RESEARCH PROGRAM ON Livestock

CGIAR

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Report of a CLEANED online awareness and training workshop or the Kenya Climate Smart Agriculture Program Digital Dairy Project Team 19 August 2021

Figure 1 Participants and facilitators during CLEANED awareness training on Microsoft Teams.

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ILRI

ICARDA Science for resilient livelihoods in dry areas

CIAT

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

SLU

CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The Program brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on forages; the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants and dryland systems; the Swedish University of Agricultural Sciences (SLU) with expertise particularly in animal health and genetics and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which connects research into development and innovation and scaling processes.

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Introduction

The Alliance of Bioversity International and International Center for Tropical Agriculture (CIAT) is committed to creating awareness, knowledge and skill on research and models to increase use by scientists and decision makers beyond the CGIAR, contributing to achieve development outcomes. As part of this commitment and strengthening partnerships, the Alliance supports the "Digital dairy – Information and Communication Technology (ICT) advisory to realize the forage triple win", a project under the Kenya Climate Smart Agriculture Program (KCSAP). KCSAP is a Government of Kenya program that is funded by the World Bank and is being implemented over a five-year period (2017-2022) under the framework of the Agriculture Sector Development Strategy (ASDS) (2010-2020) and National Climate Change Response Strategy (NCCRS, 2010). The development goal of KCSAP Digital Dairy Project is to achieve adoption at scale of existing Technologies, Innovations, and Management Practices (TIMPs) - improved forages and pastures- through ICT-based, usable and timely advisory and training to dairy farmers. Outputs from this project include:

1. Big data analysis and modelling -contributing to improved understanding of forage TIMPS adoption challenges and better understanding of end users for improved future targeting & profiling
2. Quantification of Climate Smart Agriculture (CSA) contribution of total forage TIMPS adoption in terms of total increase in milk production (Mt/year) and GHG emission intensity reduction (Mt CO2e)
3. Accessible and usable ICT-based advisories for informed decision-making on appropriate forage species and their management, taking into account local soil conditions, daily weather and market information, and enabling peer-to-peer exchange.

CLEANED is a minimum data ex-ante environmental impact assessment tool developed by the Alliance to quantify environmental impacts of livestock production systems. CLEANED is an easy-to-use Excel-based tool that allows users to explore multiple environmental impacts of transforming livestock production systems and value chains. It evaluates changes in different livestock enterprises on productivity and economics, land and water use, greenhouse gas emissions and soil health[1]. The tool is most useful in the designing and planning phase of projects, initiatives or programs that look into farm-scale interventions as it allows users to understand impacts and trade-offs and to better design sustainable livestock systems.

The Alliance offered to conduct awareness training on CLEANED model to Digital Dairy project partners from Kenya for them to choose whether model is useful to achieve expected outputs 2 of the Digital Dairy Project. The team comprised of software developers, academia staff and forage expert from Kenya Agriculture and Livestock Research Organization (KALRO), University of Nairobi (UoN), Jomo Kenyatta University of Agriculture and Technology (JKUAT), and Rongo university. A list of participants can be found in annex 1.

Objectives of the training included:

1. Participants to understand the basic functioning of the CLEANED model including outputs and input requirements
2. At the end of the training, participants are able to decide whether CLEANED model is suitable to be deployed in KCSAP digital dairy project under outputs 3.

[1] https://ciat.cgiar.org/ciat-projects/environmental-assessments-of-livestock-systems-using/

Due to COVID-19 guidelines and protocols in Kenya, the CLEANED awareness training was conducted online. The training was facilitated by Emmanuel Mwema and Birthe Paul of the Tropical Forages Program at the Alliance of Bioversity International and CIAT. The training lasted for eight hours and was conducted on Microsoft Teams and consisted of two breaks; one for coffee (15 minutes) and another for lunch (1 hour). There were also two breakout sessions; one to engage participants in a group exercise and another to discuss whether CLEANED was useful for KCSAP Digital Dairy Project.

A google form was administered to test participants' understanding on CLEANED model. A detailed description of the program can be found in annex 2. All training material can be accessed from here.

Training summary

Background: KCSAP - progress with the Digital Dairy Project

This session set the mood for the scene and a presentation from Irene Kimani – ICT specialist from KALRO (representing Boniface Akuku - ICT director KALRO) highlighted how ICT could be used under Digital dairy project to realize the forage triple win in selected counties of Kenya. The Kenya Livestock and Agricultural Research Organization (KALRO), a leading partner in this project has already established 16 forage TIMPS; Brachiaria Hybrids, Napier and Desmodium intercrop, Panicum Maximum –Makueni, CIAT 688 and among others that are currently undergoing validation using suitability analysis. The project aims to employ Big Data Analytics and Agricultural Disruptive Technologies when improving production to address feed deficit. As part of the methodology, they intend to build on CLEANED through IPCC Tier 2 methods to model the likely impacts on greenhouse gas emissions of changing livestock production systems and value chains. They are also interested to see impacts of these TIMPS on land and water use, productivity and economics, and overall soil health.

