Science session: WP2 Uganda

Innovations to improve quality in dairy value chains

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Prologue

For Uganda dairy value chain case study under WP2, scoping pointed out two key issues: quality and Tick Borne Diseases (TBD)

Easy to find solutions for quality issues, much more challenging to find solutions for TBD – more scoping was needed

In this presentation: focus on quality problem

Background: dairy value chain in Uganda

- FDI in Mbarara, often from India – cluster of processors creating demand
- Policy reforms that favor the sector – privatization
- Low cost of production
- Increase in productivity

Dairy now third biggest export earner for Uganda
Local dairy consumption increases – especially in towns

Problem statement, hypotheses & solutions

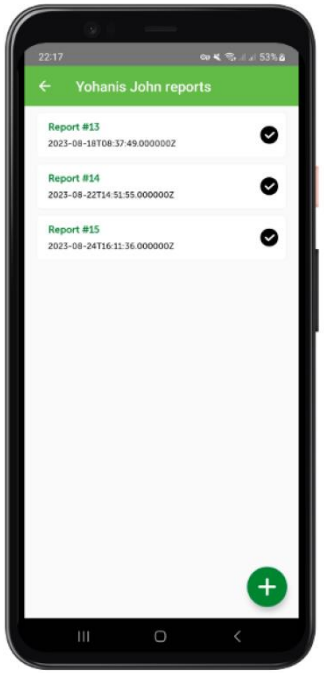
Quality (low fat and low protein content of raw milk) remains a problem. Processors want to pay more for quality & farmers indicate they can increase investment in quality if compensated, yet no market for quality exists.

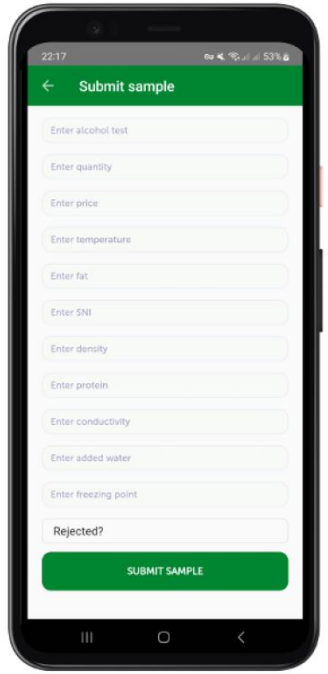
- Hypothesis 1: Quality is not readily observable and milk is bulked making tracking of quality very challenging (testing only happens at processor)
- Hypothesis 2: Farmers interpret quality as milk sanitation while processors are mainly interested in compositional quality

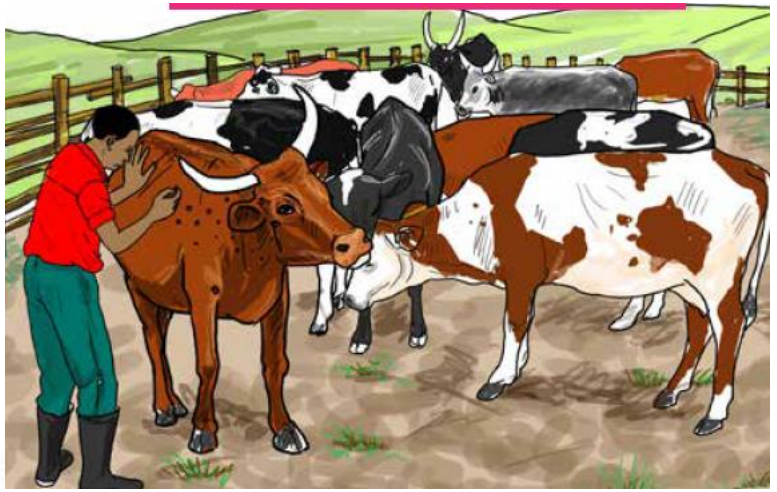
- Solution 1: make milk quality observable throughout the value chain
- Solution 2: sensitize farmers on importance of compositional quality (and how this can be achieved)

