



Alliance



# CLEANED: A tool for ex-ante assessment of environmental impacts of livestock production – A case study on dairy production in Tunisia

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Rein van der Hoek, An Notenbaert, Emmanuel Mwema, Jessica Mukiri, Birthe Paul

Tropical Forages Program  
Alliance Bioversity International and CIAT



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.






# Agenda

- The CLEANED tool
- Case of Sidi Bouzid, Tunisia
  - Baseline
  - Scenarios with best practices/ forage and feed options
- Conclusions

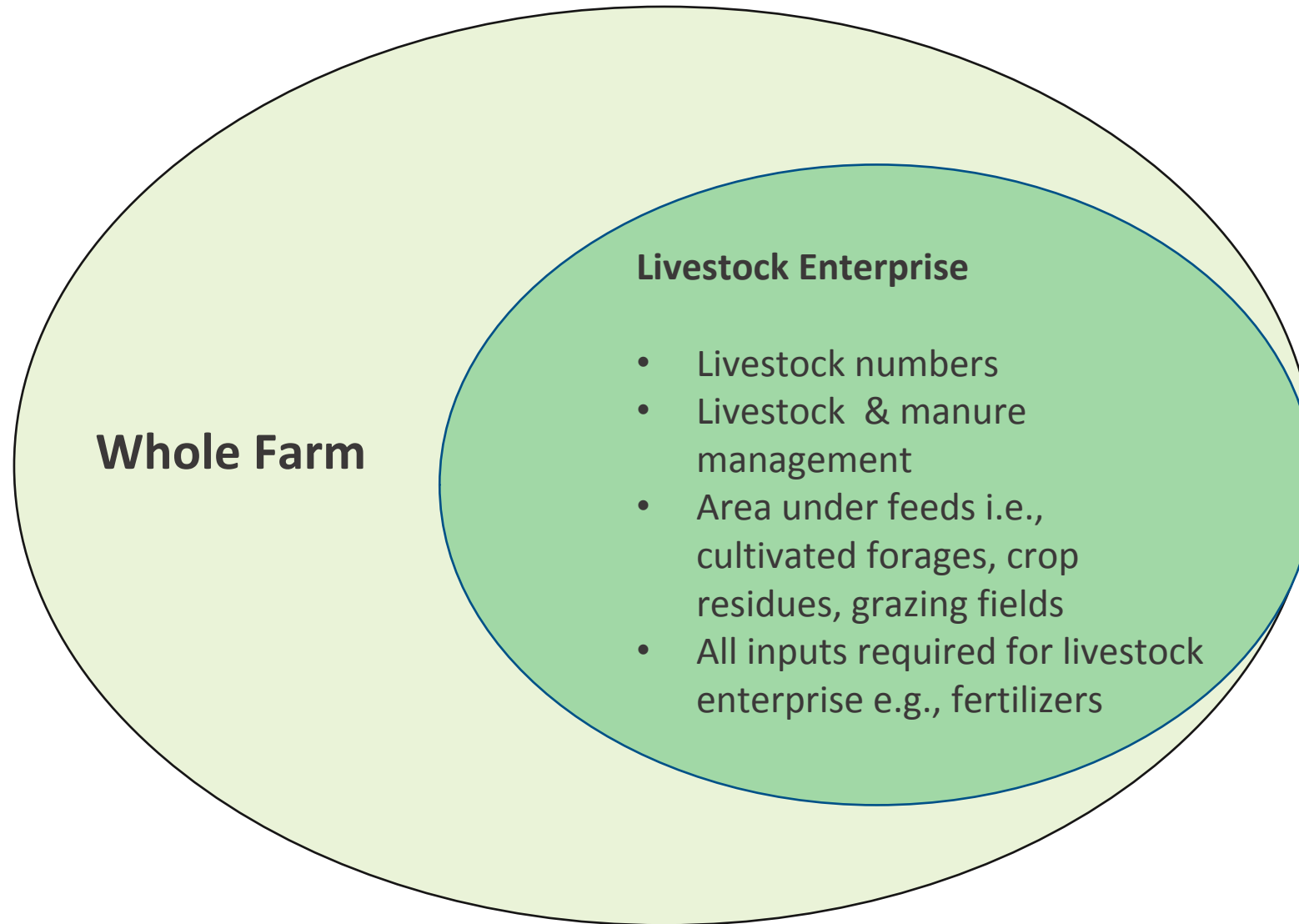
# CLEANED

**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

- rapid ex-ante environmental impact assessment tool
- lets users explore multiple impacts of livestock enterprises

	Land requirements
	Soil Impacts
	Water impacts
	GHG emissions and carbon sequestration
	Economics

# CLEANED Systems Boundary



# CLEANED Input Data Requirements



Land, soil & climate	Annual precipitation	mm/yr	1570
	Rainy season	no of months/year	6
	Soil type	FAO	Haplic Acrisols
	SoilN	g/kg	0.45
	SoilC	g/kg	7.5
	Soil clay	%	42.70
	Bulk density	g/cm <sup>3</sup>	1.33
	Soil depth	m	2
ET0	mm/year	1460	
Climate zone			Tropical Moist



- Body weight
- Herd composition
- Litter size
- Annual growth rate
- Daily mgt
- Manure mgt

- SOC
- Bulk density
- Clay content (%)
- Eto
- Soil N
- Soil depth & type
- Annual precipitation
- Rainy season

- Crop yields
- Harvest index
- N content
- Cover factor
- Crop coefficient
- Crop areas & residue mgt
- Crop inputs

- Feed basket quality (DM, CP, ME, DE)
- Feed basket composition

# Tunisia case

## Dairy sector

- Several productivity and competitiveness challenges (strong dependence on expensive external inputs)
- Inadequate/unsustainable management of natural resources (water, soil)

## Study

- Based on individual surveys, focus group discussions and soil and water quality analyses, baseline (BAU) and “best practice” (BP) scenarios were developed for each farming system.
- Assessment of the current environmental, climate and economic impacts of smallholder dairy farms in the project intervention areas
- Ex-ante impact assessment of proposed interventions (“best practices”)

Intensive dairy production systems in Tunisia depend to a large extent on off-farm (feed) resources. Therefore, the impact assessment distinguished four different “feed origins”: on-farm, off-farm roughages, off-farm concentrates and imported concentrates.

