Agroecological principles and their impact in sustainable livestock production:
El Hatico Nature Reserve, El Cerrito, Valle del Cauca, Colombia.

Juan José Molina, Carlos Hernando Molina, Enrique José Molina, Carlos Hernán Molina, Juan Pablo Castro
Agroclimatic conditions of El Hatico Nature Reserve

- Altitude: 1000 m a.s.l
- Temperature: 24 °C
- Annual rainfall: 750 mm
- Relative humidity: 75%
- Dry Tropical Forest
% Soil organic matter content
El Hatico Nature Reserve

Arias J., 1994
El Hatico Nature Reserve, 2012
THE NEED FOR A CHANGE
AGROECOLOGICAL PRINCIPLES

1. Agriculture, livestock, and forestry integration.
2. Increasing plant biomass and diversity.
3. Protecting water sources and using them rationally.
4. Curbing soil degradation and promoting its recovery.
5. Increase productivity per area.
6. Protect regional biodiversity and make a sustainable use of it.
7. Promote employment opportunities for the community.
9. Ensure economic stability of the production system.
10. Promote low impact systems for the environment.
IMPACT OF INTENSIVE SILVOPASTORAL SYSTEMS ISPS
ISPS

Fodder plants, grasses, leguminous herbs, shrubs and trees.

Animal nutrition and complementary uses.

Intensive Silvo-Agricultural Systems

Agroforestry arrangements.

Fodder plants, grasses, leguminous herbs, shrubs and trees.

Animal nutrition and complementary uses.
% Soil organic matter content
El Hatico Nature Reserve

Arias J., 1994
El Hatico Nature Reserve, 2012

15 liters per m² for every additional point of O.M.
Accumulate water in the soil with its organic matter (%)

<table>
<thead>
<tr>
<th></th>
<th>Outside of the tree canopy</th>
<th>Under the tree canopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5 years</td>
<td>3,7</td>
<td>4,9</td>
</tr>
<tr>
<td>5 to 10 years</td>
<td>3,4</td>
<td>4,6</td>
</tr>
<tr>
<td>&gt;10 years</td>
<td>3,6</td>
<td>4,4</td>
</tr>
<tr>
<td>Grass/ no trees</td>
<td>2,9</td>
<td></td>
</tr>
<tr>
<td>Forest</td>
<td></td>
<td>4,3</td>
</tr>
</tbody>
</table>

Vallejo, 2012.
El Hatico Nature Reserve
Enteric fermentation

Leucaena and methane – *Lucerna heifers*

- **Star grass 100%**
- **Star grass-Leucaena**

30% reduction of methane emissions.

Methane emissions, grams per kg of degraded dry matter.

Hours

Molina *et al.*, 2015b
Improve the infiltration of rainfall in the soil

Worm density per (0.75m³) in four soil uses

El Hatico Nature Reserve

<table>
<thead>
<tr>
<th>Intensive Silvopastoral System</th>
<th>Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic sugarcane</td>
<td>Conventional sugarcane</td>
</tr>
</tbody>
</table>

Pardo Locarno, Luis Carlos, 2009
Animal Welfare

Feeding:
- Feed
- Water
- Body condition

Housing:
- Pasture
- Shade, lack of heat stress
- Resting comfort

Health:
- No clinical signs
- No lameness

Behavior:
- Diverse positive behavior
- No aggression
- No signs of fear

2014, WAP, Cipav, *agri benchmark*, Fedegan
Animal Welfare
Quality employment opportunities
Herederos Silvopastoriles

A group that motivate young people in Colombia to continue working in the farms, and share knowledge and appropriate tools to develop sustainable productive projects.
The proposal is to achieve social, environmental and economic transformation of livestock, looking for "a single well-being".

- **35.500 ha in sustainable livestock.**
  - **31.000 ha** spread trees and live fences.
  - **4.500 ha** in ISPS.
- **15.000 ha** of preserved forests.

- **Medium farmers**
- **Large farmers**
ORGANIC PRODUCTS NOT AS A GOAL, BUT AS A CONSEQUENCE.
Resilience
Climate change resilience
Productivity
## What would happen without the transition to ISPS?

<table>
<thead>
<tr>
<th></th>
<th>Monoculture</th>
<th>ISPS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area</strong></td>
<td>111 USD</td>
<td>69 USD</td>
</tr>
<tr>
<td><strong>Number of milking cows</strong></td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td><strong>Milk production l/ha/year</strong></td>
<td>7.500</td>
<td>14.995</td>
</tr>
<tr>
<td><strong>Total milk production l/year</strong></td>
<td>667.500</td>
<td>809.706</td>
</tr>
<tr>
<td><strong>Indirect/ Administrative costs</strong></td>
<td>32.370</td>
<td>32.370</td>
</tr>
<tr>
<td><strong>Supplementation</strong></td>
<td>55.194 USD</td>
<td>55.194</td>
</tr>
<tr>
<td><strong>Mineralized salt</strong></td>
<td>6.127 USD</td>
<td>3.574</td>
</tr>
<tr>
<td><strong>Fertilizers</strong></td>
<td>25.530 USD</td>
<td></td>
</tr>
<tr>
<td><strong>Irrigation</strong></td>
<td>32.647 USD</td>
<td>206 USD</td>
</tr>
<tr>
<td><strong>Utility/ha/ month</strong></td>
<td>-27 USD</td>
<td>14.207</td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td>271.281 USD</td>
<td>210.551</td>
</tr>
<tr>
<td><strong>Milk Income</strong></td>
<td>235.588 USD</td>
<td>381.038</td>
</tr>
<tr>
<td><strong>Utility</strong></td>
<td>-35.693 USD</td>
<td>170.487</td>
</tr>
<tr>
<td><strong>Utility/ month</strong></td>
<td>-2.974 USD</td>
<td>14.207</td>
</tr>
<tr>
<td><strong>Utility/ha/ month</strong></td>
<td>-27 USD</td>
<td>206</td>
</tr>
</tbody>
</table>

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THANK YOU

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