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1. Introduce the CLEANED concept with focus on sustainable intensification of livestock production
2. Train participants on the use of the tool
3. Exchange of workshop participants with cattle farmers on proposed interventions on sustainable livestock production and the results of the CLEANED tool

Three scenarios were identified:

- i) Traditional dual purpose system with crosses (Brahman), with low milk production potential, feeding system based on a 50/50 mix of traditional and improved pastures with *Brachiaria* spp or *Megathyrus maximus* during the rainy season, and based on cut-and-carry grasses, traditional pastures, improved pastures and crop residues (maize) in proportions of 30, 25, 30 y 15%, respectively during the dry season.
- ii) Improved dual purpose system with silvopastoral component (trees planted at low density: up to 30 trees per ha) with crosses (Brahman), with low milk production potential, feeding system based on a 50/50 mix of traditional and improved pastures with *Brachiaria* spp or *Megathyrus maximus* during the rainy season, and based on cut-and-carry grasses, traditional pastures, improved pastures, crop residues (maize) and molasses in proportions of 30, 20, 30, 15% and 5%, respectively during the dry season.
- iii) Improved dual purpose system with silvopastoral component (improved pastures in combination with trees) with crosses (Brahman), with low milk production potential, feeding system based on traditional pastures, improved pastures with *Brachiaria* spp or *Megathyrus maximus* and *Leucaena leucocephala* in proportions of 40, 35 and 25% respectively during the rainy season, and based on cut-and-carry grasses, improved pastures and *Leucaena leucocephala* in proportions of 30, 30 and 40%, respectively during the dry season.

2 Discussion and field visit with 6 livestock farmers in Matiguás

Farm size: 20-40 ha

Agenda

Presentation of (1) overview of challenges and opportunities obtained in earlier workshop (see Table 1) and (2) provisional CLEANED results

Table 1: Characteristics and challenges of cattle production in Matiguás

Characteristics	Challenges
<ul style="list-style-type: none"> • Dual purpose (milk and beef) • Contributes 70-80% of cash income • Produce basic grains (maize, beans) and keep other livestock species (pigs, poultry) • Number of cattle: <ul style="list-style-type: none"> ✓ Small farmers: 1-30 ✓ Medium farmers: 30-70 ✓ Large farmers: > 70 • Feed system based on traditional pastures during most of the year, cut-and-carry grasses during 3 months (dry season) and mineral supplements throughout the year. 	<ul style="list-style-type: none"> • Increase productivity and stocking rate • Increase quality of dairy and meat products • Lower costs • Improve genetics, feeding and management • Prevent zoonotic diseases • Water harvesting • Capacity development on establishing silvopastoral systems • Better market access • Increase milk processing capacity

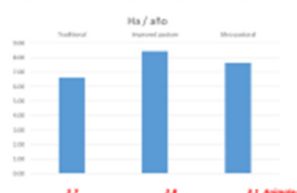
Table 2. Proposed sustainable livestock innovations

Innovation	Positive (++) or negative (- -) impacts
Climate and soil adapted forages	(++) Decrease pasture area (- -) Loss of local species (- -) Accelerated pasture degradation (inadequate (soil fertility) management)
Electric fences and water points for grazing management	(++) Increased pasture productivity, availability and use (++) Freeing up areas not suitable for livestock production (++) Reduced water source contamination (- -) Increased risk of soil compaction (- -) Mud accumulation on cow paths: foot problems and animal stress
Use of ration balancing tools	(++) Reduced use of feed supplements (++) Increased ration quality, lower GHG emissions
Use of probiotics for silage and artisanal production of feed supplements	(++) Increased ration quality, lower GHG emissions (++) Better digestion of fibrous feeds (++) Reduced use of cereals

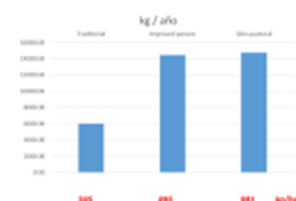
The preliminary results of the CLEANED assessment are presented below:

Graph 1: CLEANED assessment of three scenarios (traditional, silvopastoral system, silvopastoral system with improved pastures)

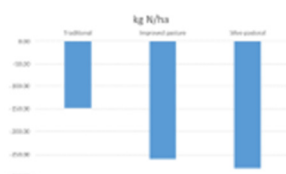
¿Cuánta tierra se necesita para la producción?