## Training of partners on the CLEANED tool

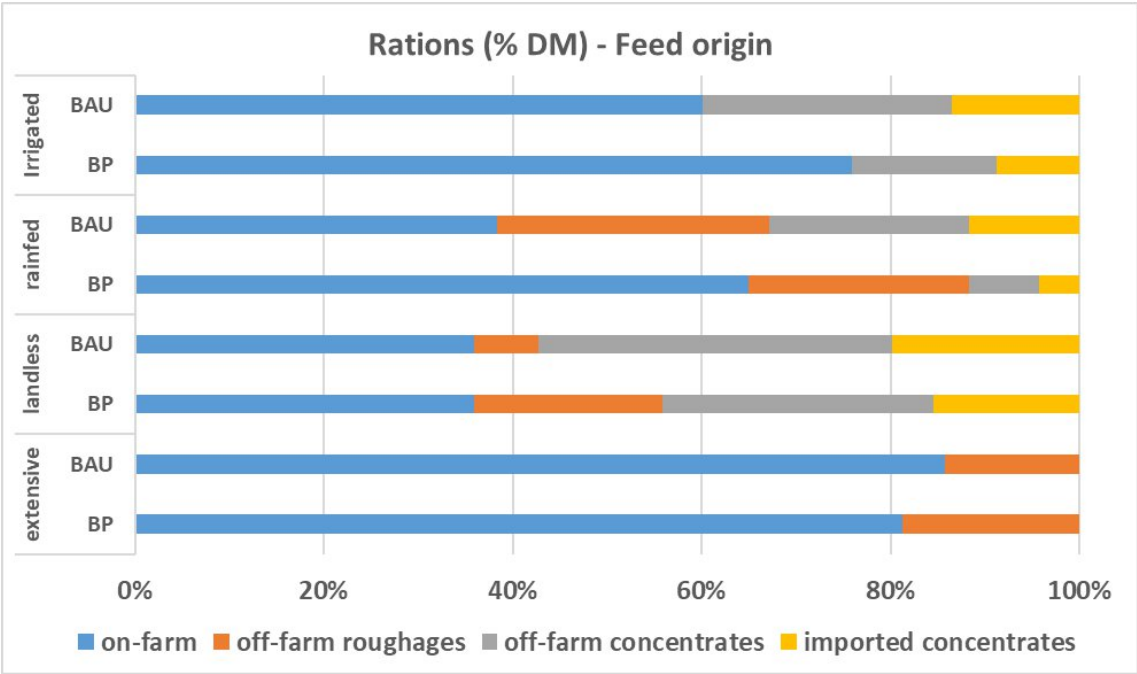
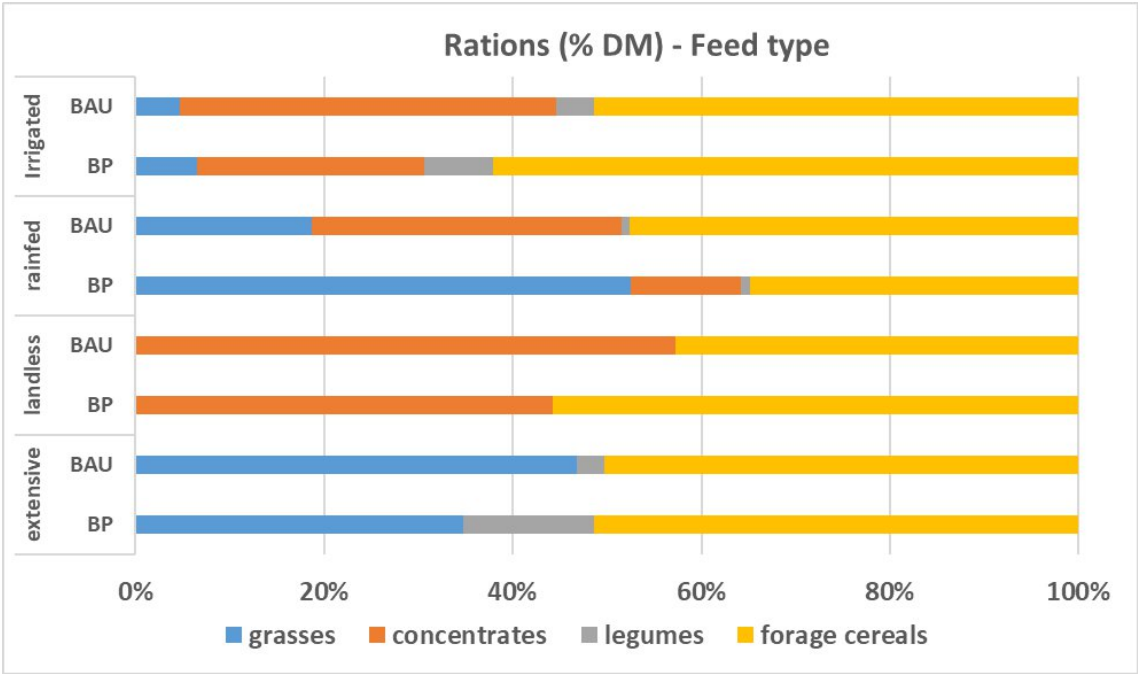
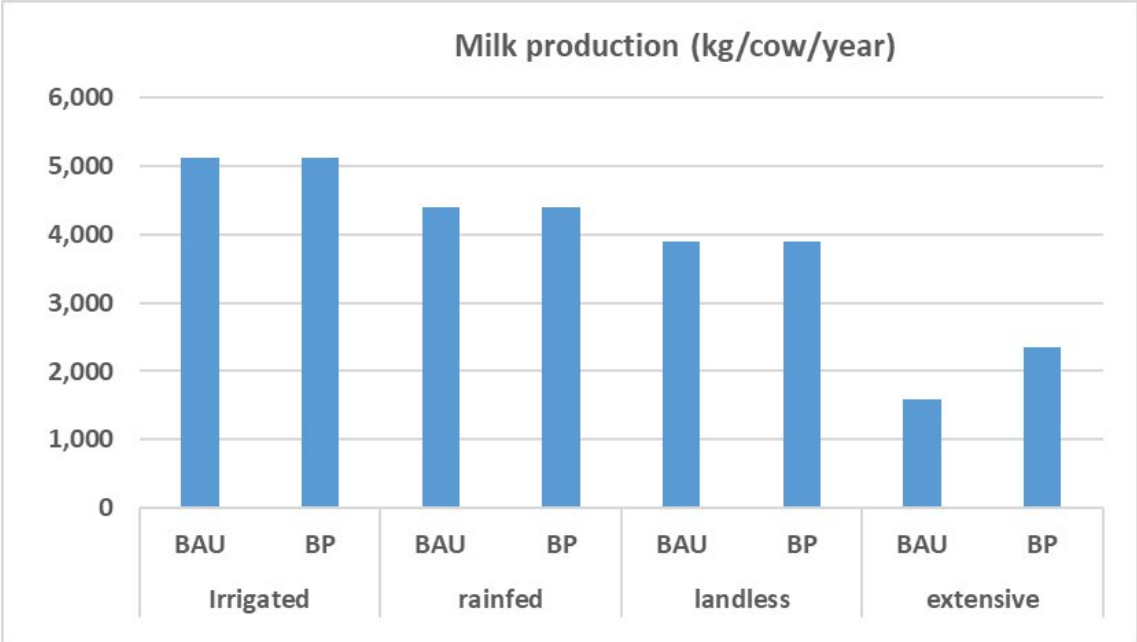
# Example Jendouba - Rations

