeting producers will be: **Brachiaria grass (or other forage options)**, **manure management**, **East coast fever vaccine, and AI.**

- These will be delivered through capacitated agripreneurs and agribusinesses, using **digital platforms for farmer profiling and e-extension**, and capacity development supporting market access, safer products and effective collective action.

- i.e., the project will support agribusiness skills development and embed proven dairy technologies in the portfolio of products and services that agribusinesses and Agri-entrepreneurs deliver hence enhancing uptake of dairy technologies and innovations.

- Women- and youth-led dairy agribusinesses will be targeted with business development services (BDS) and other support services to overcome barriers to entry into lucrative nodes of the dairy value chain.

- Generally, The key assumptions that will be tested in MZ phase II are:
  1. Inclusive agribusiness approach will enhance the uptake of technology packages.
  2. Incubation/acceleration/mentorship of agripreneurs will contribute to improved business performance.
  3. Integrated technology packages will contribute to increased productivity, income and consumption of safe milk.

NB: For more information on Maziwa Zaidi kindly visit https://maziwazaidi.org

Part 1: Intensive livestock enterprise

Why is the livestock Dairy value chain is important in Tanzania: The facts

>200,000

Smallholder dairy farmers

The estimated total number of livestock dairy cattle **680,000**

Milk produced

2.4 Billion

70% *from traditional systems, 30% improved cattle systems.*

The value of livestock accounts for

5.4%

GDP

30% of 5.4% is from dairy

Increased demand for milk and dairy products

Current milk consumption 45 kg/annum, expected to increase to 100 kg/annum.

that accounts for some jobs

4.6 Million House Holds

Alliance Bioversity International CIAT

Herrero et al., (2013)

Current Environmental impacts

Negative environmental impacts:

EMISSIONS

of greenhouse gases

LAND

degradation and deforestation

WATER

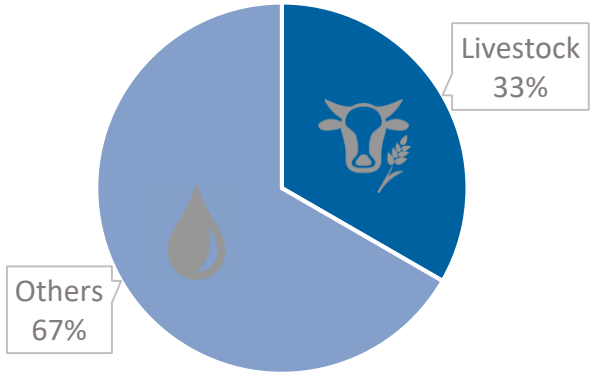
pollution and depletion

DEFORESTATION

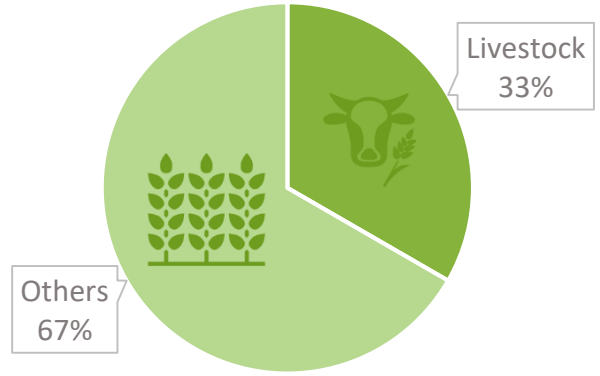
BIODIVERSITY

threatened

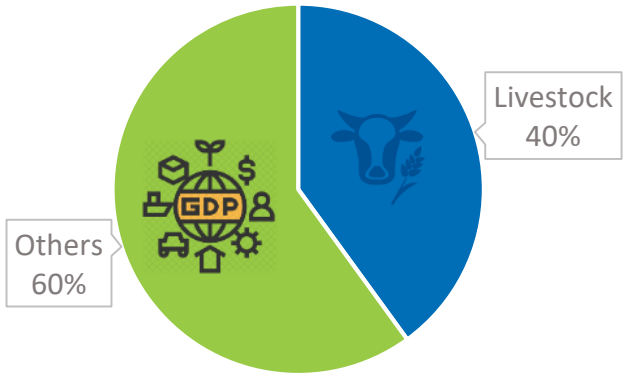
Global fresh water use

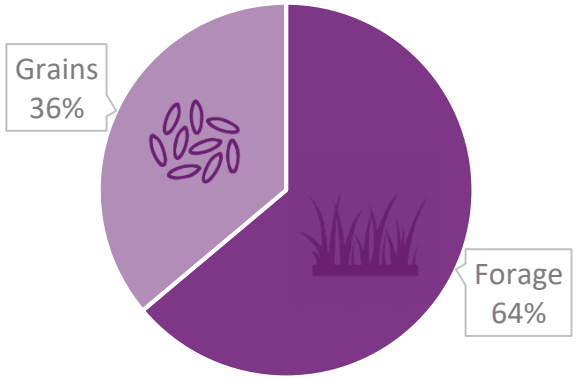


Global crop land



Global agricultural GDP





Alliance

Bioversity International

CIAT

Part 2:
CLEANED

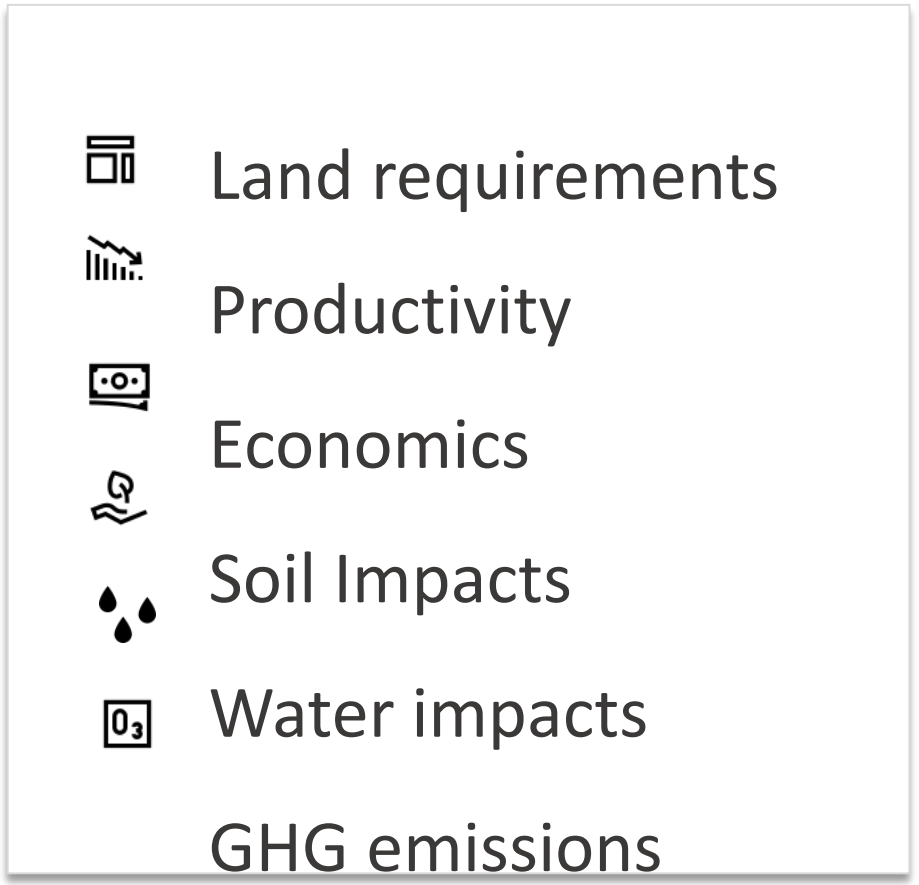
What is CLEANED?

C omprehensive
L ivestock
E nvironmental
A ssessment for Improved
N utrition, a Secured
E nvironment and Sustainable
D evelopment along Livestock and Fish Value Chains.

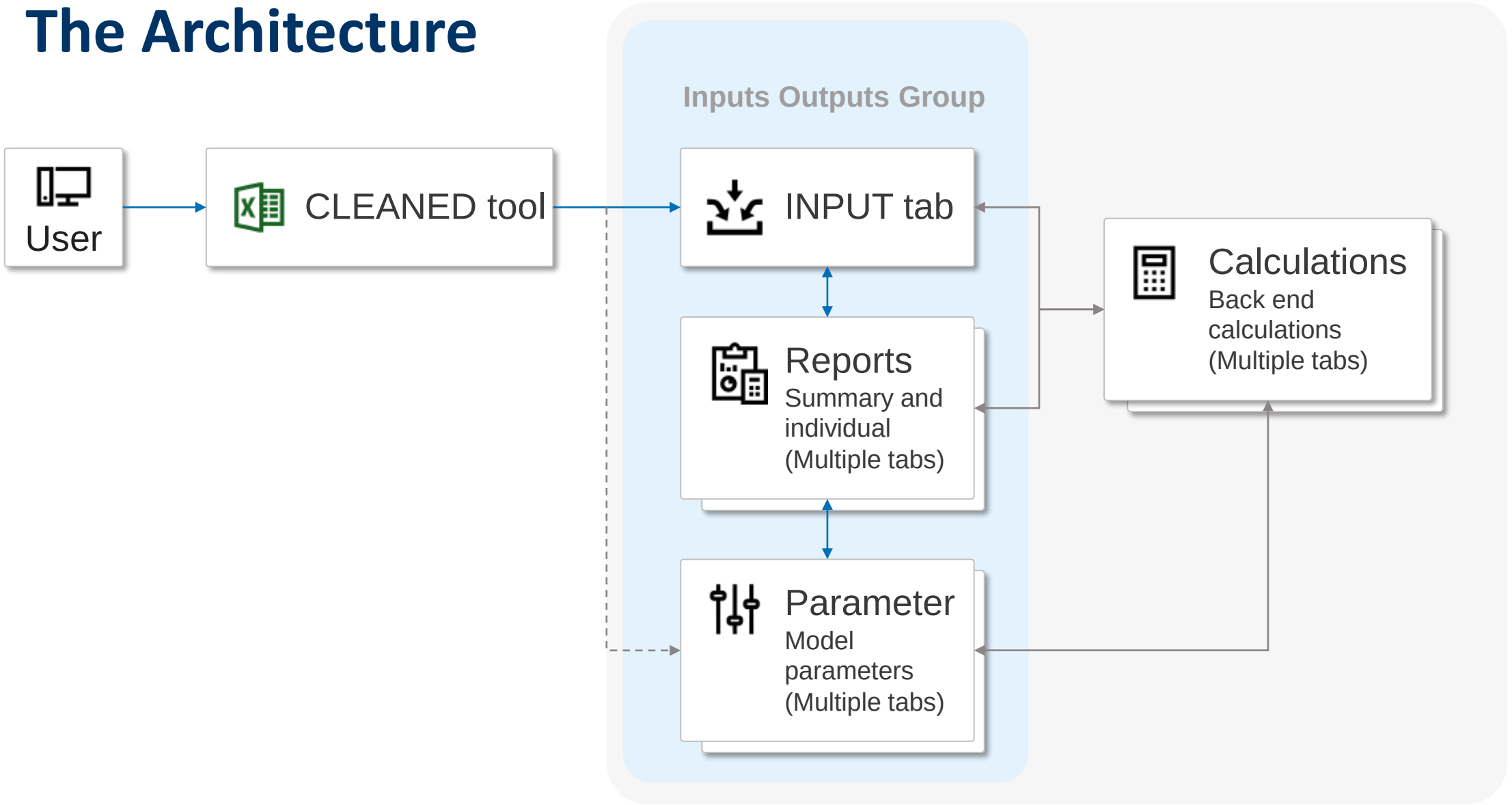
"A rapid ex-ante environmental impact assessment tool that allows users to explore multiple impacts of developing livestock value chains."