CLEANED overview

Participants were taken through general overview of the CLEANED model. This section highlighted on the importance of livestock and associated negative environmental impacts with emphasis laid on framework behind CLEANED model development. The facilitator outlined several dimensions assessed by the model, CLEANED process and input data requirements.

Table 1 Questions arising from CLEANED overview section and their response

Question	Response
Does CLEANED take into account carbon sequestration?	At the moment it does not. Data requirements to calculate carbon stock changes high, and changes in carbon stocks need to be considered over a long-time frame (e.g., 15 years). In the new upcoming desktop version of CLEANED, calculation of carbon stocks will however be included.

Deep dive: Going through sections of the CLEANED model

A deep dive into the sections of the model enabled participants to have an overview of what outputs are generated by the model, parameters used, several sections of the inputs sheet and a quick run through back-end calculations to understand how each of the dimension is computed.

Breakout sessions and reporting back

Participants were divided into two groups to conduct a CLEANED exercise. Each group was expected to model its own farm by modifying benchmark farm through changes in livestock numbers, manure management, feedbasket (percentage intake), and crop inputs. They would then save modified farm as theirs and transfer results to a summary sheet provided. As they reported back from groups discussions, the facilitator expected them to discuss and compare their model farm outputs with benchmark farm results. The objective of this exercise was to enable participants to interact with the tool and have a basic understanding of keying the data in the tool, generating reports and discussing the outcomes. It was evident from the reporting session that many had a quintessence of executing tasks and explaining results.

Table 2: Questions arising from breakout session and their responses

Questions	Responses
1. What do you mean by seasons in the model?	Seasons are defined by planting or growing periods. Some regions experience up to 3 seasons/year while others have only 2 seasons in a year. Currently, the model allows computation of up to 3 seasons.
2. What do you mean by N mining?	N mining is one of the outputs when calculating the Nitrogen balance; What fertilizer inputs are coming to the farm versus what is used by the crop as part of its growth requirements. N mining occurs when removal of nutrients by crops exceeds what is added through fertilizer inputs.
3. A lot of inputs to the farm including feeds are coming outside the farm. This is a growing and a worrying trend. How does the model take care of this?	Currently, the model assumes that anything coming outside the farm is purchased and has no impact on land use where assessment is being done. However, this is something the experts will be looking at and see possibilities of assessing beyond livestock enterprise.
4. Why is Rice calculated separately from other crops?	Rice fields have much higher methane emissions and thus it requires special attention.

Recap of CLEANED model understanding

This was meant to test participants level of understanding CLEANED model. Ten participants' respondent to the questions. Highlights of questions and their responses are in Table 3.

Table 3: Participants' responses to google form questions

Question	Participants' responses
Why do you think environmental assessments are important in livestock production systems?	• Informs decision-makers and the public of the environmental consequences of implementing a proposed project in the livestock system • In order to be able to understand the impact it has on the environment and see ways to mitigate the negative effects • Because there is a link between livestock related activities such as feeding and animal emissions and the status of the environment • These reports are essential in planning for better land utilization. • They inform on the impact of livestock production on the environment and hence influence farming decisions
How would you employ CLEANED in your work, and with what objective?	• It will assist me assess the effect of improved forage and livestock management on productivity of the enterprise and the impacts of these changes on GHG emission, erosion and water use efficiency • KSCAP objective 2. By seeing the effect of the different types of fodder • In preparation of Livestock advisories to the various stakeholders. • Evaluating the impact of the farm enterprise on the environment under objectives 2 & 3 • Modelling the system and also assess the risks • The model can be changed to an online application to increase availability, accessibility and impact. I would apply it on a web-based application

Showcasing a CLEANED assessment case study, including scaling to regional level

In this session, a representative of a dairy livestock enterprise from the Southern Highlands of Tanzania was used to show case how CLEANED has been applied to assess Greenhouse gas (GHG) emissions in intensive dairy systems. Participants were in agreement that low emission livestock diet plays a critical role in reducing GHG emission intensity. This was followed by a case study to elaborate in details how CLEANED was used to scale farm level milk production impacts to national level[2]. Ideally, farm scale impacts are multiplied by herd composition to get national level environmental impacts. Information on herd composition and individuals per herd is based on national statistics. One of the participants suggested a possible pathway of grouping farm types of similar characteristics and choosing one farm to model and then predicting the rest through multiplication. Participants were impressed with scaling outcomes and clearly saw a tool that can be used to influence decisions at both regional and national levels .

Break-out group discussion: Application of CLEANED to KCSAP digital dairy project

Participants were again divided into two groups to discuss amongst themselves on CLEANED relevance and application to KCSAP Digital Diary Project under aforementioned outputs 2. Comments arising from the group discussions included the following:

- Impacts of climate change are evident. This tool is useful to influencing our own institutions and can be used in other projects as well.
- The tool can be used to influence policy at both county and national levels.
- Kakamega has big project on dairy improvement. The tool can be used to measure impacts of improved feeding on climate smart agriculture goals within the county.
- According to participants, Nyandarua dairy was an important enterprise to see how proposed interventions were addressing climate change goals since the county had already started investing in its value chain.
- It was established that county governments were willing to invest in evidence-based research. Therefore, CLEANED model will be used to provide evidence (in values) to source climate finance.
- It is key in generating policy briefs and general advisories on climate change.
- CLEANED is useful when comparing policy targets especially in agriculture sector.

