Economic Analysis of Tropical Forages in Livestock Systems in the Eastern Plains of Colombia

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Introduction

• 70% of the Colombian livestock production are characterized by extensive production systems, which usually show low productivity levels, low land use efficiency and often lack environmental sustainability.

• This is related to native grasses and degraded pastures that generate limited forage supply, both in volume and quality, especially in the dry season.

• With their high potential for mitigation of and adaptation to climate change and their ability to increase productivity levels, technologies such as improved forages and silvo-pastoral systems can be viable alternatives for sustainable cattle production.

• The establishment of such technologies implies higher investment and management costs for the producer, which limits in many cases their adoption.

Objectives

To evaluate the financial viability of the implementation of improved forage technologies in livestock systems, in this case of improved pastures and scattered trees associated with improved pastures, and to compare them to the traditional production system with native or naturalized pastures.

Materials & Methods

• Research took place in 2015 in the Casanare Department in the Eastern Plains of Colombia as a part of the research project “Clima y Sector Agropecuario Colombia no-Adaptación para la sostenibilidad productiva” between CIAT and the Colombian Ministry of Agriculture (MADR).

• Data sources: Field measurements; expert consultations; secondary data and literature review.

• Economic Analysis:

1. Construction of a discounted cash-flow model (10 year period) taking into account the factors associated to the benefits (animal productivity in kg/ha/y) and the costs related to the initial investment and management.

2. Development of a simulation model (soft ware @Risk-Decision Tools Suite of Paladise) for analyzing the different associated risk factors.

3. Estimation of profitability indicators for different scenarios: Net Present Value (NPV), Internal Rate of Return (IRR), Probability of NPV<0.

Table 1 Productive parameters, investment and management costs per production system

<table>
<thead>
<tr>
<th>Production system</th>
<th>Animal productivity (kg/ha/year)</th>
<th>Annual stocking rate (AU/ha)</th>
<th>Productive parameters ha-1-year-1</th>
<th>Investment and management costs χ105 (US$/ha)</th>
<th>Initial costs of systems in association with scattered trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved Pasture1</td>
<td>130-445</td>
<td>310-486</td>
<td>2-</td>
<td>2-</td>
<td>2-</td>
</tr>
<tr>
<td>Improved Pasture2</td>
<td>294-402</td>
<td>302-480</td>
<td>1.090-2</td>
<td>1,187</td>
<td>0</td>
</tr>
<tr>
<td>Native Pasture3</td>
<td>179-231</td>
<td>12.7</td>
<td>11.23%</td>
<td>65.62%</td>
<td>50.77%</td>
</tr>
</tbody>
</table>

Table 2 Profitability indicators per production system

<table>
<thead>
<tr>
<th>Productive Parameters</th>
<th>Scenarios</th>
<th>NPV+</th>
<th>IRR</th>
<th>Probability(NPV&lt;0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved Pastures</td>
<td>Scattered Trees + Improved Pastures</td>
<td>Native Pasture</td>
<td>49.78 $</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td>P</td>
<td></td>
<td>290.32 $</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td></td>
<td>40.41 $</td>
<td>18%</td>
</tr>
<tr>
<td>Scattered Trees +</td>
<td>Improved Pastures</td>
<td>Native Pasture</td>
<td>120.6 $</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td>P</td>
<td></td>
<td>25.17 $</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td></td>
<td>258.86 $</td>
<td>9%</td>
</tr>
<tr>
<td>Native Pasture</td>
<td></td>
<td></td>
<td>18.19 $</td>
<td>11.23%</td>
</tr>
</tbody>
</table>

• Compared to native pastures, improved pastures on average increase the NPV by 86% and show an IRR higher than the opportunity costs (16%).

Conclusions

• The system with scattered trees is not profitable resulting from the high initial investment necessary (e.g., tree protection during the first year, slow tree growth delaying improvement of productive parameters). However, this study focused only on the benefits with regard to animal productivity and did not consider additional income that might result from planting trees (e.g., firewood, timber, fruits, eco-system services).

• The profitability indicators are highly sensitive to variations in meat sales prices.

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References