What is CLEANED

The CLEANED tool lets users explore **multiple** impacts of developing livestock value chains in explicit ways. It models the impact of intensifying livestock along multiple pathways:



The Architecture



CLEANED Calculations

Land Requirement =

Feed requirement + Feed quality ==> feed amount

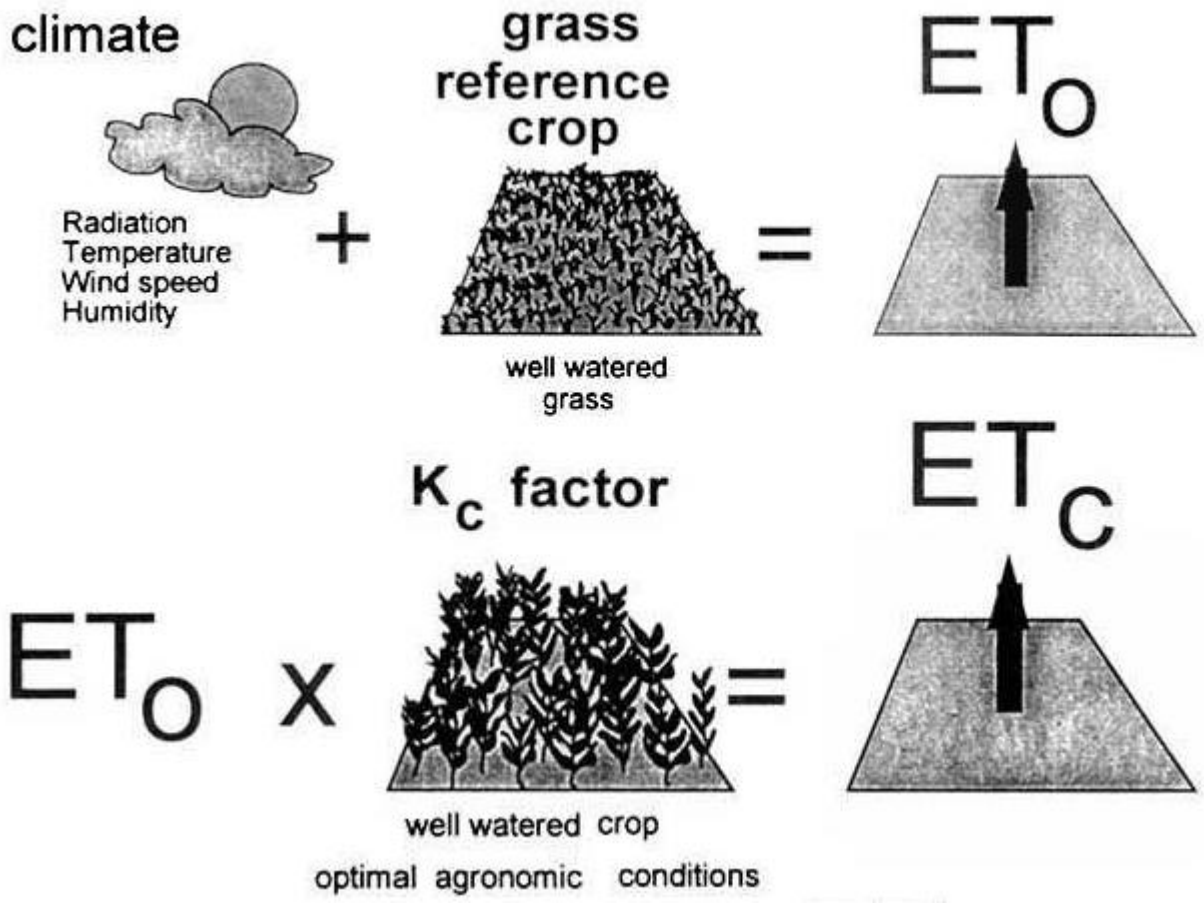
Feed amount + crop yields ==> land size

RUSLE (Revised Universal Soil Loss Equation) is widely used for estimating the rate of soil loss by **water**.

A = R x K x L x S x C x P

A: annual soil loss per acre
R: **rainfall erosivity**
K: **soil erodibility**
L: **slope length**
S: **slope steepness**
C: **vegetative cover**
P: **erosion control practices**

Water Using -> Evapotranspiration (ET)