Innovation Bundles

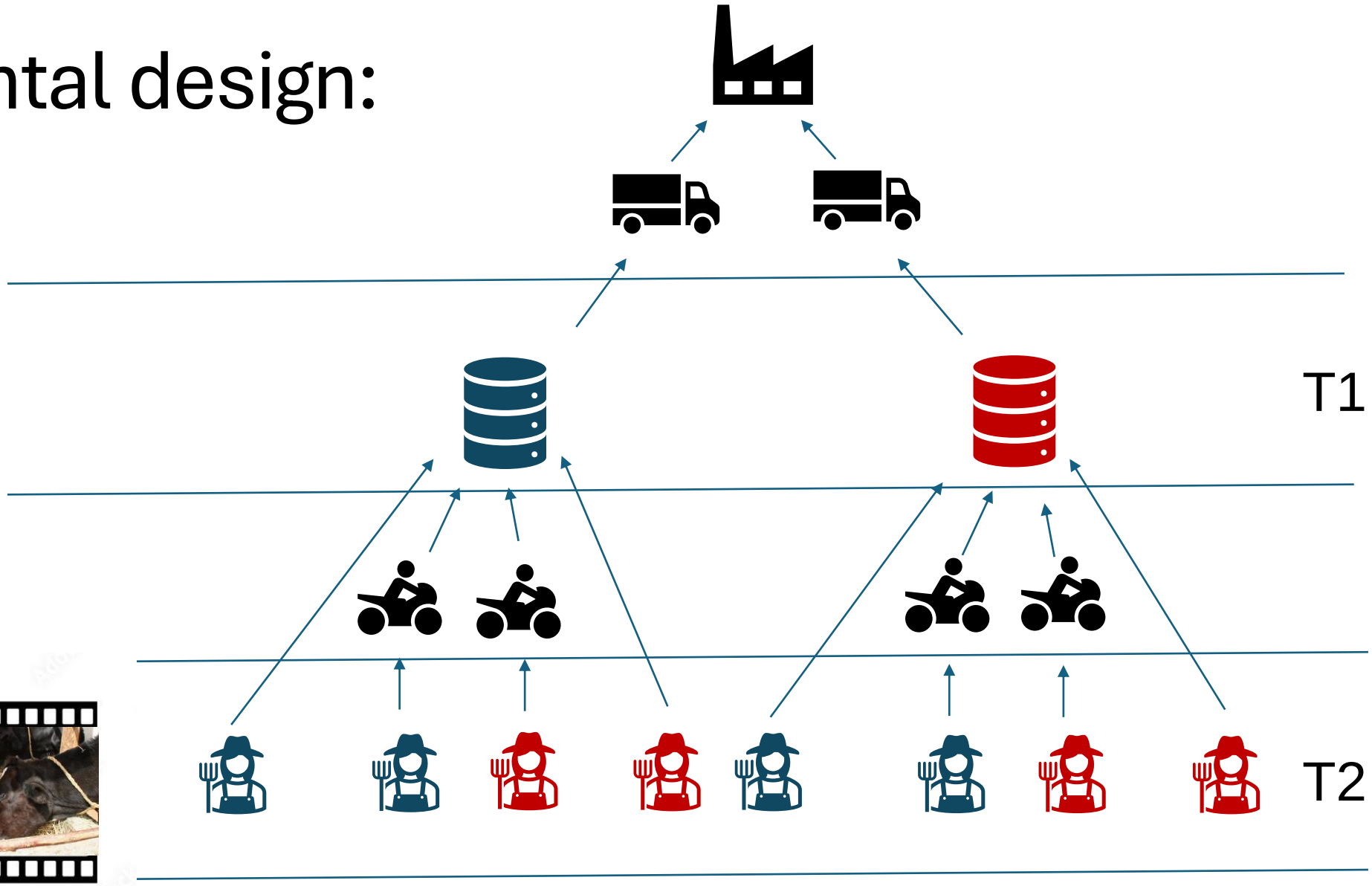
- Innovation bundle 1 (T1): Milk analyzer + training/hotline + tablet with application to track quality + BCC-type poster “get tested!”
- Innovation bundle 2 (T2): Video on management practices to increase quality + handout (cartoons)







Experimental design:



Empirical Specifications

Impact on MCC

$$y_m = \alpha + \beta_{H1}.T1_m + \varepsilon_m$$

Impact on farmer

$$y_{i,m} = \alpha + \alpha_C C_{i,m} + \beta_{H2}.T1_m + \beta_{H3}T2_i + \beta_{H4}T2_i.T1_m + \beta_{H2C}.T1_m.C_{i,m} + \beta_{H3C}T2_i.C_{i,m} + \beta_{H4C}T2_i.T1_m.C_{i,m} + \varepsilon_{i,m}$$

Hypotheses:

- making quality visible at the MCC level increases outcomes at MCC level ($\beta_{H1} > 0$)
- making quality visible at the MCC level increases outcomes at farmer level ($\beta_{H2} > 0$)
- providing information on how to increase milk quality increases outcomes for farmers ($\beta_{H3} > 0$)
- Combined treatment of making quality visible at the MCC level and providing information on how to increase milk quality increases outcomes for farmers ($\beta_{H4} > 0$)

Heterogeneity at farmer level:

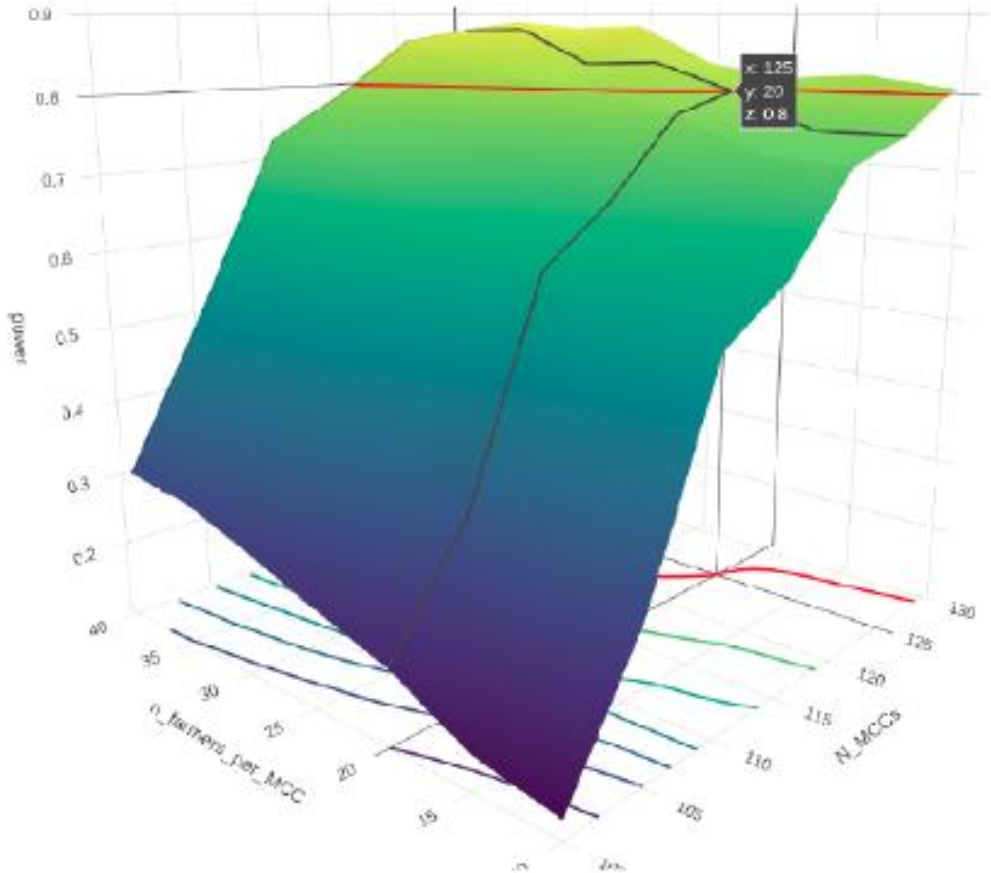
- Does making quality visible at the MCC level affect indirectly connected farmers differently ($\beta_{H2C} \neq 0$).
- Does providing information on how to increase milk quality affect indirectly connected farmers differently ($\beta_{H3C} \neq 0$).
- Does Combined treatment of making quality visible at the MCC level and providing information on how to increase milk quality affect affect indirectly connected farmers differently ($\beta_{H4C} \neq 0$).

Power calculations (simulations)

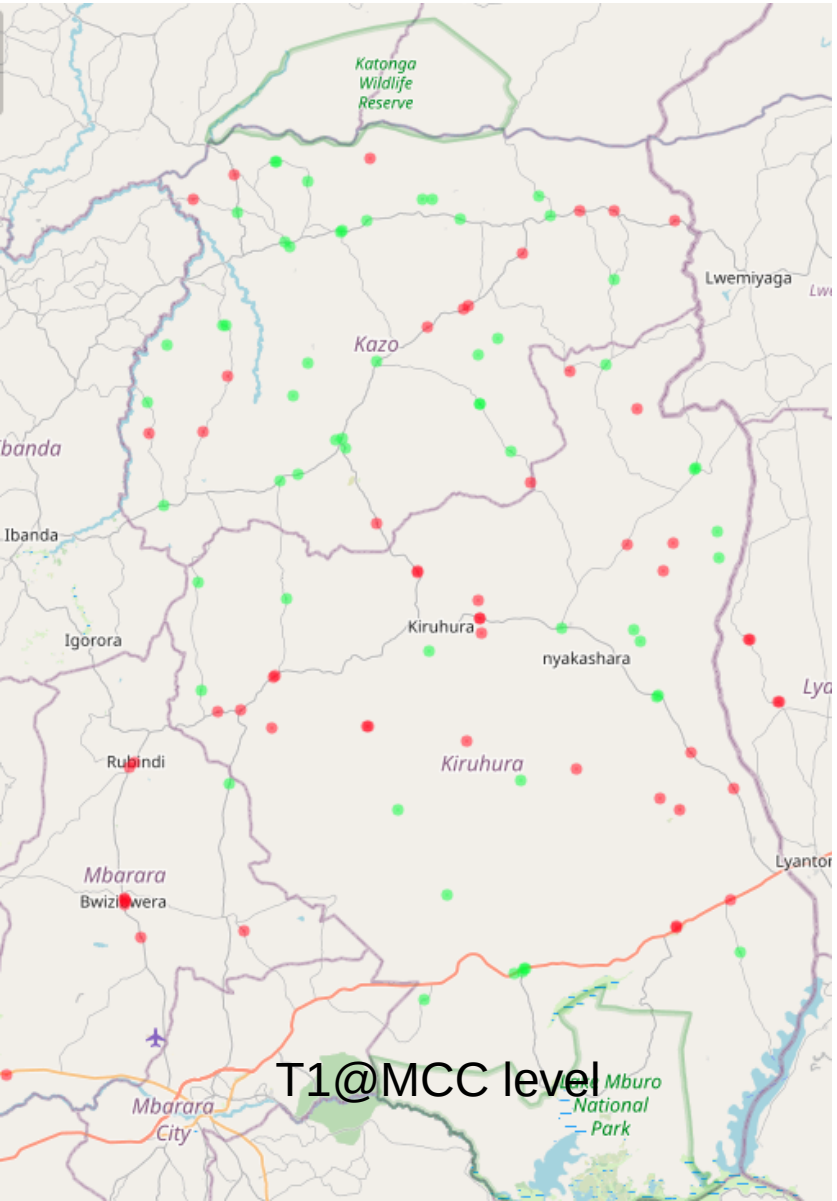
Problem: determine number of MCCs (N) and number of farmers per MCC (n) to power the entire design

Outcome: price of milk

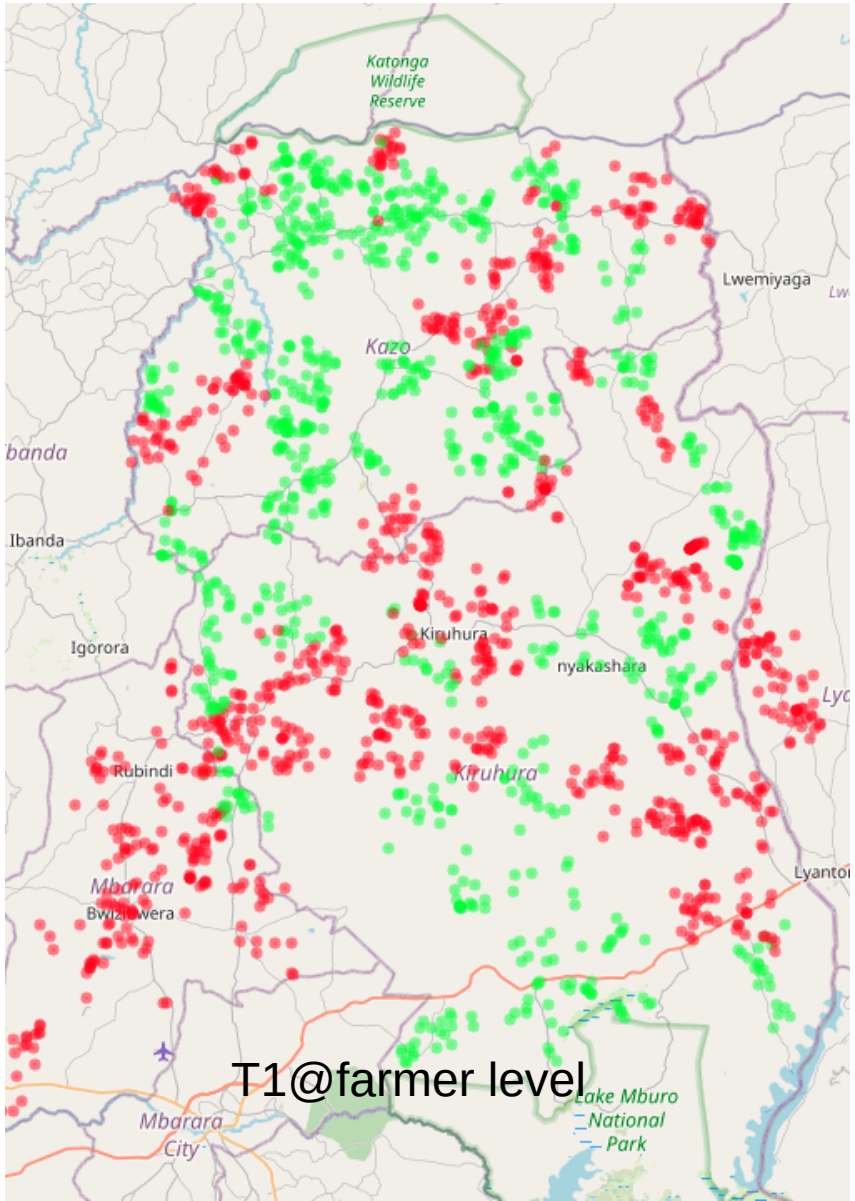
1. Define MDE sizes of T1 (30 UGX at MCC level, 40 UGX at farmer level) and T2 (25 UGX at farmer level) and interaction (50 UGX at farmer level).
2. Generate N prices at the MCC level and N*n prices at the farmer level, the latter being clustered at the MCC catchment area level (mean price =1000 UGX per liter, SD higher at farmer level); add MDE to half of the sample following the design
3. Run the two regressions and check if all four coefficients are significant
4. Do this 10000 times and calculate the how often all four coefficients are significant (divide by 10000 to get share – this is your power of your Nxn sample)
5. Repeat this for different N and n



