The inclusion of *Leucaena diversifolia* in Colombian cattle systems: An economic perspective

Enciso, Karen; Sotelo, Mauricio; Peters, Michael; Burkart, Stefan

International Center for Tropical Agriculture (CIAT), Tropical Forages Program. CONTACT: s.burkart@cgiar.org

**Introduction**

» The forage-based cattle sector plays a key role in tropical food production, food security and poverty alleviation.

» But it is also associated with causing negative environmental impacts, e.g. greenhouse gas emissions, land degradation, deforestation, pollution and water depletion, loss of biodiversity.

» Improvements in animal feeding and sustainable intensification are considered to be among the most promising strategies for mitigating these impacts.

» The inclusion of forage legumes in cattle production systems has the potential to increase yield, efficiency and nutritional value of the forage, with less environmental impact.

» But adoption and use of forage legumes by the producers remain limited due to economic factors, the lack of knowledge and limited perceived benefits by the producer, and aspects associated with risk aversion and uncertainty.

**Objective**

To evaluate the profitability of including *L. diversifolia* in the Colombian cattle production system, in comparison with a grass monoculture.

**Methodology**

**Data source:** Monthly field measurements carried out by the International Center for Tropical Agriculture (CIAT) in Palmira, Valle del Cauca, Colombia, between August 2014 and August 2015.

**Evaluated diets:** T1) *Brachiaria* hybrid CIAT BR 02/1752 cv. Cayman monoculture (100%), and T2) Cayman-*L. diversifolia* association in a proportion of 70%-30% (2,000 *L. diversifolia* plants/ha).

**Economic, risk and sensitivity analyses**

» 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 (software @Risk).

» Three pasture persistence scenarios and the following variables were randomly combined: live weight gain per animal and year, investment costs, maintenance costs, sales price per kg of live weight, and purchase price per kg of live weight.

» Sensitivity and scenario analyses were carried out to identify those variables with the strongest effects on the profitability indicators.

**Results**

» Establishment costs of T2 are 60% higher than of T1.

» The evidenced animal productivity indicators for T2 allowed average annual increases per hectare of 66% in gross income and 119% in net profit, when compared to T1.

**Table 2:** Summary of profitability indicators of the simulation model.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Indicator</th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean1</td>
<td>(286)</td>
<td>(342)</td>
<td>(473)</td>
</tr>
<tr>
<td>CV</td>
<td>1.55</td>
<td>1.28</td>
<td>0.85</td>
</tr>
<tr>
<td>CI (95%)</td>
<td>(1,135)-508</td>
<td>(1,106)-481</td>
<td>(1,259)-292</td>
</tr>
<tr>
<td>IRR</td>
<td>9.7%</td>
<td>4%-10%</td>
<td>4%-14%</td>
</tr>
<tr>
<td>Benefit/Cost</td>
<td>0.98</td>
<td>0.90</td>
<td>1.5</td>
</tr>
<tr>
<td>IRR</td>
<td>9.1%-0.9%</td>
<td>0.89-1.03</td>
<td>0.87-1.02</td>
</tr>
<tr>
<td>Profitability period, years</td>
<td>3-8</td>
<td>3-8</td>
<td></td>
</tr>
<tr>
<td>Min. area (ha)</td>
<td>5.54</td>
<td>5.76</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusions**

» *L. diversifolia* has significant potential to increase both animal productivity and profitability, under different scenarios of animal productivity and market conditions, which is conducive to the sustainable intensification of meat production in grazing systems.

» The inclusion of *L. diversifolia* comes along with a reduction of the risk of economic loss and less variance to changes in critical variables. This is key to encourage adoption, since farmers, being naturally rather risk adverse, will most likely favor technologies with a relatively lower variance.

» The establishment of grass-legume association should be accompanied by specific training and extension programs that overcome the lack of knowledge and experience in the use of tropical forage legumes. This will reduce uncertainties associated with technology adoption and increase adoption rates.

» The access to and structure of necessary financial resources (e.g. credits) needs to be improved in order to provide the required framework for technology adoption.

**References**


**Acknowledgements**

This work was done as part of the CGIAR Research Program on Livestock. We thank all donors that globally support our work through their contributions to the CGIAR system.