N Balance → NUTMON

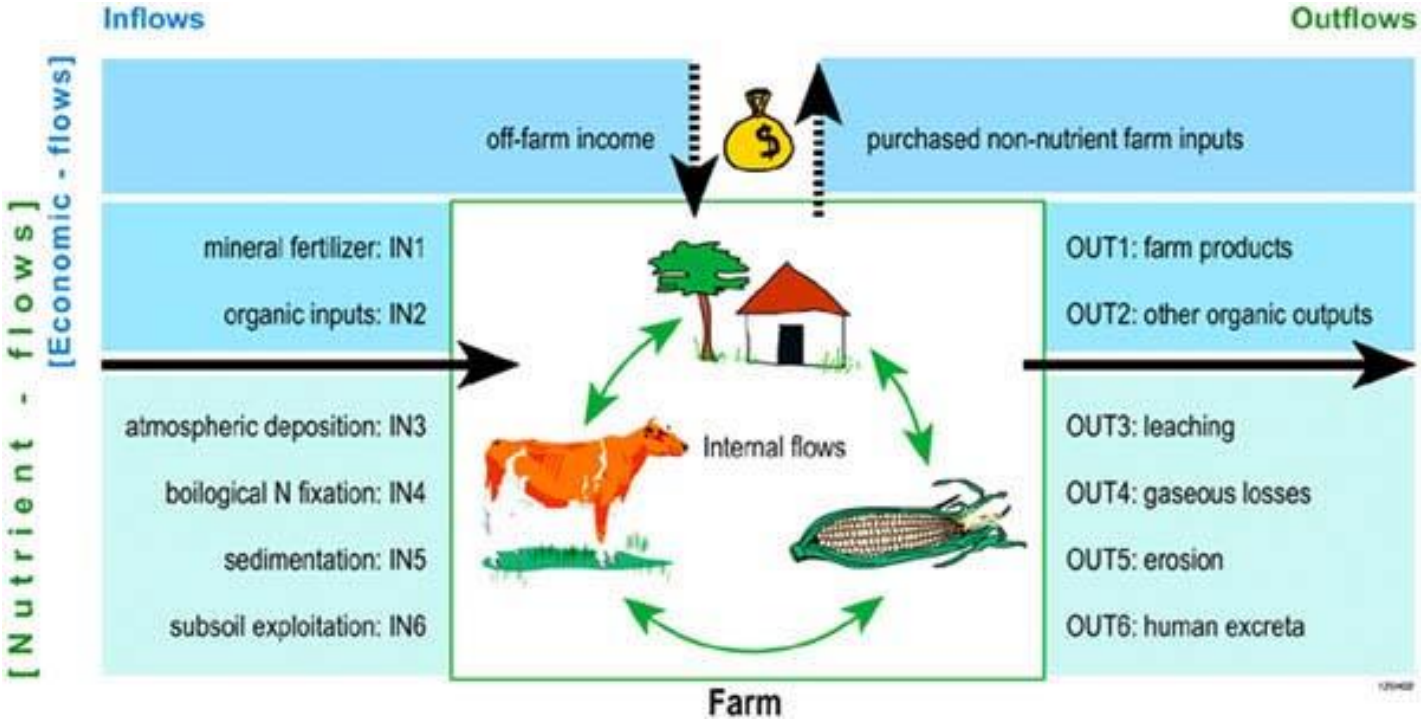
CLEANED

IN1 → OUT1

IN2 → OUT2

IN3 → OUT3

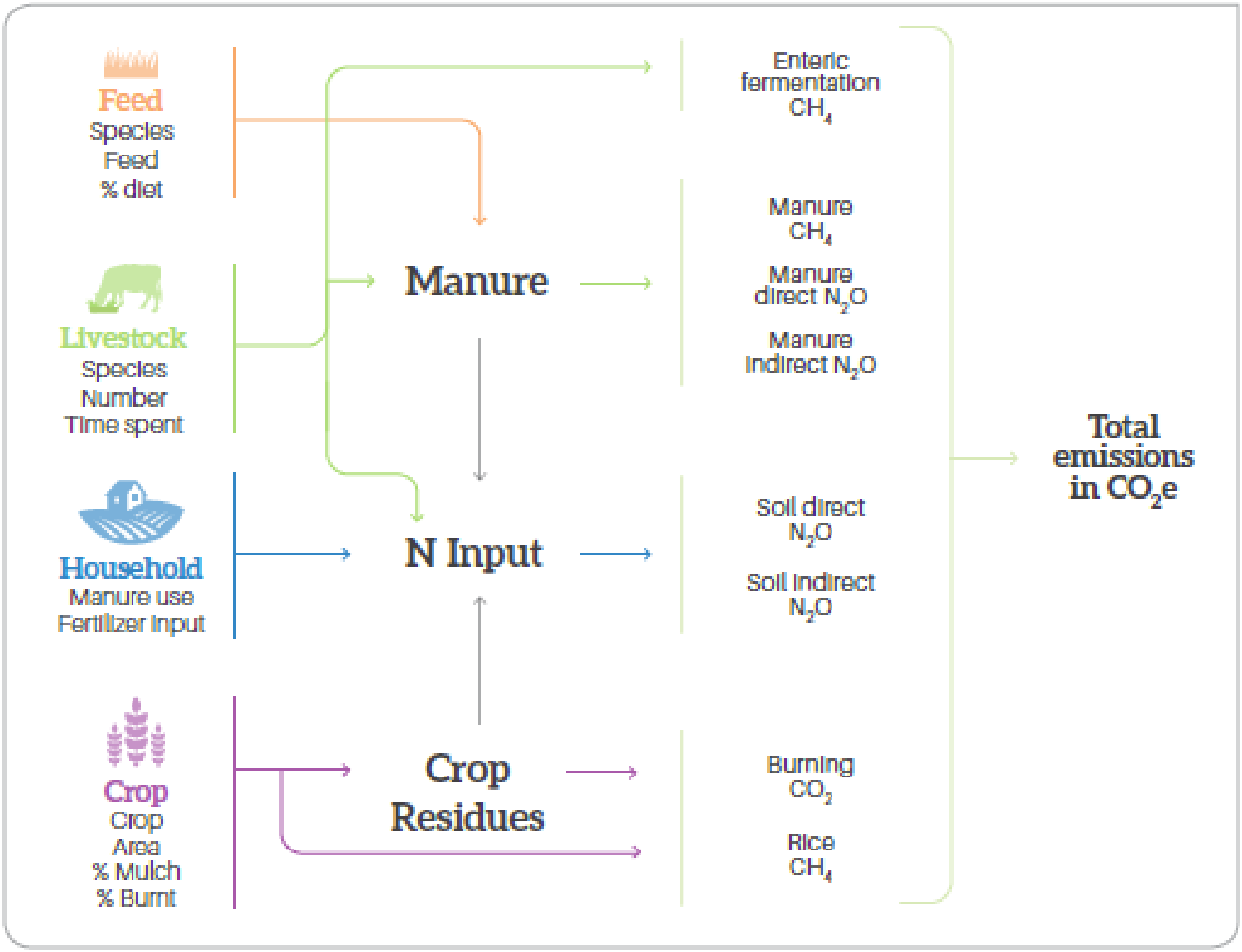
IN4 → OUT4



GHG

2006 IPPC Guidelines for National Greenhouse Gas Inventories.

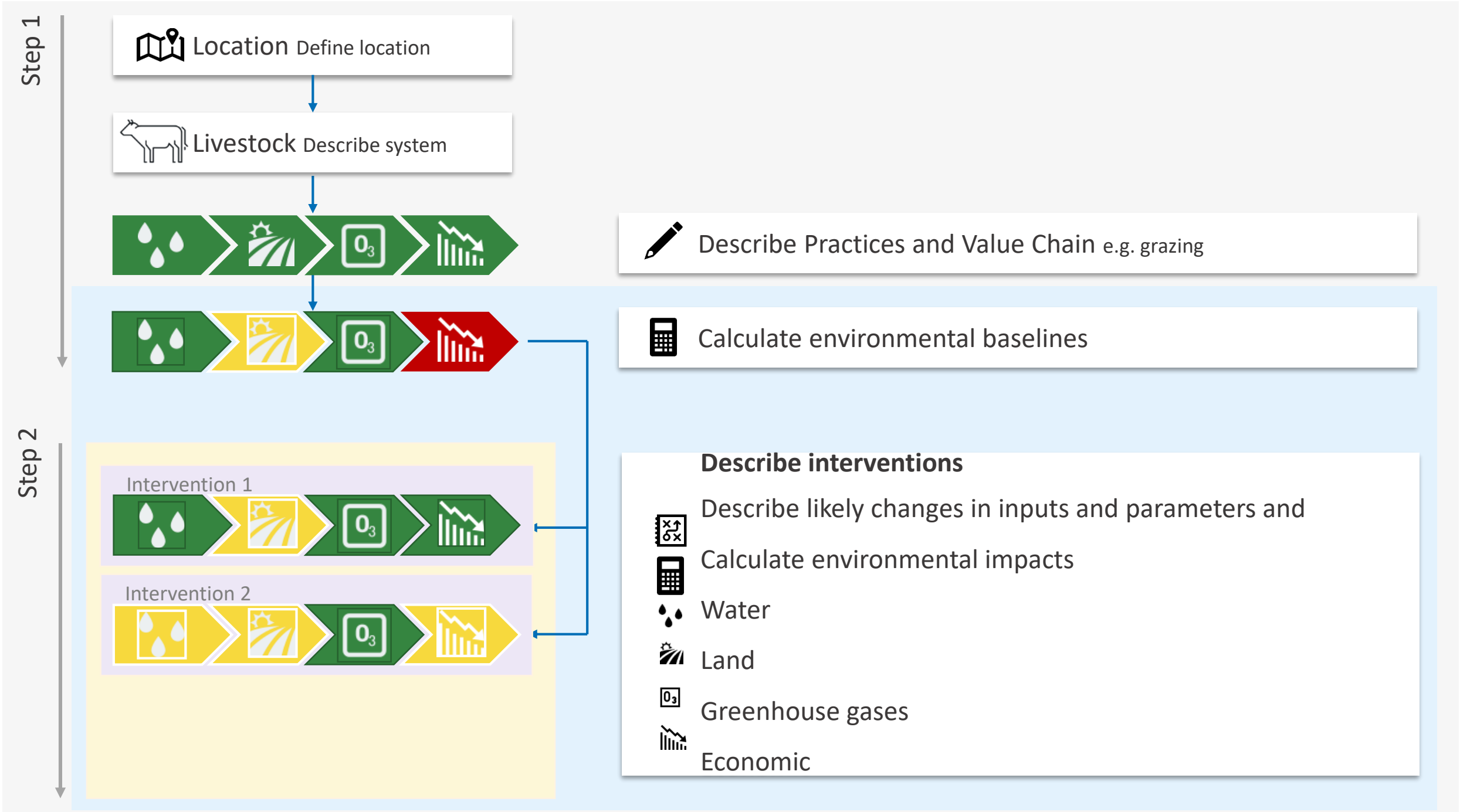
Tier 1 and 2



The process

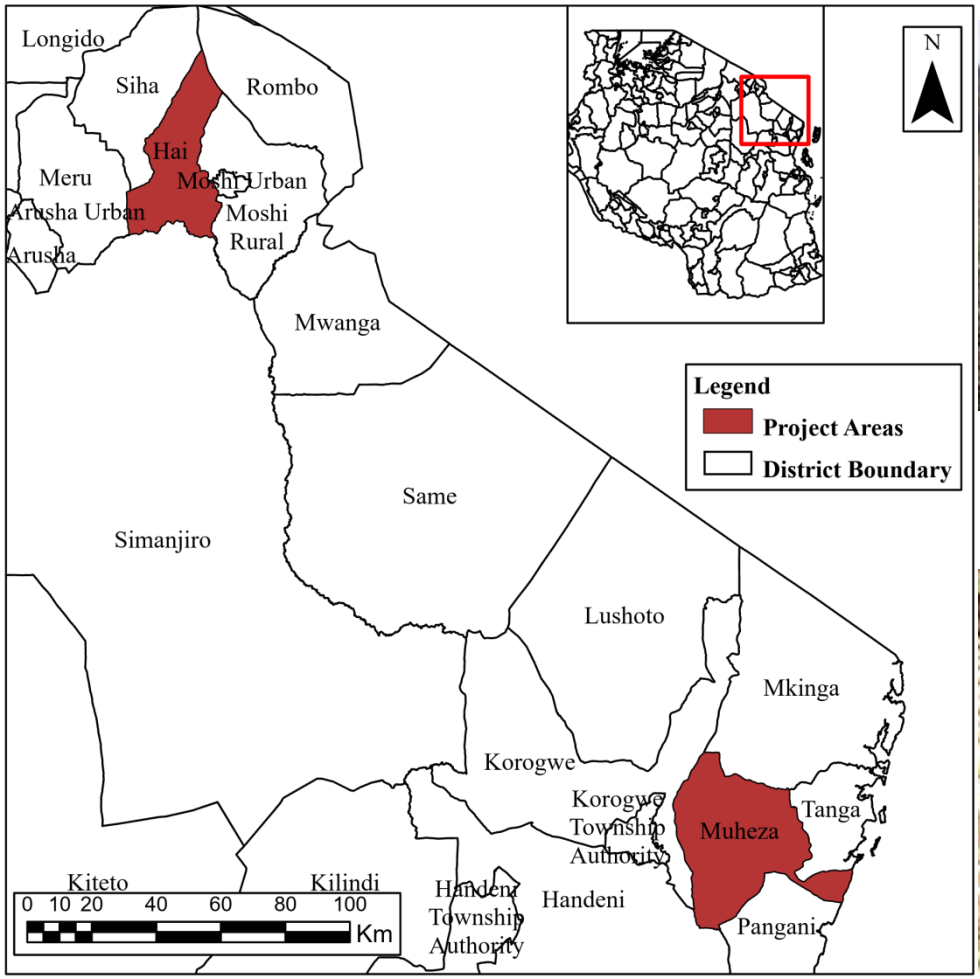
The CLEANED tool process comprises of 2 stages:

1. Collect and input the baseline data
2. Generate reports for different scenarios of how the livestock production systems might change


