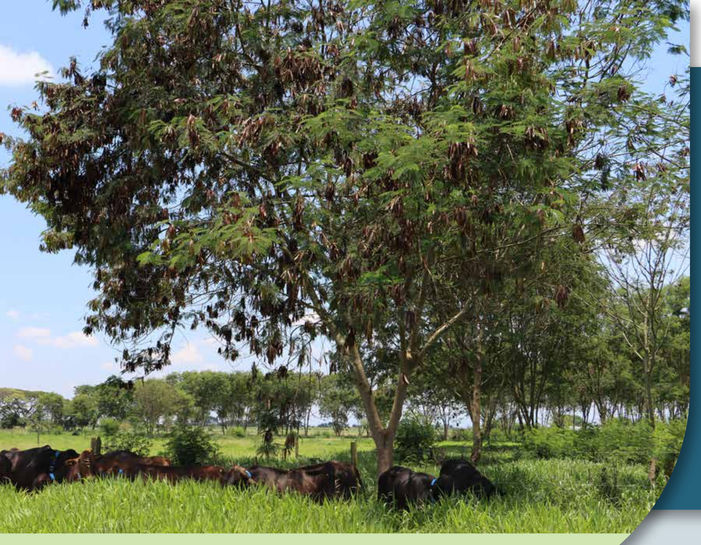

CIAT / JL Urrea

N fixation and N_2O emissions in silvopastoral systems based on *Urochloa* grasses & *Leucaena* shrub legume.

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Introduction

Silvopastoral systems provide a number of environmental and productive benefits compared to grass-alone pastures (Shultze-kraft et al 2018) in terms of:

i. increased forage biomass offer and quality
ii. nutrient cycling
iii. biodiversity
iv. cash flow, among other ecosystem services.

Objective

To evaluate the nitrogen (N) cycling differences in grass-alone pastures and silvopastoral systems (SPS) we established a field trial in the CIAT campus in Palmira, Colombia.

Methodology

Experimental design: RCBD with three replications. Treatments:

- T1: *Urochloa* hybrid cv. Cayman (CIAT BR02/1752)
- T2: *Urochloa brizantha* cv. Toledo (CIAT 26110)
- T3: *Urochloa* hybrid cv. Cayman + *Leucaena diversifolia* (ILRI 15551)
- T4: *Urochloa brizantha* cv. Toledo + *Leucaena diversifolia* (ILRI 15551)

Response variables:

- Plant biomass production
- Nutrition quality parameters (Crude protein-CP, acid detergent fiber-ADF, neutral detergent fiber-NDF)
- N_2O emissions from urine patches

Results

Figure 1. Silvopastoral trial at CIAT, Colombia. Photo: CIAT/ M Sotelo

Plant biomass production and nutrition quality of the pastures was higher in the grass-legume (T3 and T4) than the grass monoculture treatments (T1 and T2). N_2O emissions were higher in the grass-legume pastures.

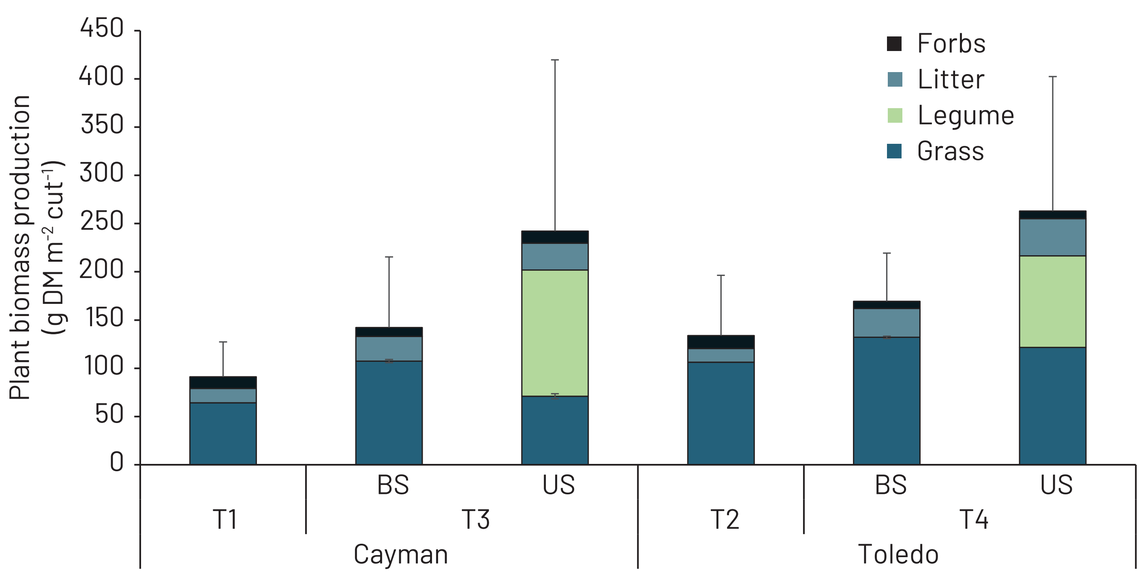

Figure 2. Plant biomass production in different pasture treatments. BS=Area between shrub rows of *L. diversifolia*. US=Area under shrubs of *L. diversifolia.*

Table 1. Nutrition quality parameters of grass alone (T1-T2) and grass-legume tree (T3-T4) treatments.

Treatment	Area	CP (%)		ADF (%)		NDF (%)	
		Grass	Legume	Grass	Legume	Grass	Legume
T1	-	8.8	-	26.1	-	61.3	-
T2	-	9.6	-	32.8	-	68.6	-
T3	BS	13	-	30	-	62.5	-
	US	14.1	26.6	30	49.4	63.5	58.7
T4	BS	9.7	-	35.9	-	69.7	-
	US	12	26.4	36.5	51.7	69.2	60.3

Table 2. N_2O emissions of grass alone (T1-T2) and grass-legume tree (T3-T4) pasture treatments.

Treatment	Area	Plant biomass g DM m^{-2}	N_2O emissions mg N_2O-N m^{-2}	Emissions intensity mg N_2O g DM^{-1}
T1	-	91.3	352.5	3.9
T2	-	133.9	453.4	3.4
T3	BS	142.4	404.5	2.8
	US	242.1	613.2	2.5
T4	BS	169.4	540.8	3.2
	US	263.0	685.7	2.6

Conclusions

Although N_2O emissions were higher in the grass-legume pastures, higher N uptake by the pastures in terms of higher N accumulation in tissue and biomass production yielded to lower emissions intensity, i.e. less N_2O emitted per dry matter produced.

References

Schultze-Kraft, R., Rao, I. M., Peters, M., Clements, R. J., Bai, C., & Liu, G. (2018). Tropical forage legumes for environmental benefits: An overview. Tropical Grasslands-Forrajes Tropicales, 6(1), 1-14. https://doi.org/10.17138/tgft(6)1-14

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