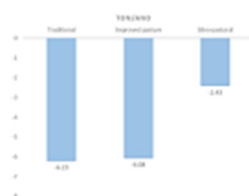
¿Cuánta leche se produce?



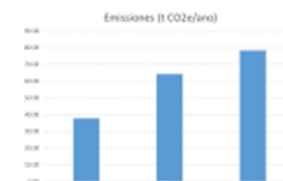
¿Qué sucede con la fertilidad del suelo?



¿Cuánto suelo se pierde?



Cambio climático



After the discussion, some pastures were visited: traditional pasture, improved pasture and silvopastoral system. The farmers are convinced on the need to change their production systems, increasing areas with improved grasses and establishing silvopastoral systems. However, unstable milk prices and expensive

grass seed have limited the intensification process. Another limiting factor is the lack of knowledge on silvopastoral systems (how to manage pastures in combination with trees, shade)

3: Adjustments to the CLEANED assessments

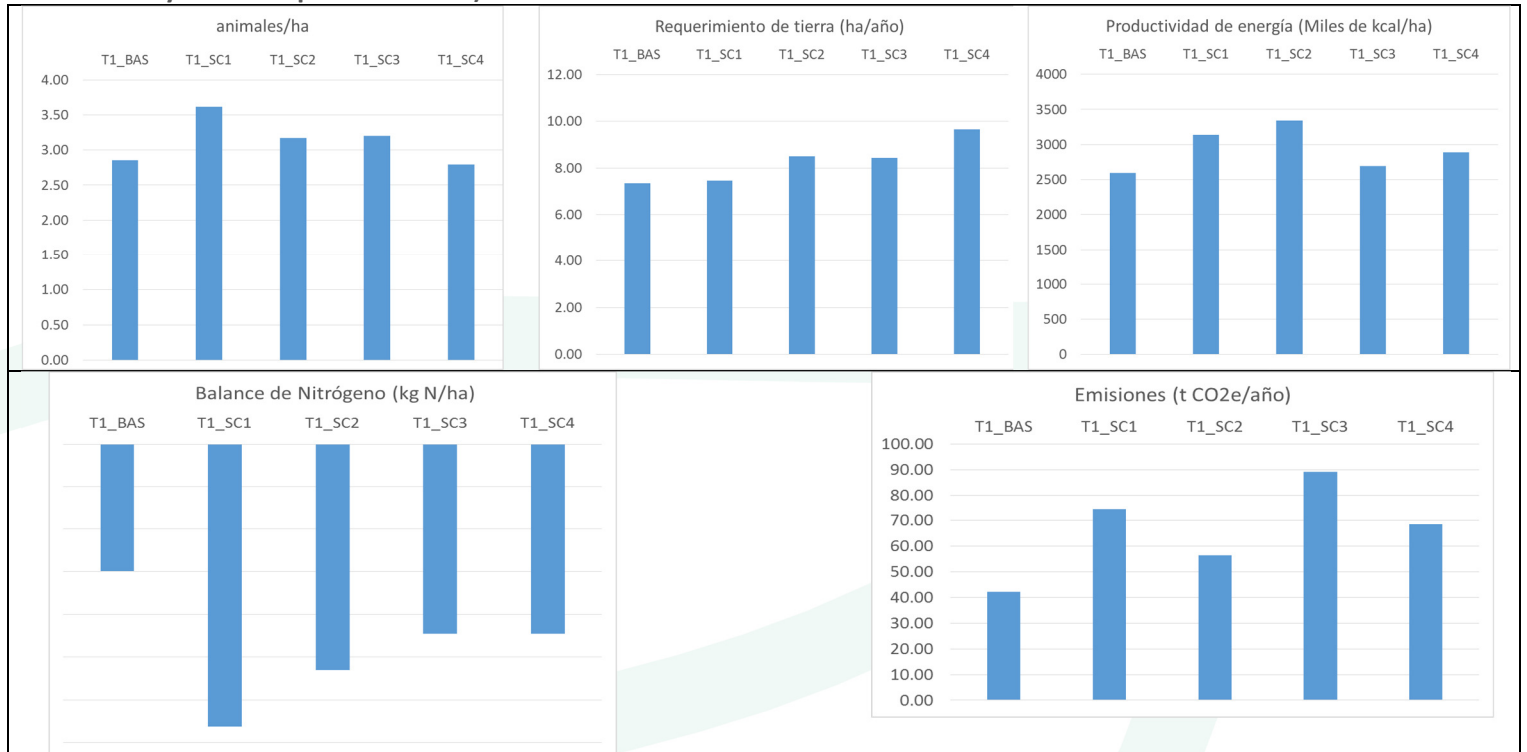
- Based on discussions and field visit it was proposed to increase the number of scenarios to 5, by including a variable on genetic characteristics of the animals. Apart from the “baseline” (100% animals with high proportion of *Bos indicus* with low milk production potential, a second category was added: 60% of animals with high proportion of dairy-like breeds (Brown Swiss, Jersey, Holstein-Frisian).
- Some feed parameters were adjusted (mainly protein content), and some feeds were added.