Step 1
Location Define location
Livestock Describe system
Describe Practices and Value Chain e.g. grazing
Calculate environmental baselines
Step 2
Intervention 1
Intervention 2
Describe interventions
Describe likely changes in inputs and parameters and
Calculate environmental impacts
Water
Land
Greenhouse gases
Economic

Methodology

Study Area


Longido
Siha
Rombo
Hai
Meru
Moshi Urban
Arusha Urban
Moshi
Rural
Arusha
Mwanga
Same
Simanjiro
Lushoto
Mkinga
Korogwe
Korogwe
Township
Authority
Muheza
Tanga
Kiteto
Kilindi
Handeni
Township
Authority
Handeni
Pangani
N
Legend
Project Areas
District Boundary
0 10 20 40 60 80 100
Km

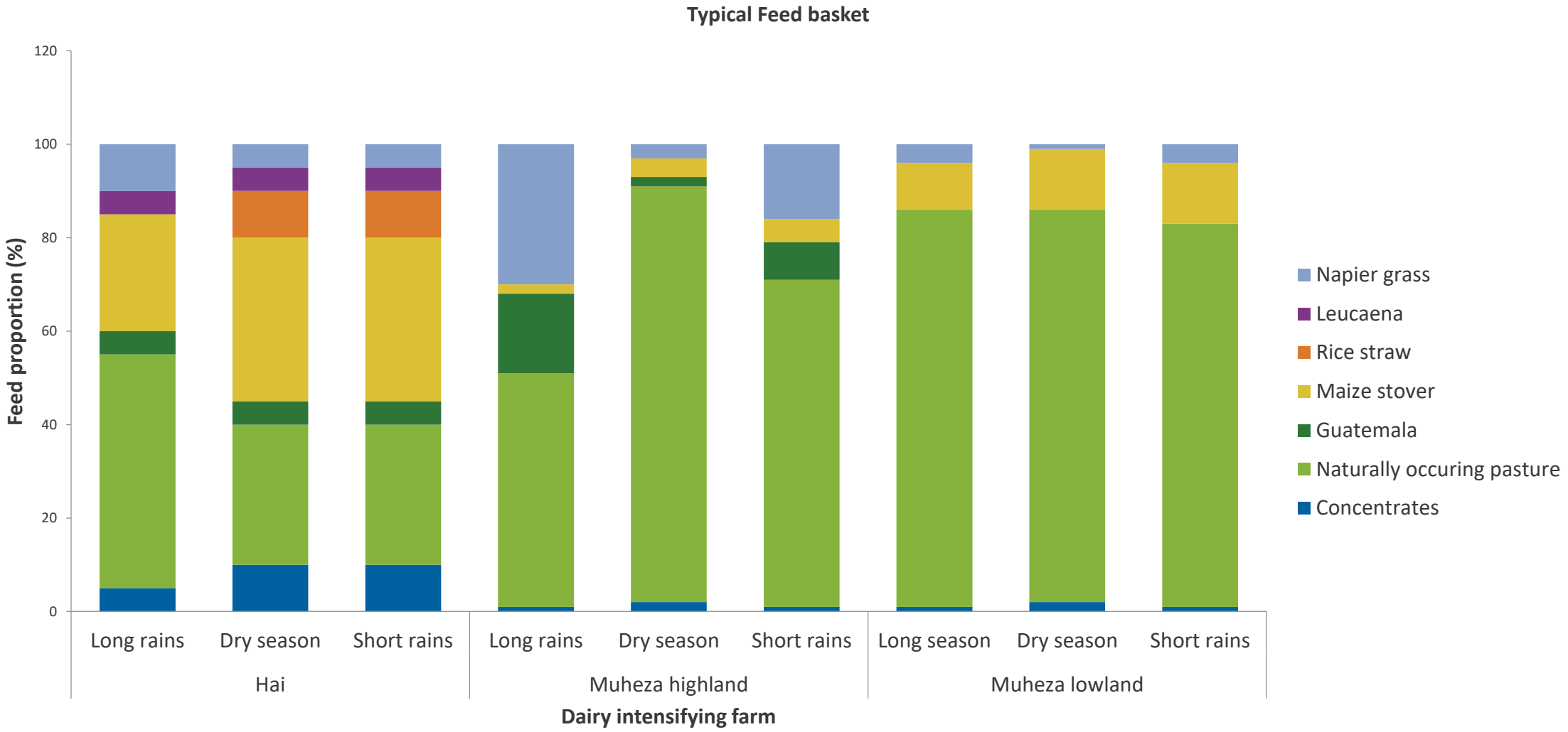
Types

Site	GPS coordinates (Lat; Long)	Mean Annual Rainfall (mm)	Mean Annual Temperature (˚C)	Land area (sq. km)	Reference
Muheza highland, Tanga	-4.83333 38.78333	1,100 to 1,400	18.3 to 33.9	1,974	Muheza District Profile, 2014
Muheza lowland, Tanga	38.6234 -5.0851	474	20.6		https://en.wikipedia.org/wiki/Muheza_District https://www.besttimetovisit.com.ph/tanzania/amani-3785550/
Hai, Kilimanjaro	-3.29164 37.20137	521 ± 1888	23.3 ± 0.66	902	Hai District Profile, 2017

Types – Livestock system

Site	Livestock systems	Season	Season Months	Mgt system	Breed type	Av. Milk pdn/cow /kg. yr	Type and No. of animals	Feeding system	Type of feed (%)
Muheza - Highland	Intensive	Long rains	April to June	Zero grazing	Cross breed	6100	Cows : 3 Heifers:2 Calves: 2	Cut & Carry	Improved Forages (47) Concentrates (1) Crop residues (2) Natural Pastures (50)
		Short rains	July, Oct to Dec						Improved Forages (24) Concentrates (1) Crop residues (5) Natural Pastures (70)
		Dry	Jan to March, Aug & Sep						Improved Forages (5) Concentrates (2) Crop residues (4) Natural Pastures (89)
Muheza - low land	Intensive	Long rains	April to June	Zero grazing	Cross breed	3660	Cows : 3 Heifers: 2 Calves: 2	Cut & Carry	Improved Forages (4) Concentrates (1) Crop residues (10) Natural Pastures (85)
		Short rains	July, Oct to Dec						Improved Forages (4) Concentrates (1) Crop residues (13) Natural Pastures (82)
		Dry	Jan to March, Aug & Sep						Improved Forages (1) Concentrates (2) Crop residues (13) Natural Pastures (84)
Hai	Intensive	Long rains	March to July	Zero grazing	Pure Breed	4650	Cows : 2 Heifers:1 Calves: 1	Cut & Carry	Improved Forages (15) Concentrates (5) Crop residues (30) Natural Pastures (50)
		Short rains	Mid Oct to Dec						Improved Forages (15) Concentrates (10) Crop residues (45) Natural Pastures (30)
		Dry	Sep to Mid Oct and Jan to Feb						Improved Forages (15) Concentrates (10) Crop residues (45) Natural Pastures (30)

Animal Diet/ Feed basket



Parameters Used

Livestock

annual_evapo_transpiration
aridity_index_ETO
precipitation
soil Organic Carbon
bulk_density_.kg_per_cubic_meter.
soil clay_content
soil total_nitrogen_.ppm.
Soil_Depth
Soil Type
Rainy season