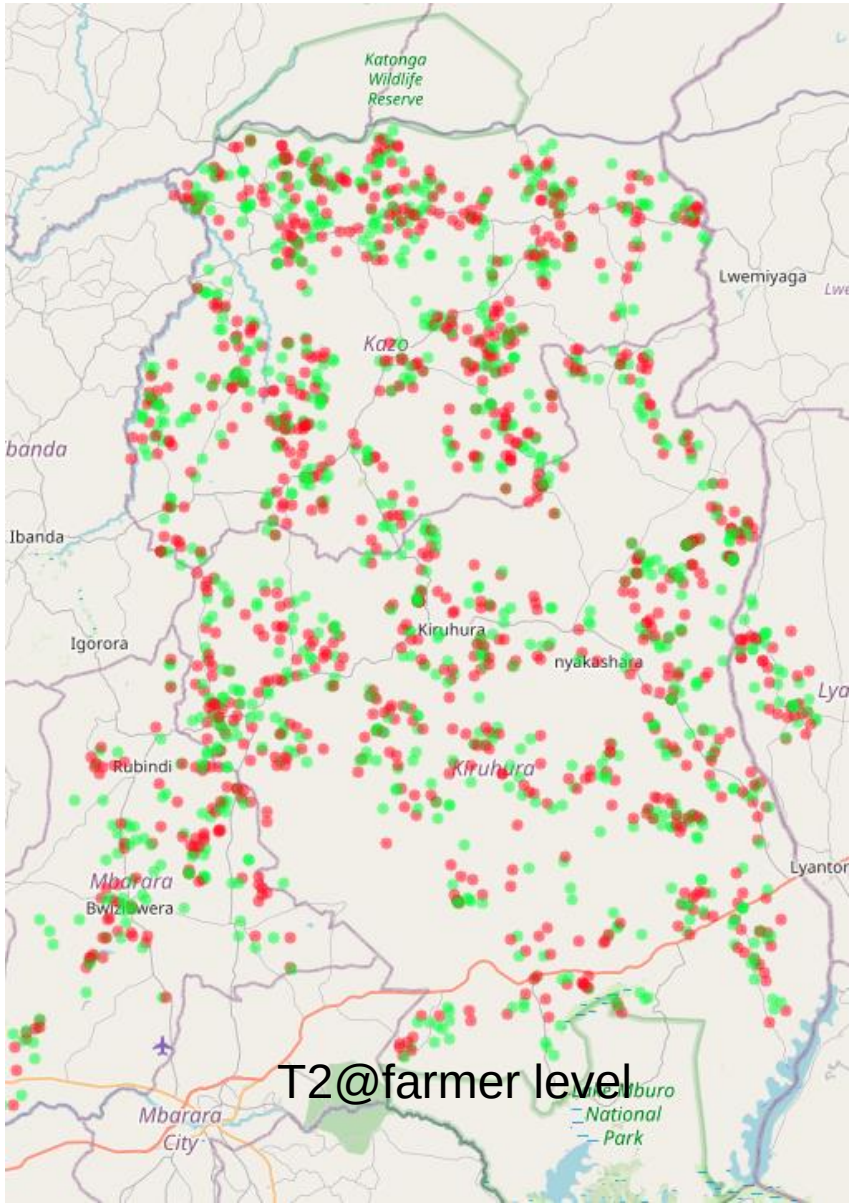
Sample



T1@MCC level



T1@farmer level



T2@farmer level

Table 1: Balance table

	mean ctrl	analyzer	video	bundle	nobs
			milk collection centers		
Is this milk collection center (part of a) cooperative? (yes/no)	0.575	0.133			127
	(0.496)	(0.089)			
Total Capacity of MCC (in liters)	4591.457	438.445			127
	(2451.97)	(426.818)			
Does the MCC pay a premium for quality (yes=1)	0.244	0.012			127
	(0.431)	(0.076)			
Years Experience in MCC	9.611	-1.778			126
	(8.068)	(1.571)			
Facilitates supply of acaracides? (yes=1)	0.543	0.039			127
	(0.5)	(0.092)			
			dairy farmers		
Household Head Age (years)	54.135	-1.756	-2.665	3.428	2229
	(13.494)	(2.632)	(2.168)	(3.189)	
Current Total herd size (number)	68.037	-1.157	-9.264	-1.749	1948
	(80.139)	(16.732)	(13.032)	(20.318)	
Number of improved animals in total herd (share)	75.65	-1.935	7.569	-0.142	2229
	(85.338)	(20.749)	(18.276)	(21.414)	
Liters milk sold per day (on average in the rainy season) (liters)	63.9	-9.778	-2.473	9.875	2229
	(66.72)	(15.64)	(11.943)	(16.063)	
Average monthly expense (USD) on chemical purchases	71.811	-31.341	-27.857	-0.611	891
	(113.279)	(30.51)	(24.601)	(55.469)	

Note: First column reports control group means (and standard deviations below); **, * and + denote significance at the 1, 5 and 10 percent levels.

Progress

- Baseline data was collected in December 2022 + T2 was done
- Only now milk analyzers have been delivered!
- In two weeks: implement T1 and repeat T2
- Midline (originally planned 6 months after T1) has been postponed to 2024 (budget cuts + slow procurement of milk analyzers)

- For TBD work, scoping report is ready and co-design workshop was held (together with MELIA&SPA team) where we identified some potential innovation bundles
- Future of TBD work is uncertain due to budgetary uncertainty – priority to ongoing field experiment

Thank you

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