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
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](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

2.4 Billion
Milk produced
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.

4.6 Million House Holds
that accounts for some jobs
Current Environmental impacts

Negative environmental impacts:

- **EMISSIONS**: of greenhouse gases
- **WATER**: pollution and depletion
- **BIODIVERSITY**: threatened
- **LAND**: degradation and deforestation
- **DEFORESTATION**: threatened

**Global fresh water use**
- Livestock: 33%
- Others: 67%

**Global crop land**
- Livestock: 33%
- Others: 67%

**Global agricultural GDP**
- Livestock: 40%
- Others: 60%
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:

- Land requirements
- Productivity
- Economics
- Soil Impacts
- Water impacts
- GHG emissions
The Architecture

User → CLEANED tool → INPUT tab

Report:
- Summary
- Individual (Multiple tabs)

Parameter:
- Model parameters (Multiple tabs)

Calculations:
- Back end calculations (Multiple tabs)
RUSLE (Revised Universal Soil Loss Equation) is widely used for estimating the rate of soil loss by water.

\[ A = R \times K \times L \times S \times C \times P \]

- 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

Land Requirement =

Feed requirement + Feed quality ==> feed amount

Feed amount + crop yields ==> land size
Water Using -> Evapotranspiration (ET)

\[ ET_0 \] + \[ \text{grass reference crop} \] = \[ ET_0 \]

\[ ET_0 \times \frac{K_c}{1} \text{ factor} \] = \[ ET_C \]

In this diagram, climate factors such as radiation, temperature, wind speed, and humidity are combined with the grass reference crop to determine \( ET_0 \). The \( K_c \) factor, representing the climatic, seasonal, and crop factors, adjusts \( ET_0 \) to \( ET_C \), which accounts for well-watered grass under optimal agronomic conditions.
N Balance → NUTMON

CLEANED

IN1 → OUT1
IN2 → OUT2
IN3 → OUT3
IN4 → OUT4
GHG
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

Describe interventions

Describe likely changes in inputs and parameters and

Calculate environmental impacts

Water

Land

Greenhouse gases

Economic
Methodology
Study Area
## Types

<table>
<thead>
<tr>
<th>Site</th>
<th>GPS coordinates (Lat; Long)</th>
<th>Mean Annual Rainfall (mm)</th>
<th>Mean Annual Temperature (°C)</th>
<th>Land area (sq. km)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muheza highland, Tanga</td>
<td>-4.83333; 38.78333</td>
<td>1,100 to 1,400</td>
<td>18.3 to 33.9</td>
<td>1,974</td>
<td>Muheza District Profile, 2014</td>
</tr>
<tr>
<td>Muheza lowland, Tanga</td>
<td>38.6234; -5.0851</td>
<td>474</td>
<td>20.6</td>
<td></td>
<td><a href="https://en.wikipedia.org/wiki/Muheza_District">https://en.wikipedia.org/wiki/Muheza_District</a></td>
</tr>
<tr>
<td>Hai, Kilimanjaro</td>
<td>-3.29164; 37.20137</td>
<td>521 ± 1888</td>
<td>23.3 ± 0.66</td>
<td>902</td>
<td>Hai District Profile, 2017</td>
</tr>
</tbody>
</table>
## Types – Livestock system

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

Typical Feed basket

Feed proportion (%)

Long rains | Dry season | Short rains
Hai | Muheza highland | Dairy intensifying farm | Muheza lowland

- Napier grass
- Leucaena
- Rice straw
- Maize stover
- Guatemala
- Naturally occurring pasture
- Concentrates
Parameters Used

Livestock  Area  Crop  Feed
CLEANED Results
Results overview

Summary

- Land requirements
- Soil impacts
- Water impacts
- GHG emissions
Land

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

- Less usage of planted grass in Hai than Muheza
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
### Results Verification

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Validate</th>
<th>Population involved in VC* in Project Area</th>
<th>Reasons for yes/no answer</th>
<th>What information is needed to further verify the results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Percentage (%) Low / Medium / High (0 -29 / 30 -60 / 61 -100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td></td>
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</tbody>
</table>
## Input and Parameters Verification

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

<table>
<thead>
<tr>
<th>Environmental Impact: CLEANED results</th>
<th>Importance of Results to xxx</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 = very low; 2 = low; 3 = medium; 4 = high; 5 = very high; 0 = non-existent; N/D = no data; N/A = not applicable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason for answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area under feed production</td>
</tr>
<tr>
<td>N nutrient mining</td>
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<td>GHG emission intensity per kg protein</td>
</tr>
<tr>
<td>GHG emission intensity per product</td>
</tr>
</tbody>
</table>


END of DAY 1
Thank you!
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. _____

Package
1, ii, c, A

Package
3, i

Package
2, iii, b,

Emphasis on ‘demand driven’

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

Cross-cutting gender, youth, capacity building;
Environmental sustainability

• Packaging technical components
## Mapping challenges to the location

<table>
<thead>
<tr>
<th>Production Challenges</th>
<th>Is the production challenge affecting your dairy type</th>
<th>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)</th>
<th>Reasons for answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genetics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment/Manure mgmt.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Formulating the Package

<table>
<thead>
<tr>
<th>Type</th>
<th>The Package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brachiaria grass (or other forage options) / Manure management / East coast fever vaccine, and / Artificial Insemination</td>
</tr>
</tbody>
</table>

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

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