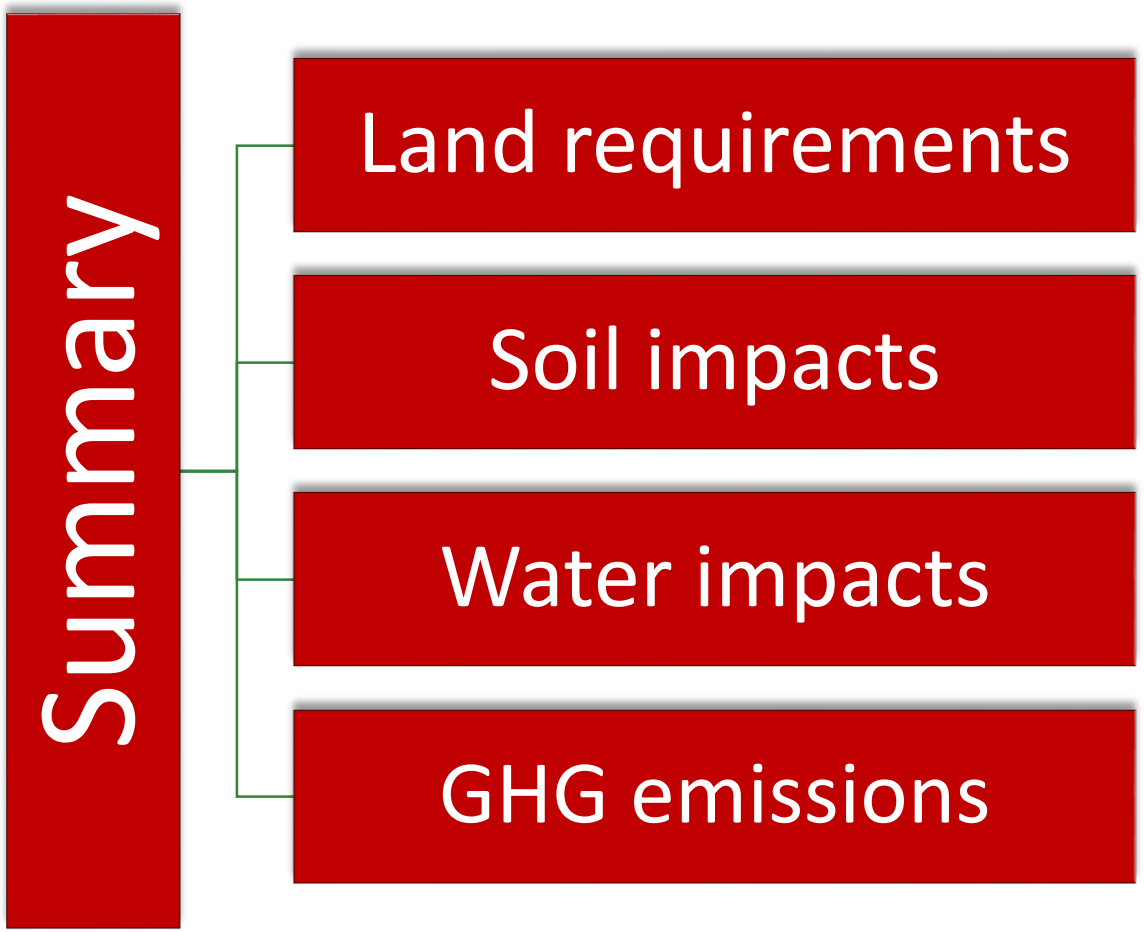
Area

Crop

Feed

CLEANED Results

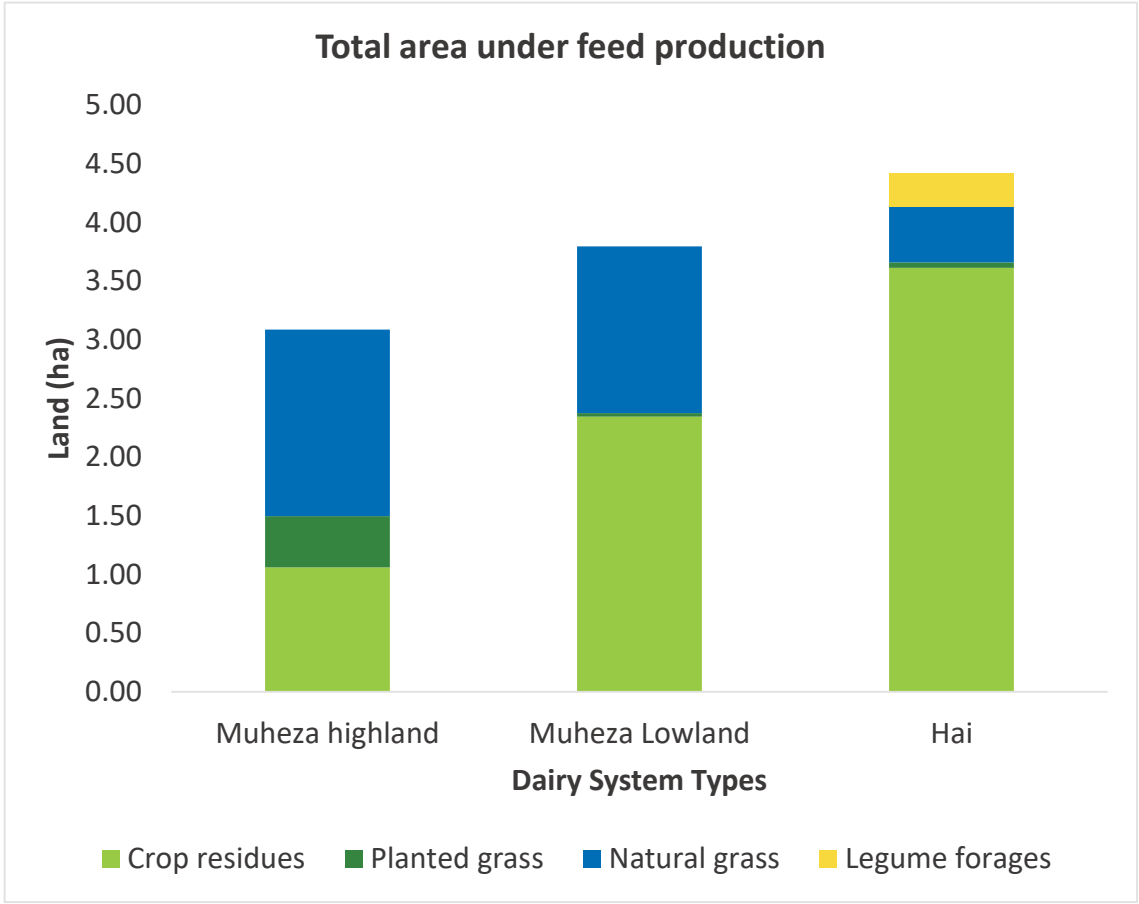
Results overview



Land

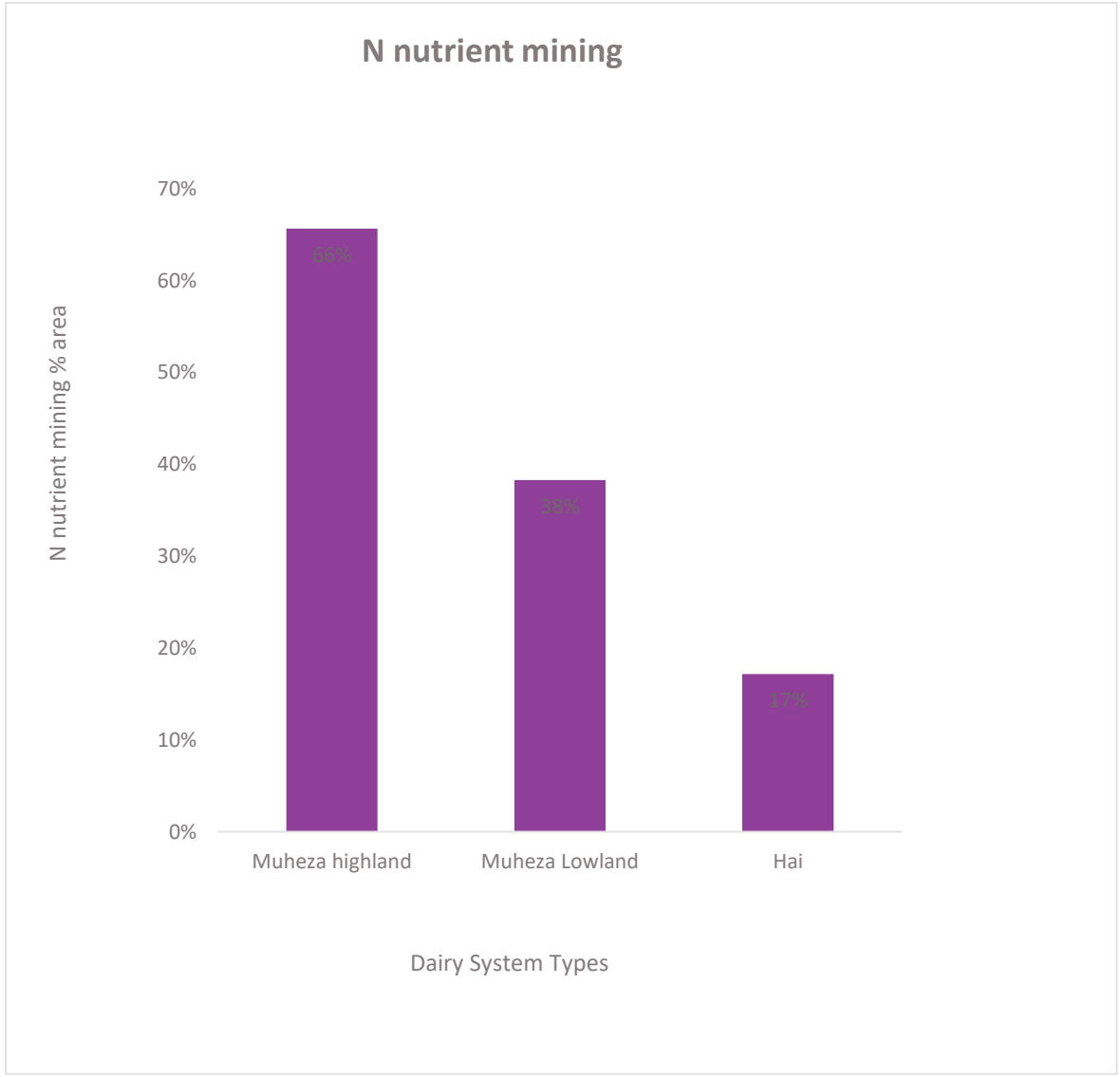
- High dependence of crop residues in Hai than in Muheza therefore high land requirement

- Less usage of planted grass in Hai than Muheza



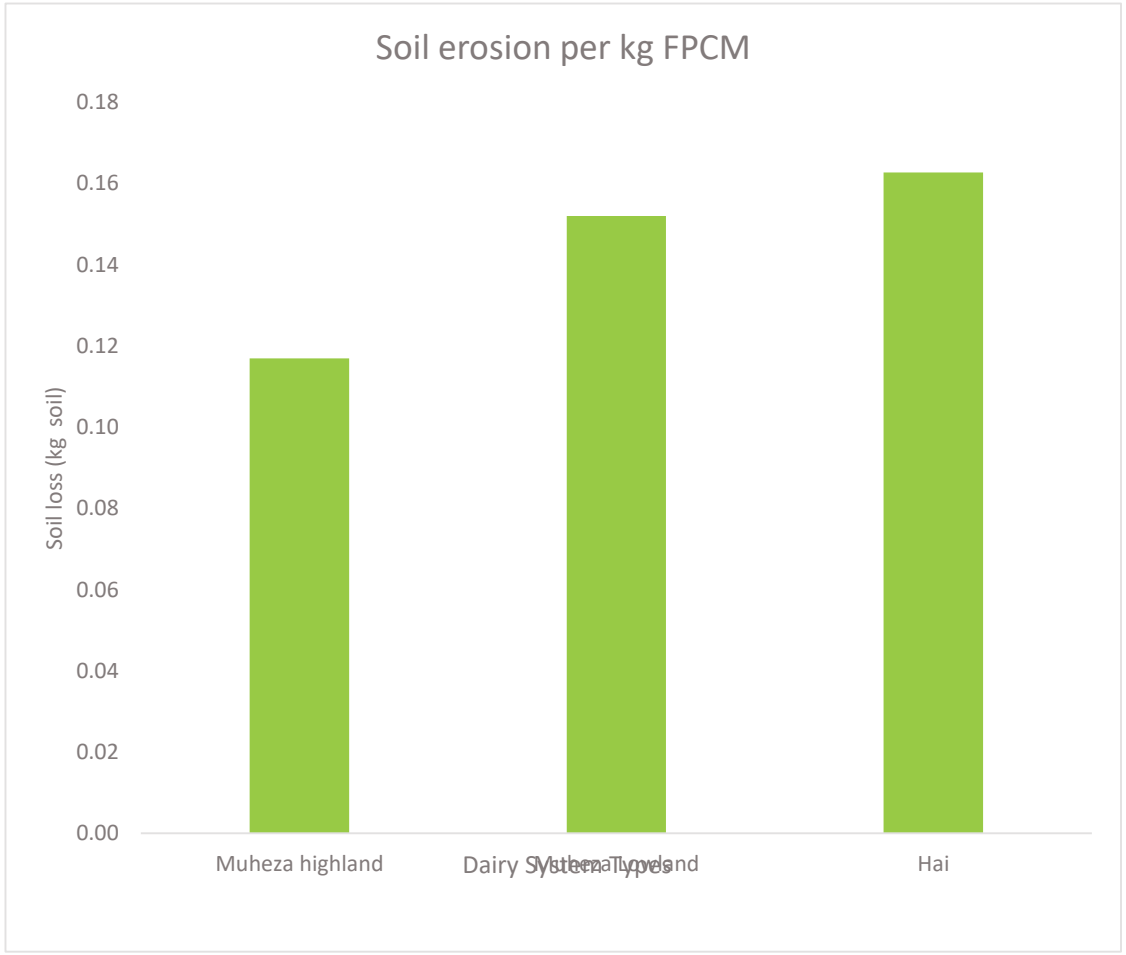
Soil Impacts

Minimum N addition to the soil coupled with high crop cultivation leads to high N nutrient mining in Muheza



Soil Impacts

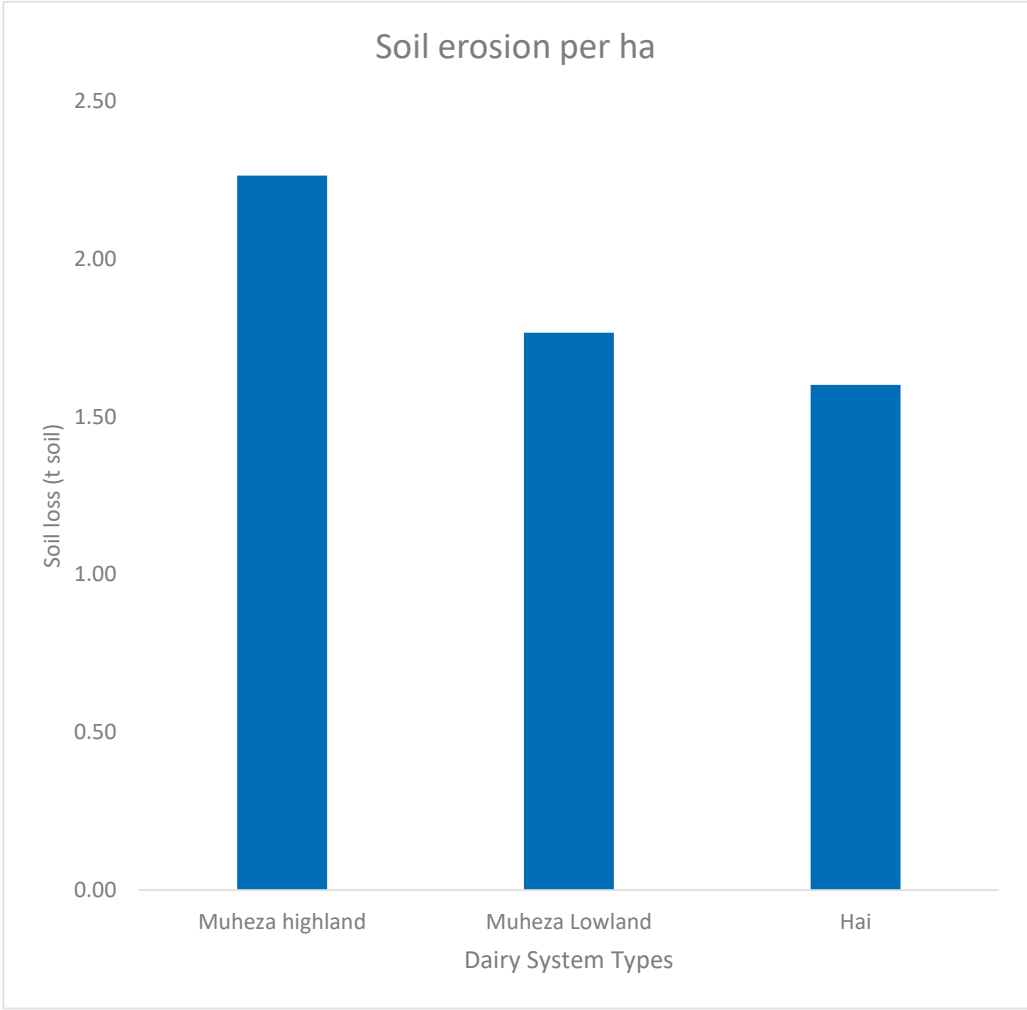
High soil erosion per kg FPCM in Muheza lowland due to high usage of livestock feeds from natural sources



Soil Impacts

High level of soil erosion in Muheza highland due to;

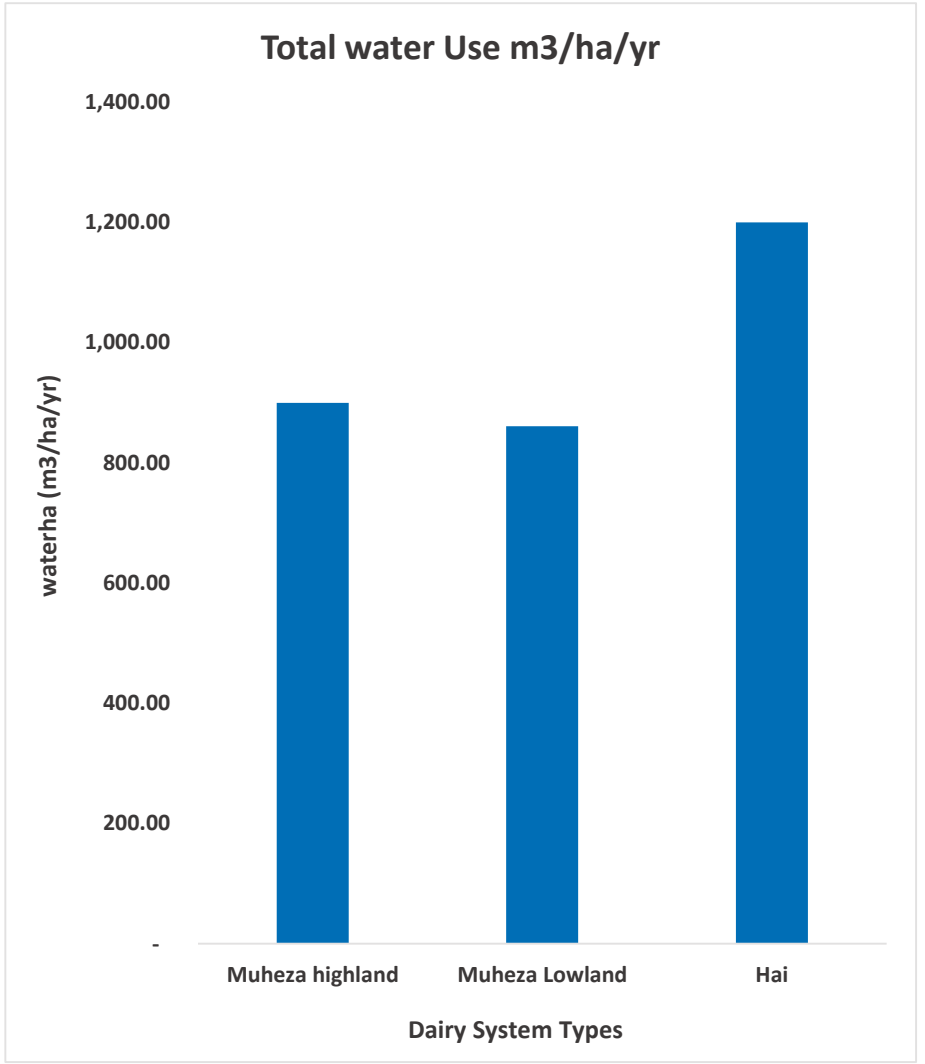
- Topographical nature of the area
- High crop cultivation activities
- Less soil conservation practices



Water Impacts

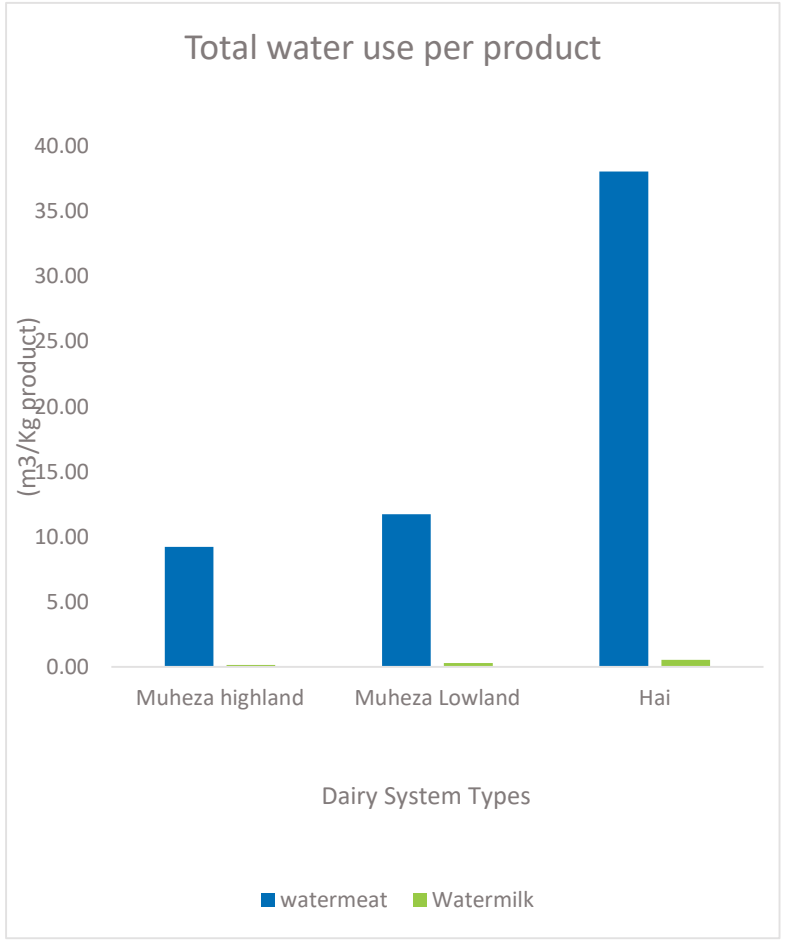
- Much usage of water in Hai due to much usage of crop residues which needs much precipitation for crops growth

