# Land reclamation potential of four forage legumes along an environmental gradient in Cauca, Colombia

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## Introduction

- Livestock worldwide is one of the most important economic activities since grasslands are the crop with the highest occupation of land on the planet.
- Poor management of grasslands due to overgrazing and animal overpopulation lead to soil degradation. In the tropical region of Latin America and the Caribbean (LAC) alone, it is estimated that more than 200 million hectares of grasslands are degraded.
- The use of forage legumes has great potential for soil recovery due to the supply of nitrogen and easily decomposable organic material; In addition, biological activity increases, which in turn facilitates soil aggregation and, therefore, the soil becomes more friable and with greater water retention at the same time that it provides food for livestock.
- The soil recovery potential of four forage legumes was evaluated: *Canavalia brasiliensis* CIAT-17009, *Centrosema molle* CIAT-15160, *Desmodium heterocarpon* CIAT-13651 and *Stylosanthes guianensis* CIAT-11995 between August 2015 and December 2017 in degraded soils along an environmental gradient in three municipalities of the department of Cauca, Colombia.

## Study site and methods

- Valle del Patía, municipality of Patía and Mercaderes Cauca, Colombia
- Annual precipitation: 676–1020 mm
- Rainy period: Biannual
- Plots of 100 $m^2$ in complete blocks at random with three repetitions and 4 treatments plus a control (predominant coverage: Mercaderes and Patía, *Dichanthium aristatum* and Piedra Sentada: *Hyparrhenia rufa*) by locality
- Determination of changes in the physical, chemical and biological parameters of the soil

## Results

- No significant differences were found between treatments for the variables evaluated, however, positive changes are evidenced in some treatments compared to the control.
- In general terms, for each of the measured variables it was found that for the parameter:

» Physical: *Canavalia brasiliensis* presented a greater reduction in the apparent density of the soil (Figure 1).

» Chemical: *Stylosanthes guianensis* in general terms had the highest content of organic matter and phosphorus availability (Table 1).

» Biological: *Stylosanthes guianensis* was the treatment with the highest diversity and abundance of macrofauna in the soil (Figure 2).

