ARACHIS PINTOI: POTENTIAL FOR RISK REDUCTION/PRODUCTIVITY INCREASE IN LIVESTOCK SYSTEMS OF THE COLOMBIAN ORINOQUÍA REGION

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Introduction

» In parts of Colombian Orinoquía region, cattle production takes place on poorly drained soils.

» Extensive grazing systems with *Brachiaira humidicola* cv. Humidicola dominate: high adaptation potential and biomass production but low nutritional quality.

» Feed shortage is a major constraint, particularly during dry season.

» According to climatic projections for the region, climate change (CC) will negatively affect quantity and quality of forages and increase heat stress risks for cattle.

» *Arachis pintoi* CIAT 22160 (Arachis) is a promising alternative for cattle production on soils with waterlogging problems, showed good agronomic behavior: nutritional quality, persistence and compatibility with Humidicola.

Objective

To assess milk profitability in the foothills of the Colombian Orinoquía. We compared two production systems: **T1:** Association of Arachis – Humidicola and **T2:** Humidicola as monoculture. The analysis considers changes in forage characteristics, resulting from variations in the projected climatic variables under CC scenarios (Representative Concentration Pathways -RCP 2.6 & 8.5).

Methodology

1.ANOVA was used for the identification of main climate variables and their effect on biomass production.

2. The LIFE-SIM model was used to simulate dairy production according to forage production, animal information and environmental characteristics.

3. The MaxEnt model was used for modeling future distribution.

4. A discounted cash flow model for the estimation of financial profitability indicators was developed and a quantitative risk analysis carried out by running a Monte Carlo simulation

Results

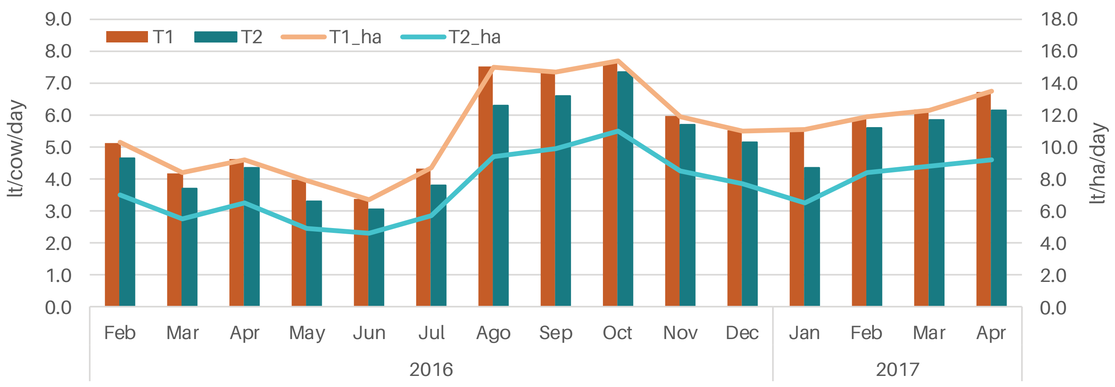

Figure 1. Average milk production per treatment (at *Arrayanes* farm, municipality Castilla La Nueva).

Compared to T2, the inclusion of Arachis in T1 allows for:

» Average increase of daily milk production/cow by 24%, animal stocking rate/ha by 33%, and milk production/ha by 52%.

» A higher content of crude protein (9.2% versus 6.6%) and less Acid Detergent Fiber (ADF) proportion (30% vs. 38%).

Economic evaluation under the current scenario

» Profitability indicators are highly sensitive to variations in milk production per cow (contribution to variance of NPV >90%) under both treatments.

Table 1. Performance indicators of the economic evaluation.

Decision criteria	Indicator	T1	T2
NPV	Mean[1]	US$119.67	US$(940.98)
	SD[2]	US$278	US$277
	Prob >0	60.9%	0%
IRR	Mean	12.2%	-

[1]NPV mean value obtained through simulation (5,000 repetitions at 95% confidence level); [2]Standard Deviation regarding NPV mean value; [4]Probability of NPV being >0 (regarding NPV mean value). ∗Prices in USD – /USD/COP XRT: Average 2019.

