SILVOPASTORAL SYSTEMS

Land use efficiency in the Cono Sur region: A Case Study from Paraguay

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THE FORESTRY & LIVESTOCK SECTOR

- More than 17 Million ha of cattle
- Political aim: become the 5th largest beef exporter by 2018 (20 million heads).
- Extensive grazing of large herds; high levels of underutilization.
- Highest deforestation rates in the region (2% annually).
- Switch from timber export to imports/supply-demand gap.
- National target of 450,000 ha of reforestation by 2030, today around 60,000 ha.
- Trend of intensification due to land competition and prices.
THE FORESTRY & LIVESTOCK SECTOR

Case Study: Paraguay

Source: FCPF, SENACSA
Paraguay has large areas of grassland used for beef production suitable for forestry not in competition with food production. Proposition: Silvopastoral systems as a strategy for diversification and more efficient & sustainable land use.
## SILVOPASTORAL SYSTEMS IN PARAGUAY

Comparison: Economic and E&S performance

<table>
<thead>
<tr>
<th></th>
<th>Plantation forestry</th>
<th>Silvopastoral systems</th>
<th>Traditional beef</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production target</strong></td>
<td>Timber</td>
<td>Timber &amp; Beef</td>
<td>Beef</td>
</tr>
<tr>
<td><strong>Cycle (years)</strong></td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>MAI (m³/ha/yr)</strong></td>
<td>40</td>
<td>33</td>
<td>--</td>
</tr>
<tr>
<td><strong>Weight gain (kg/ha/yr)</strong></td>
<td>--</td>
<td>127</td>
<td>200</td>
</tr>
<tr>
<td><strong>Stocking (head/ha)</strong></td>
<td>--</td>
<td>0.64</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Density (trees/ha)</strong></td>
<td>1,000 to 200</td>
<td>714 to 200</td>
<td>--</td>
</tr>
<tr>
<td><strong>Spacing</strong></td>
<td>5 x 2 m</td>
<td>(5 x 2 m) x 9 m</td>
<td>--</td>
</tr>
</tbody>
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# SILVOPASTORAL SYSTEMS IN PARAGUAY

## Economic, environmental and social performance

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<tbody>
<tr>
<td><strong>Economic Performance (without land prices)</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Investment volume</td>
<td>2,040</td>
<td>1,906</td>
<td>829</td>
</tr>
<tr>
<td>Net annual income (USD/ha/yr)</td>
<td>926</td>
<td>753</td>
<td>93</td>
</tr>
<tr>
<td>First year positive cashflow</td>
<td>7</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>First year positive cumulative cashflow</td>
<td>7</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>IRR (%)</td>
<td>22.4 %</td>
<td>19.9 %</td>
<td>15.7 %</td>
</tr>
<tr>
<td><strong>Environmental and Social Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor (FTE/1,000 ha)</td>
<td>26</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>Carbon balance (tCO₂-eq/ha/yr)</td>
<td>-8.2</td>
<td>-5.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Biodiversity* (qualitative)</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Soil conservation* (qualitative)</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
</tbody>
</table>

* Baseline scenario: Agriculture
Key Messages about Silvopastoral Systems

Silvopastoral Systems...
- ...are profitable and financially approachable.
- ...allow for diversification and increased income security.
- ...allow to continue with cattle business in areas in which it is not profitable.
- ....increase E&S benefits.
- ...might be more aligned to increasing consumer demands (animal welfare, ecosystem services).
- ...have the potential to be up-scaled in many places.
- ...might pave the way for more complex systems in the future.
THE CASE FOR SILVOPASTORAL SYSTEMS

Concept & Definition

Silvopastoral systems within this study refer to intensive and optimized systems in which both components are managed.

Below 50% of insolation there is a tipping point in fodder production. When tipping point is reached depends on tree species, density & spacing.
Livestock sector: 14.5% of human-induced GHG emissions.

Complex environmental changes: Call for diversified production systems.

Source: Rabobank, 2010
Not what we’re talking about
ADVANTAGES

- More profitable than beef production
- Makes plantations more affordable with the short-term beef component
- Positive environmental and social impacts
- Diversification
- Large areas available
- Favorable legal and institutional arrangements
- Production system more aligned to future needs

DISADVANTAGES

- High investments needed
- Long-term cashflow
- Complex system compared to traditional systems
- Hard to align interest: sector-based thinking
- Little trajectory with plantation forestry in Paraguay
- Lack of financial instruments to support producers
COMPARISON OF SILVOPASTORAL SYSTEMS

Summary of Pros & Cons

- Cashflow
- Acceptance

- Profitability
- Complexity

VS

+ Profitability
+ Environmental
+ Social

- Complexity
- Acceptance
- Investment
THE FORESTRY & LIVESTOCK SECTOR

Global Outlook

Correlation = 0.93

World population (World Bank forecast)

Estimated global consumption of wood*

Sources: FAO, World Bank and OECD

* Future global consumption of wood is estimated via a univariate regression on world population that employs the indicated correlation
THE BEEF & TIMBER SECTOR

Case Study: Paraguay – Beef Sector

Political aim: World’s fifth largest beef exporter by 2018, increasing its herd from 14 to 20 million heads.

61 % of the herd in the East, occupying 8 million ha. Of these, 2.2 million ha on lowlands.

Extensive grazing of large herds with high level of underutilization.

Trend of intensification due to land competition and high land prices.
SILVOPASTORAL SYSTEMS

Concept & Definition

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THE FORESTRY & LIVESTOCK SECTOR

South America & the Cono Sur region

- Latin America and the Caribbean: highest emissions (almost 1.3 gigatonnes CO$_2$-eq) of the livestock sector worldwide.
- Inefficient production systems and ongoing land-use change
- Plantation forestry concentrated in eucalypt and pine plantations.
- Strong plantation forestry sector in Brazil (>7 million ha), Uruguay (>1 million ha), Chile (>2.5 million ha).
AGENDA

The Forestry & Livestock Sector in South America & Paraguay

The case for Silvopastoral Systems: Comparative Case Study in Paraguay

Conclusions & Lessons Learned
THE FORESTRY & LIVESTOCK SECTOR

Case Study: Paraguay
THE CASE FOR SILVOPASTORAL SYSTEMS

Current Best Practices & Experiences in the Region

Defining production target: Combining beef and timber production

Defining optimized management:

- Plant trees in double rows → increased density and light
- Prunings & thinnings increase timber value + allow for pasture growth
- Cattle rotation according to pasture growth
- Experiences exist with a combination of Brachiaria, Elephant grass, Jesuit grass with Eucalyptus and/or pine