**Figure 1.** Apparent density after two years of establishment

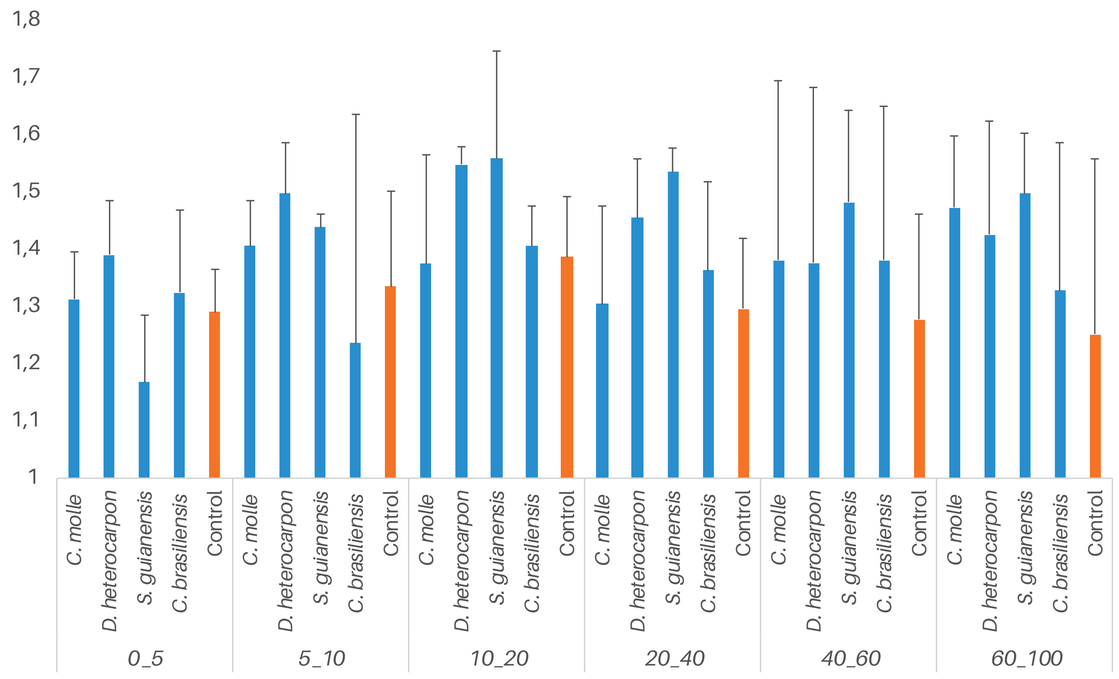
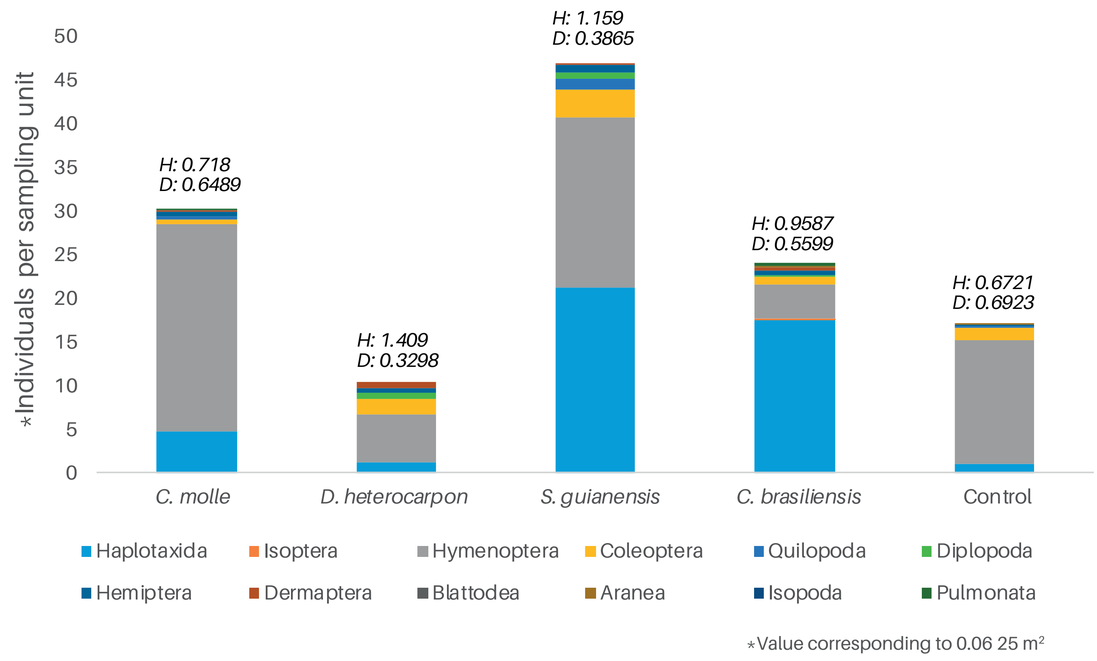



**Figure 2.** Diversity and abundance of macrofauna after two years of establishment




*Value corresponding to 0.06 25 $m^2$

**Tabla 1.** Chemical changes after two years of establishment

| Parameter | L.B | *C. molle* | *D. heterocarpon* | *S. guianensis* | *C. brasiliensis* | Control |
|---|---|---|---|---|---|---|
| Piedra Sentada | | | | | | |
| P-Bray II (mg/kg) | 0.49 | 4.97 | 1.92 | 13.31 | 5.63 | 1.04 |
| MO (g/kg) | 4.05 | 4.11 | 3.29 | 3.27 | 3.28 | 4.2 |
| Patía | | | | | | |
| P-Bray II (mg/kg) | 21.39 | 61.48 | 77.74 | 62.9 | 19.13 | 32.11 |
| MO (g/kg) | 3.91 | 29.4 | 26.89 | 31.65 | 26.8 | 40.43 |
| Mercaderes | | | | | | |
| P-Bray II (mg/kg) | 3,02 | 10,63 | 5,01 | 8,13 | 2,90 | 0,86 |
| MO (g/kg) | 2,39 | 18,13 | 24,11 | 22,14 | 20,66 | 16,81 |

## Conclusions

- The genotype-environment interaction insidium in the behavior of the materials so that a single material was not found that surpassed in the three localities.
- It is important to identify the niche for each treatment, however, the four treatments showed potential to be used as an alternative in soil recovery.
- The wide range of adaptation that legumes present allows them to establish themselves under climatic critical conditions.

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