See below for details

	BASELINE Traditional pastures + traditional breeds (T1_BAS)		SCENARIO 1: Improved pastures + traditional breeds (T1_SC1)		SCENARIO 2: Improved pastures + improved breeds (T1_SC2)		SCENARIO 3: Improved pastures + traditional breeds + silvopastoral systems (T1_SC3)		SCENARIO 4: Improved pastures + improved breeds + silvopastoral systems (T1_SC4)	
Herd composition	20-30		20-30		20-30		20-30		20-30	
Traditional breeds	10		12		5		12		5	
Dry cows			2		2		2		2	
Improved breeds (dairy)	0		0		7		0		7	
Bulls	1		1		1		1		1	
Heifers/Steers	4		6		6		6		6	
Sold	3		4		4		4		4	
Calves	6		8		8		8		8	
Milk production (tr br) (kg/year)	500		840		880		980		1030	
Milk production (improved breeds)					1500				1735	
FEED RATION										
	RAINY SEASON	DRY SEASON	RAINY SEASON	DRY SEASON	RAINY SEASON	DRY SEASON	RAINY SEASON	DRY SEASON	RAINY SEASON	DRY SEASON
Brachiaria -	30	20								
Napier	-	35		30		30		20		20
Megathyrus	-	-	50	20	50	20	35	10	35	10
Traditional pastures	70	20								
Brachiaria hybrids	-	-	50	30	50	30	40	20	40	20
Maize residues	-	20		15		15		10		10
Molasses	-	5		5		5				
Sugarcane								10		10
Leucaena							25	30	25	30
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Based on the adjustments the CLEANED model was run again adding the two new scenarios, with the following results:

Graph 2: CLEANED assessment of five scenarios (traditional, improved pastures, improved pastures + improved breeds, improved pastures + silvopastoral systems, improved pastures + silvopastoral system + improved breeds)



CONCLUSIONS

- The workshop participants got acquainted with CLEANED and its use in the context for sustainable livestock development.
- They developed some skills to use the tool and improved it adjusting the feed basket and some feed parameters.
- The farmers agree with the proposed livestock related innovations, especially improved pastures. Cost of seed and lack of knowledge mainly on silvopastoral systems are still major limiting factors.