Economic evaluation under CC scenarios

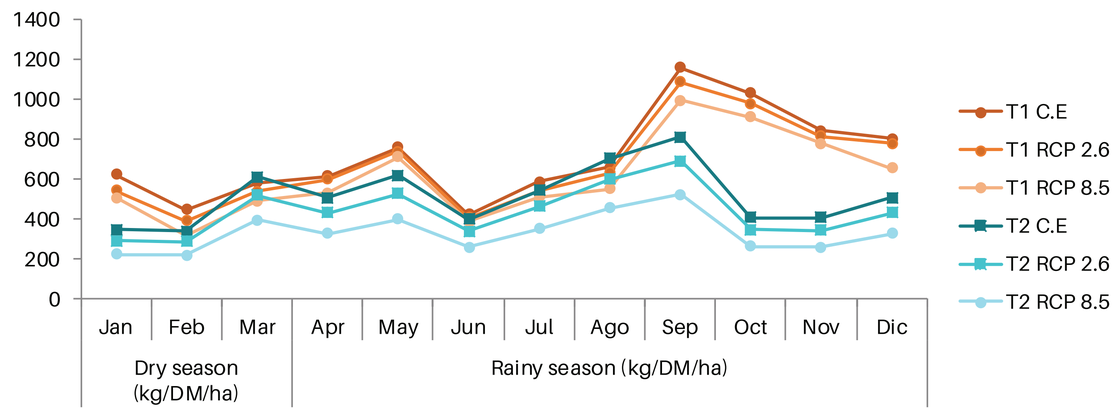

Figure 2. Dry Matter (DM) production under CC scenarios (2.6 y 8.5) and Current Scenario (C.S).

» Biomass production declines by 7.74% (RCP 2.6) and 16.62% (RCP 8.5) for T1, and 14.95% and 35.27% for T2, respectively.

» The MaxEnt model shows: a) with changes in suitable areas towards higher altitudes (RCP 2.6), and b) a general reduction of suitable areas for the legume (RCP 8.5).

Table 2. Current and future milk production under CC scenarios (2.6 and 8.5).

Treatment	Scenario	Milk production in dry season *(Average liters cow^{-1}day^{-1})*	Milk production in Rainy season *(Average liters cow^{-1}day^{-1})*
T1	C.S.	5.49	5.59
	2050 RCP 2.6	4.2	5.4
	2050 RCP 8.5	3.66	4.53
T2	C.S	4.97	5.1
	2050 RCP 2.6	1.83	2.93
	2050 RCP 8.5	1.63	2.35

» Milk production during dry season will drop by 23% (RCP 2.6) and 33% (RCP 8.5) for T1, and 63% y 67% for T2, respectively.

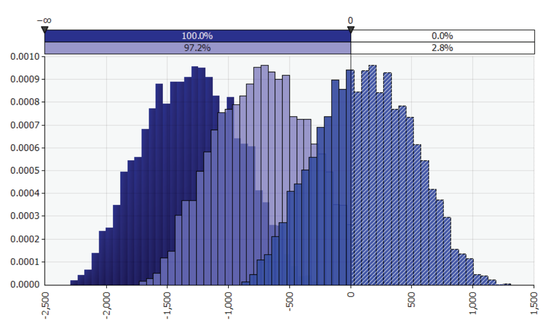

Figure 3. Probability density of NPV_T1 under CC scenarios (2.6 and 8.5)

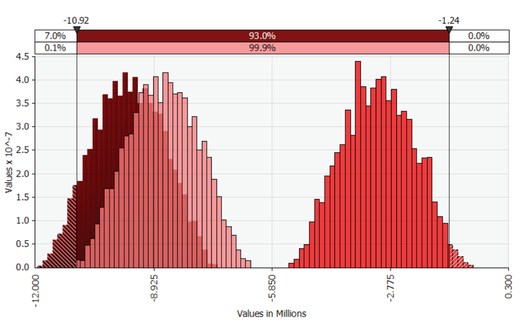

Figure 4. Probability density of NPV_T2 under CC scenarios (2.6 and 8.5)

» A displacement to the left of the probability density curve of NPV is visible. Under both CC scenarios, neither T1 nor T2 are profitable.

Conclusions

» *A. pintoi* has potential to increase productivity and profitability, under different scenarios. This is conducive to sustainable intensification of milk production under grazing systems.

» The inclusion of *A. pintoi* comes along with a reduction of the risk of economic loss and less variance to changes in critical variables. Since farmers, being naturally rather risk adverse, will most likely favor technologies with a relatively lower variance.

» Under the tested CC scenarios, the impact of atmospheric variables on forage production is considerable: both total area and potential distribution will change, and biomass production will decline.

» The adoption of more efficient production practices (e.g. the use of trees in paddocks, protein banks, or efficient animal breeding) are important for improving resilience under CC scenarios.

References

Rincón, A; Pesca, A. 2017. Productividad animal de una leguminosa forrajera seleccionada para pastoreo en suelos con drenaje deficiente [Final Report]. The Colombian Agricultural Research Corporation (AGROSAVIA)

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Alliance

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