[2] Waha, K. (2020) Feed-based dairy system intensification scenario development and national-level biophysical impact assessment. Canberra (Australia): Commonwealth Scientific and Industrial Research Organization. 23 p. https://hdl.handle.net/10568/111512

Conclusions and way forward

The KCSAP project team reiterated their interest to use the model to achieve objective 2 of the KCSAP project on digital dairy. For this, areas for deployment of the tool need to be mapped out, data gaps identified and data collected from farmers who have implemented TIMPS before baselines and scenarios can be modeled. The Alliance emphasized their readiness to conduct deeper trainings into the application of the model once the project team has identified individuals who can allocate time to run the model. It is estimated that it can take a few months to define systems, pull together data, model baseline and TIMPS scenarios, scale it to county and national level, and share results with policy makers to inform decision making. Once the CLEANED desktop application is ready, it will be shared with the project. The CLEANED R package has already been developed. The Alliance is waiting for feedback from the Digital dairy project team leadership to conduct user training and technical backstopping if the model is to be deployed within the project.

Annex 1. Attendance list of participants

Full Name	Institution/Organization	Position/Title	Email Address
Prof. Robert Oboko	University of Nairobi	Chairman Computer science	roboko@uonbi.ac.ke
Dr. David M. Mwangi	Kenya Livestock and Agricultural Research Organization	Institute Director-Kakamega/ Forage expert	David.Mwangi@kalro.org
Dr. Evans Ouma	Rongo University	Head of Department Agronomy and Environmental Science	evans.ouma13@gmail.com
Dr. John Kinyuru	Jomo Kenyatta University of Agriculture and Technology	Lecturer	jkinyuru@agr.jkuat.ac.ke
Irene W. Kimani	Kenya Livestock and Agricultural Research Organization	ICT Specialist	Irene.Kimani@kalro.org
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Morris Gatheru	Kenya Livestock and Agricultural Research Organization	Software developer	morrisoh@gmail.com
Dr. Birthe Paul	Alliance of Bioversity International and CIAT	Senior scientist	b.paul@cgiar.org
Emmanuel Mwema	Alliance of Bioversity International and CIAT	Research consultant	E.Mwema@cgiar.org

Annex 2. Workshop program

Time	Activity	Responsible
8:30am - 9:00am	Microsoft Teams testing + solving participants' connection problems	Emmanuel Mwema (Alliance Bioversity and CIAT)
9:00am - 9:10am	Welcome to training, opening remarks, self-introduction of participants	Emmanuel Mwema, Birthe Paul (Alliance Bioversity and CIAT), Boniface Akuku (KALRO), participants
9:10am - 9:20am	Objectives of the training, agenda	Emmanuel
9:20am - 9:40am	**Background: KCSAP - progress with Digital Dairy Project** **Objective 3:** Quantifying the contribution of forage technology adoption to reaching policy targets under the Kenya Climate Smart Agriculture Strategy - what have you implemented on the current status of 30% ? Have you collected the data needed for quantification? - What are your plans for the remaining 70%?	Boniface Akuku (KALRO) - general project overview Objective 3: Robert Oboko (UoN) assisted by Dr John Kinyuru (JKUAT) and Dr Evans Ouma (Rongo)
9:40am - 10:00am	**CLEANED overview** **-** Importance of livestock and environment - What is CLEANED? - CLEANED architecture (two-step process) - Data requirements Q&A	Emmanuel Mwema
10:00am - 10:15am	Coffee/restroom break	Participants
10:15am - 11:00am	**Deep dive: sections of the CLEANED model** -Inputs sheet -Results sheets -Calculations sheets -Parameters sheets Q&A	Emmanuel Mwema
11:00am - 12:00pm	**Group work/exercise (breaking up in two groups of five participants)** 1. Familiarizing with benchmark farm 2. Modifying benchmark farm to your own farm 3. Summarizing results	Participants
12:00pm - 12:45pm	Reporting back from both groups, Q&A	Group representatives
12:45pm - 1:00pm	**Quiz**: recap of CLEANED model understanding	Participants
1:00pm - 2:00pm	LUNCH BREAK	All
2:00pm - 3:00pm	**Showcasing a CLEANED assessment case study**, including scaling to regional level, Q&A	Emmanuel Mwema

3:00pm - 3:20pm	**Group discussion**: Application of CLEANED to KCSAP digital dairy project	Participants
3:20pm - 4:00pm	**Reporting back from groups**, discussion	Participants
4:00pm - 4:30pm	Feedback, closing, next steps	Emmanuel Mwema, Birthe Paul, Boniface Akuku