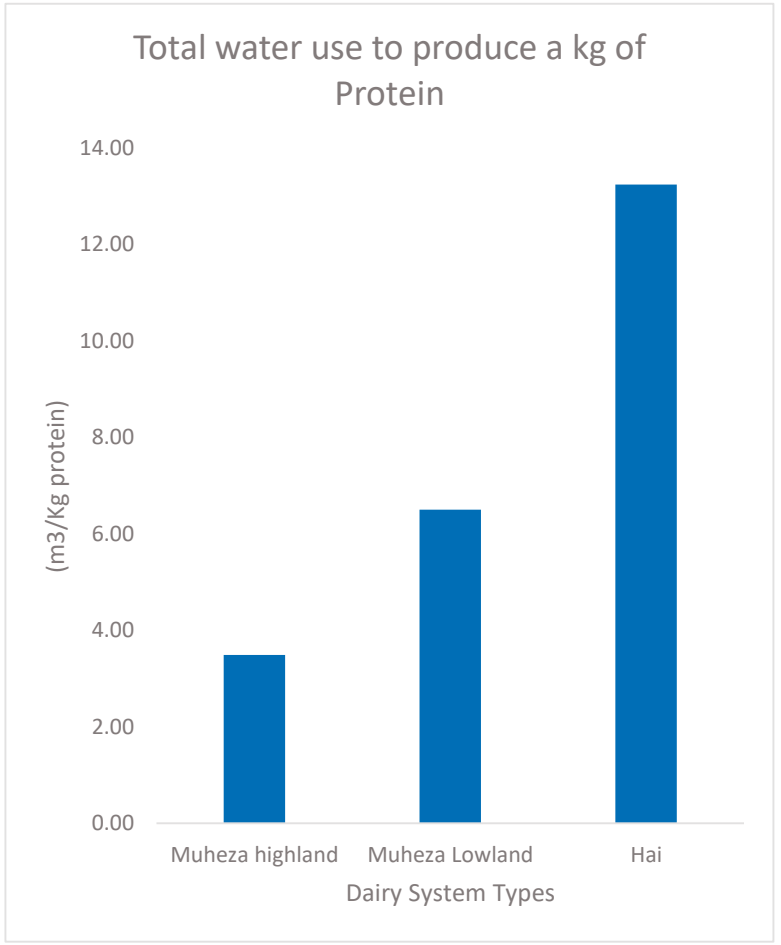
- Increase production of high quality forage would reduced relative water resource use and improve efficiency of intensive dairy production system



Water Impacts

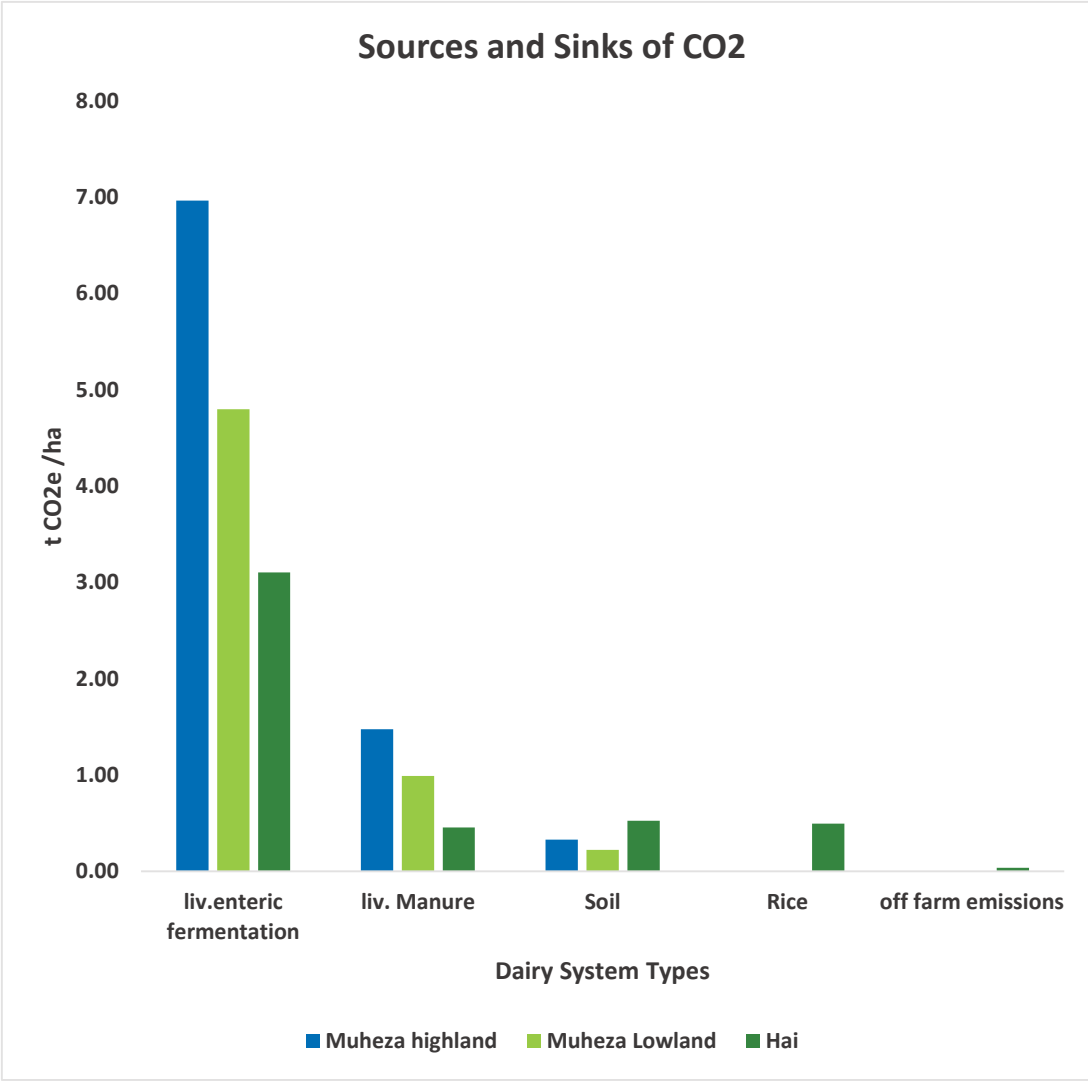
- Water loss through evapotranspiration by the portion of the crops that is used for feed and fodder
- Production of high yielding crops can reduce the loss



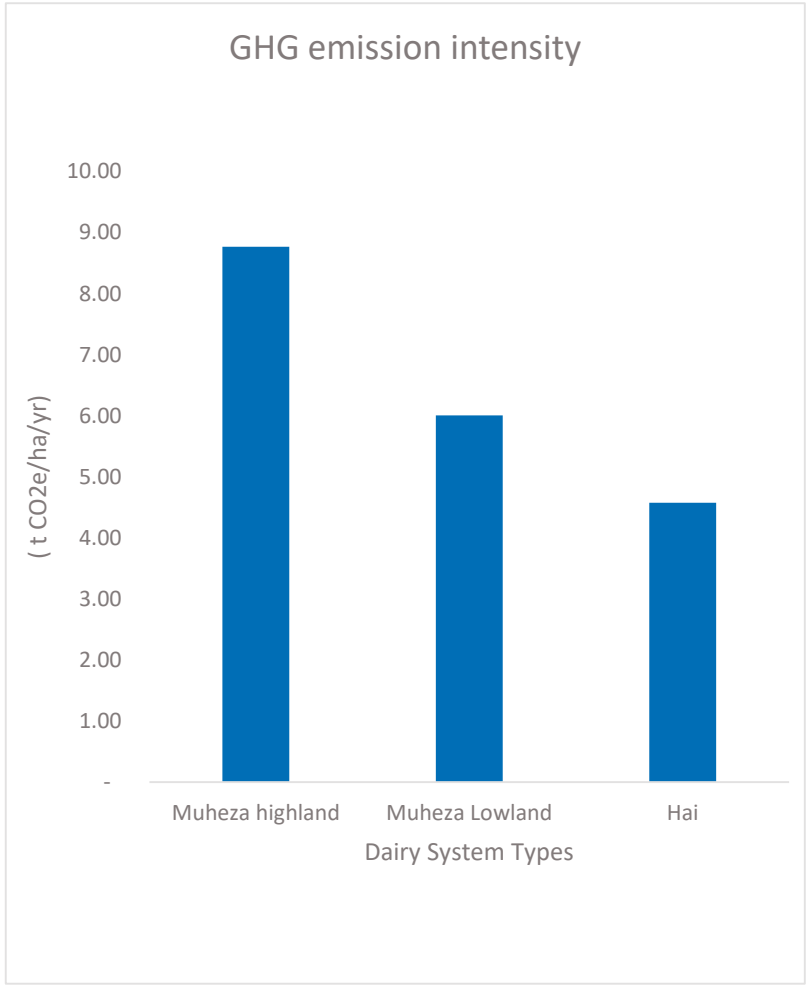


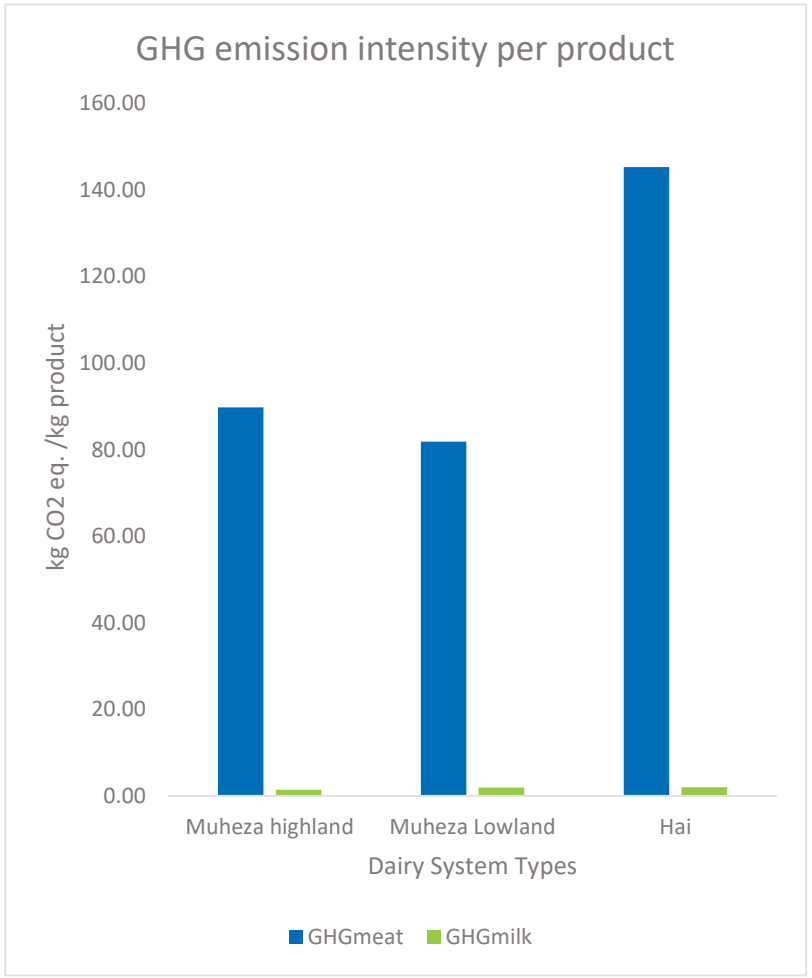
GHG Emissions

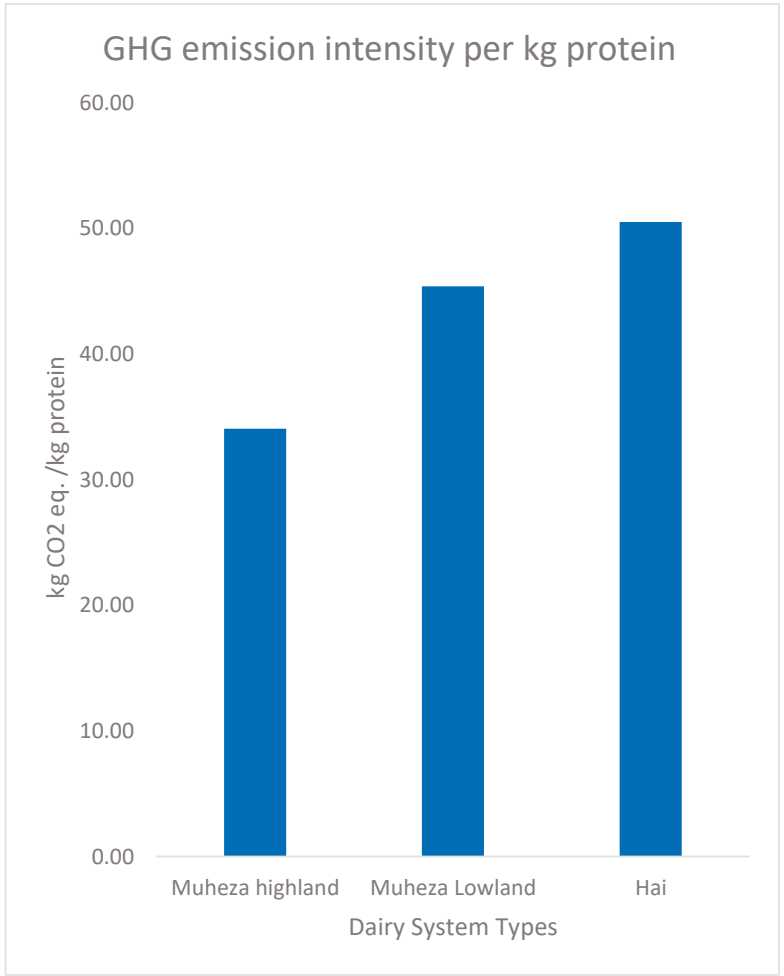
- High milk production correlates positively with enteric fermentation especially when low quality feeds are used
- Poor manure management also increases emissions
- Production and use of improved forages and proper manure management is highly recommended



GHG Emissions







Alliance

Results Verification

Environmental Impact: CLEANED results	Validate Is this what is expected on the ground		Reasons for yes/no answer What information is needed to further verify the results
	Yes	No	
Total area under feed production			
N nutrient mining			
Soil erosion per kg FPCM			
Soil erosion per ha			
Total water Use m3/ha/yr			
Total water use per product			
Total water use to produce a kg of Protein			
Sources and Sinks of CO2			
GHG emission intensity			
GHG emission intensity per kg protein			
GHG emission intensity per product			

Type Verification

Type	Validate **Is this what is expected on the ground**		**Population involved in VC* in Project Area**	**Reasons for yes/no answer** **What information is needed to further verify the results**
	Yes	No	Percentage (%) **Low / Medium / High** (0 -29 / 30 -60 / 61 - 100)	

Input and Parameters Verification

INPUT and Parameters	Validate Is this what is expected on the ground		Reasons for yes/no answer
	Yes	No	
Herd composition (nr)			
Average annual milk (kg)			
Average annual growth per animal (kg)			
Average Body weight (kg) - Cow			
Average Body weight (kg)- Heifers			
Average Body weight (kg) - Calves			
Parturition interval (years)			
Feed basket/ Diet			
Animal Whereabouts			
Natural pasture /DM Yield tonne/ha			
Pennisetum purpureum/ DM Yield tonne/ha			
Maize/DM Yield tonne/ha			
Manure application tonne/ha			

CLEANED Application

Who will be using CLEANED?

- What is their job?
- Where does it fit into the job role?
- Who will be *their* audience?

What questions do you want to answer?

- Implementing technologies
- Soil impacts in an area
- Alternative processes or practices
- GHG emissions
- Land use
- Water impacts

Feeding a productive dairy cow in western Kenya: environmental and socio-economic impacts

https://hdl.handle.net/10568/97557

Who are the stakeholders?

Use of Results for stakeholder x

Environmental Impact: CLEANED results	Importance of Results to xxx 1 = very low; 2 = low; 3 = medium; 4 = high; 5 = very high; 0 = non-existent; N/D = no data; N/A = not applicable	Reasons for answer
Total area under feed production		
N nutrient mining		
Soil erosion per kg FPCM		
Soil erosion per ha		
Total water Use m3/ha/yr		
Total water use per product		
Total water use to produce a kg of Protein		
Sources and Sinks of CO2		
GHG emission intensity		
GHG emission intensity per kg protein		
GHG emission intensity per product		

END of DAY 1

Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

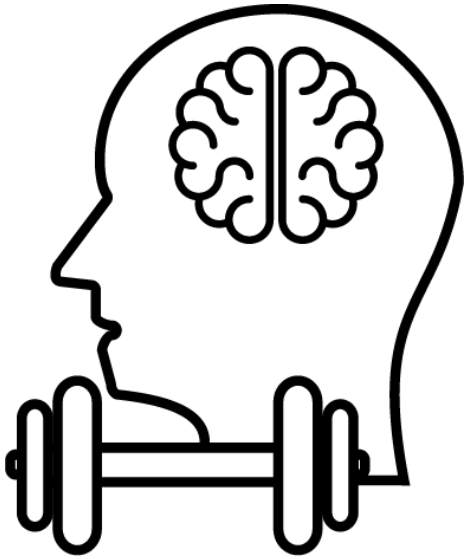
Thank you!

CGIAR

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.

DAY 2: CLEANED Scenarios

Recap



Program for the day

CLEANED Scenarios

Challenges and for dairy value chain

Challenges

- Disease control
- Low quality forage
- Low performance of A.I
- Inbreeding
- Poor Manure Management

The Interventions

Proven genetics, health and feeds technologies:

1. **Brachiaria grass (or other forage options)**,
2. **Manure management**,
3. **East coast fever vaccine**
4. **Artificial Insemination**

Example of Scenario/ Intervention

Dairy basket of technologies & innovations

Genetics
1. _____

Feeds and forages
i. _____

Herd health
a. _____

Cross-cutting gender, youth, capacity building;

Environmental sustainability

Emphasis on 'demand driven'

Package
1, ii, c, A

Package
3, i

Package
2, iii, b,

Affected by
- Demand by entrepreneur
- Demand by farmer
- Recommendation by experts

- **Packaging technical components**

Mapping challenges to the location

Production Challenges	Is the production challenge affecting your dairy type		If Yes How important is this production challenge in dairy type and location Percentage (%) Mildly important/ Important / Very Important (0 -29 / 30 -60 / 61 -100)	Reasons for answer
	Yes	No		
Feeding				
Health				
Genetics				
Environment/Manure mgmt.				

Formulating the Package

Type	The Package Brachiaria grass (or other forage options) / Manure management/ East coast fever vaccine, and /Artificial Insemination
A	

How do this(these) package(s) affect the production and input and parameters in your dairy type?

% increase of production from baseline Milk yield	Input	Parameters
	- Feeding basket what proportion of the basket will change? - Which feed item will be utilized less - What feed it item will be introduced - Does this intervention change the wet and dry season basket?	- What are the yields for the introduced feed items in the location? - What are the nutritional values for introduced feed items in the location? - Will there be any inorganic/organic fertilizer use? How much?
	- If the intervention package is successful, does the herd composition change or remain the same? - If a change, is there an increase or decrease in animal numbers? Specify	- Do the weights of the animal change or remain the same? - Does the birthing interval change?
	- How would the manure be managed if intervention is successful? - Will collection and use of manure change	N/A

Alliance

Bioversity International

CIAT
International Center for Tropical Agriculture
Since 1967 Science to cultivate change

Thank you!

CGIAR

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.