## Four livestock/feed-forage systems:

- Irrigated
- Rain-fed
- Landless
- Extensive

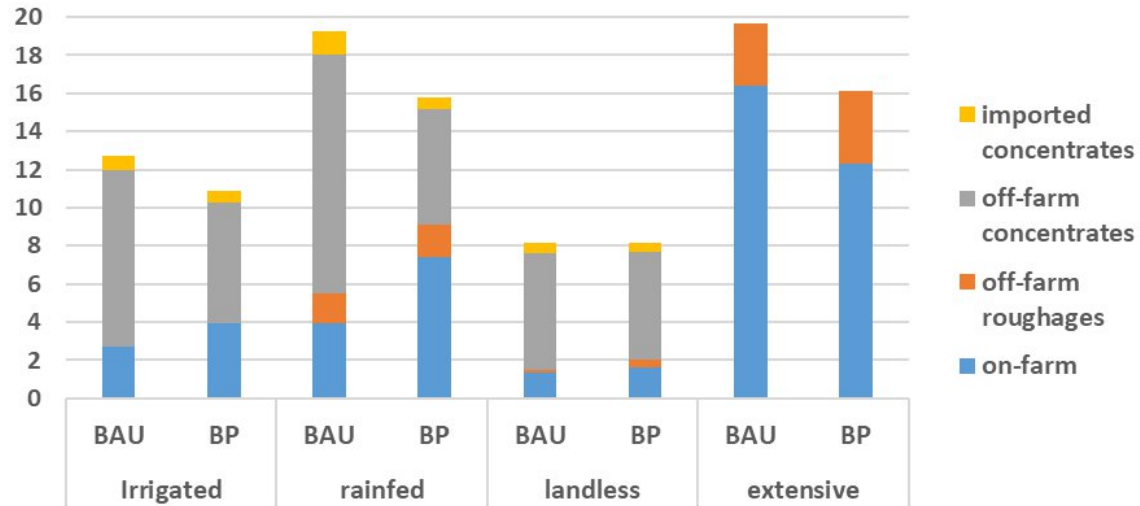
## Best Practices

- Reduction of concentrates (26%)
- Increase legumes and forage cereals (89%)

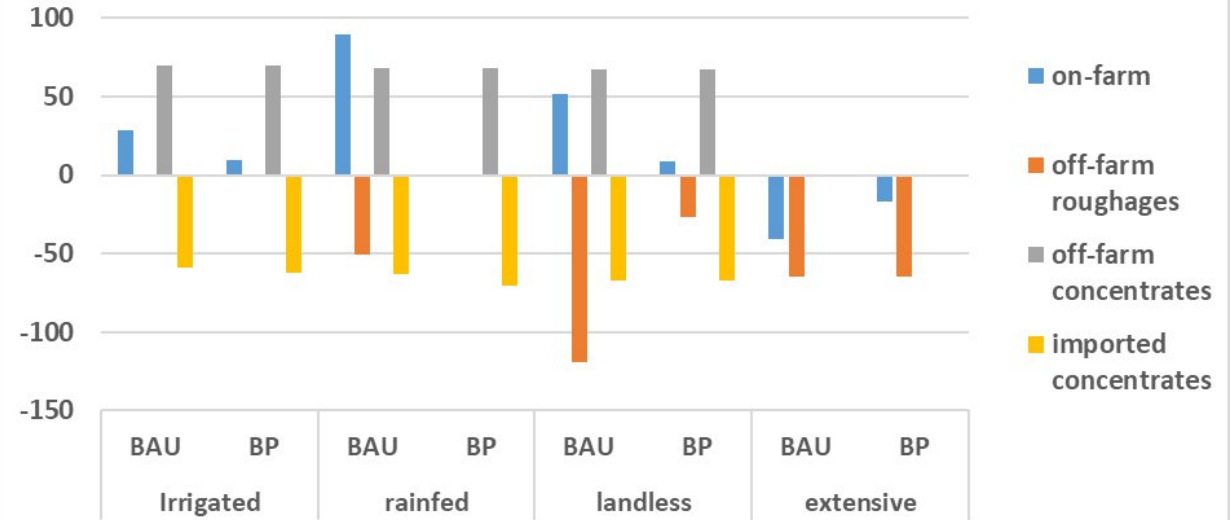


# Example Jendouba - Impacts

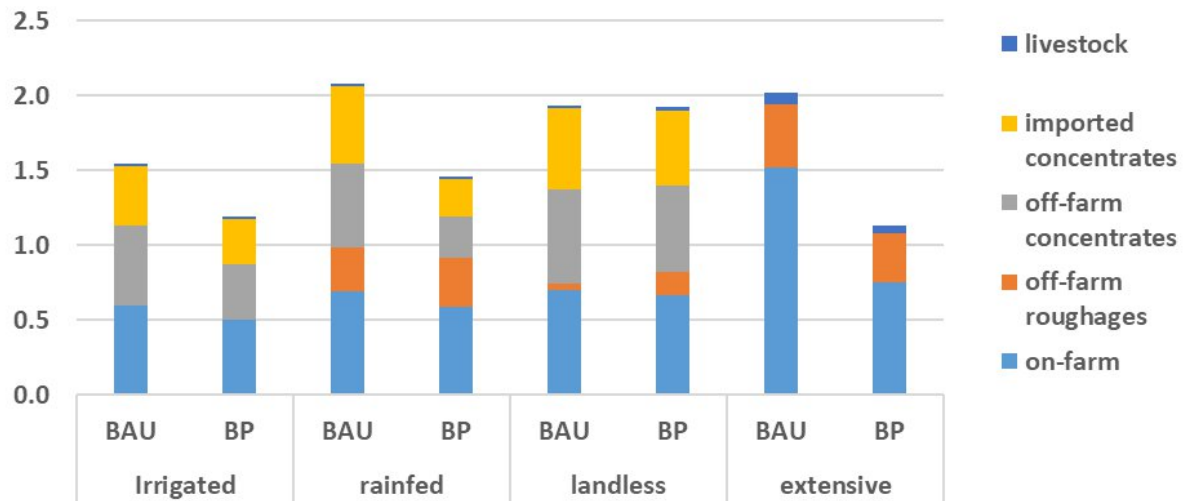
Land requirement (ha)



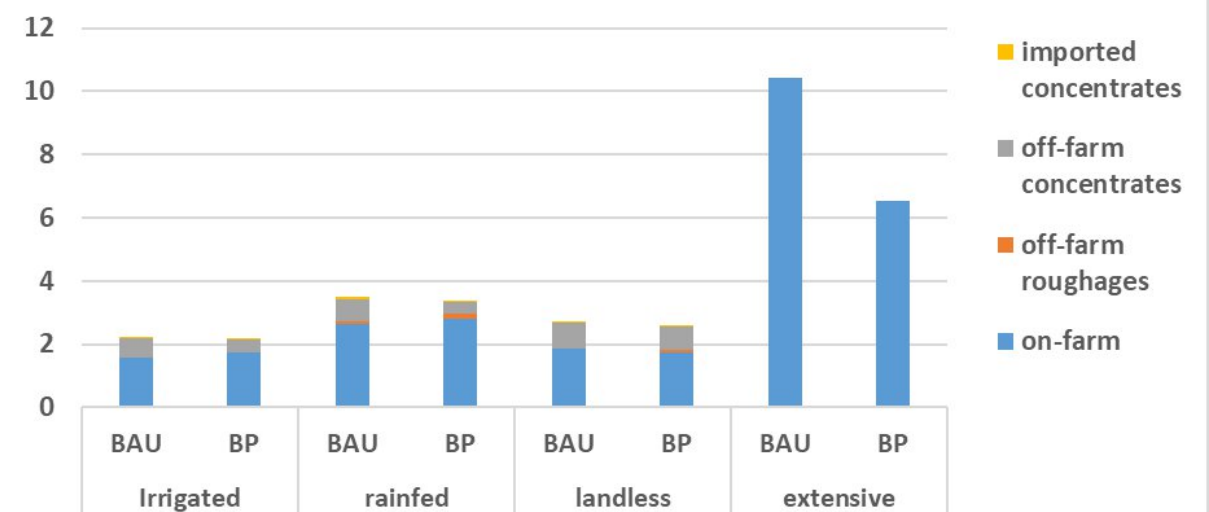
N balance (kg/ha)



Water requirement (m<sup>3</sup>/kg of milk)



GHG emissions (kg CO<sub>2</sub>e/kg of milk)





## Next steps

- Assessment of other scenarios with other feeds, other livestock breeds, other management practices (crops, livestock, manure)
- Region and country-wide extrapolation of farm level results
- Currently based on Excel, developing R version (allowing integration of spatial, climate and other data, crop and feed databases, “automated” comparison of different scenarios)

## For further discussion

- Suggestions for improvements
- What is needed for application on a wider scale
- Possibilities to integrate with other farm-level assessment tools

# Some references

## CLEANED workbook:

Mukiri, J.; Notenbaert, A.; Paul, B.; Mwema, E.; van der Hoek, R. (2020) CLEANED Workbook [Web site]. International Center for Tropical Agriculture (CIAT). Nairobi, Kenya. Retrieved from:

<https://cleanedtraining.netlify.app/>

## CLEANED: How-it works brief

Mwema, E., Boukpepsi, G., Van der Hoek, R. and Notenbaert, A. 2021. Assessing the environmental impacts of livestock production using the CLEANED approach. How-it-Works Brief. Nairobi, Kenya:

Alliance of Bioversity International and CIAT. <https://hdl.handle.net/10568/116681>

## Journal paper:

Notenbaert et al. (2020). Towards environmentally-sound intensification pathways for dairy development in the Tanga region of Tanzania. *Regional Environmental Change*.

<https://doi.org/10.1007/s10113-020-01723-5>

**CLEANED website:** <https://alliancebioversityciat.org/tools-innovations/cleaned>