INTENSIVE SILVOPASTORAL SYSTEMS

Improving sustainability and efficiency in cattle ranching landscapes of Latin America

Julian Chávez1, Enrique Murgueitio1, Rolando Barahona2, Rogerio Martins3, Martha Xochilt Flores4, Fernando Uribe1

2. Universidad Nacional de Colombia, Medellin, www.unal.edu.co
3. Universidade Federal de São João del-Rei, Brazil, www.ufsj.edu.br/pbbe/
4. Fundación Produce Michoacán, Morelia, Mexico.

Intensive Silvopastoral Systems (ISPS) are agroforestry arrangements that combine high-density cultivation of fodder shrubs (4,000 to 40,000 plants per ha) with improved tropical grasses, and trees or palms at densities of 100–600 individuals per ha. These systems are managed under rotational grazing with occupation periods of 12 to 24 hours and resting periods of 40 to 50 days, including provision of water and mineral salt in each paddock.

The main fodder shrubs used so far are Leucaena leucocephala (Lam.) de Wit, and the Mexican Sunflower Tithonia diversifolia (Hemsl.) A. Gray, due to their fast growth and tolerance to direct consumption by cattle. The bastard cedar or guachimó Guazuma ulmifolia Linn., is also used in some regions of Colombia and Mexico.

Advantages:

- ISPS produce more dry matter, digestible energy and crude protein per ha than pasture monocultures.
- In ISPS dry matter intake is 30% higher and protein intake 90% higher than in traditional systems and therefore there is an increase in milk or meat production while reducing the need of chemical fertilizers and concentrate feeds.
- 2.6 times higher stocking rate (SR) and 50% higher daily weight gain (DWG) than traditional pastures.

Biodiversity in the system is increased due to its higher structural and biological complexity.

- The presence of N-fixing legumes and other tree species improves production and nutrient cycling and eliminates the need of chemical N fertilizers.
- Deep rooted trees recover nutrients and water from deeper soil layers which increases carbon sequestration and increases the resilience of the system to climate variability.

Mexico:

- SR increased from 0.8 to 4 AU ha⁻¹ and DWG grew 15% when compared with pasture monoculture.

Brazil:

- Soil Carbon Stock (Ton CO₂, eq ha⁻¹)

Table 1.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Conventional pasture</th>
<th>Improved Pasture</th>
<th>Intensive ISPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocking rate (large animals ha⁻¹)</td>
<td>0.5</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>Daily weight gain animal (kg)</td>
<td>0.07</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Daily weight gain heifer (kg)</td>
<td>0.185</td>
<td>0.9</td>
<td>2.4</td>
</tr>
<tr>
<td>Days of growth from 250 to 440 kg</td>
<td>534</td>
<td>217</td>
<td>238</td>
</tr>
<tr>
<td>Kg of meat produced ha⁻¹ (kg)</td>
<td>67.5</td>
<td>328.5</td>
<td>876.0</td>
</tr>
<tr>
<td>Consumption of DM (% of LW)</td>
<td>1.5</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>Consumption of DM kg ha⁻¹ 1 p.l.</td>
<td>958</td>
<td>2874</td>
<td>7005</td>
</tr>
<tr>
<td>Land surface required to produce</td>
<td>14.8</td>
<td>3.0</td>
<td>1.1</td>
</tr>
</tbody>
</table>

In Colombia there are around 4,000 hectares of ISPS planted, and the project “Mainstreaming Biodiversity into Sustainable Cattle Ranching” aims to establish 4,000 hectares more. In Mexico, ISPS network led by Fundación Produce Michoacán with support of SAGARPA has established 12,218 hectares of ISPS in 37 states in less than four years.

The ISPS is an important tool to supply the demand of beef and dairy products and at the same time contribute to provide environmental services and increase resilience to climate change.

References: