Tapping genetic variation, region-specific experience and knowledge to spur coffee agroforestry intensification and adaptation to climate change in Ethiopia and Latin America

Sustainable agroforestry intensification and adaptation of coffee farming to climate change in Latin America

Rolando Cerda, Dominique Dessauw, William Solano, Elias de Melo, Eduardo Somarriba

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Main types of coffee farming systems in Latin America (LAC)

- Coffee monoculture
- Coffee-bananas
- Coffee with service trees
- Coffee-fruit trees
- Coffee-timber trees
- Coffee rustic plantations
- Coffee gardens

Complexity of agroforestry systems
Intensity of cropping practices

Most common types (Toledo and Moguel, 2012; Cerda et al 2017)
Coffee crisis in Latin America

➢ Crisis since 2012, due to negative climatic and socioeconomic factors

➢ Decrease of coffee production
  2012-2013: ~ 28%
  2013-2014: ~ 30%
  Production continued low

➢ There is also a risk of degradation of biodiversity and ecosystem services
**Suitability change by 2050**

**Mesoamerica**

Suitable now: 400-2000 masl

By 2050:
+2°C; -70mm/year
800-2500 masl
Change of suitability: -24%

**South America**

Suitable now: 500-1500 masl

By 2050:
+2.5°C; +270mm/year
1000-2800 masl
Change in suitability: -20%

Ovalle-Rivera et al. (2015)
Suggested adaptation strategies

For sustainable intensification is essential:

- New varieties and hybrids
- Cropping practices
- Agroforestry
- Reduce production costs
- Training (farmers, students, technicians)

We can share this with Ethiopia
### International coffee collection of CATIE

<table>
<thead>
<tr>
<th>Type of material</th>
<th>Nº of Accessions</th>
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</thead>
<tbody>
<tr>
<td>Wild genotypes</td>
<td>880</td>
</tr>
<tr>
<td>Varieties, mutants</td>
<td>923</td>
</tr>
<tr>
<td>Hybrids</td>
<td>184</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1992</strong></td>
</tr>
</tbody>
</table>

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*Image: International coffee collection at CATIE.*
First generation of F1 HYBRIDS (1992 – 2005)

Must be propagated as clones

Source: Euphytica, 2011 (181: 147-158)
Modern techniques to propagate plants are available

Plants ready for the field in 6 months

Second generation of F1 Hybrids (2015-2025)
**Intensification requires:**

- Adequate pruning

**Optimal agroforestry systems:**

- Improve soil quality
- Regulate microclimate
- Reduce use of inputs (-costs and -carbon footprint.)
- Good coffee yields and diversification (-financial risks)
We need modernization-training to design-manage agroforestry

Use of technology:

Example: COFFEE CLOUD

To train and motivate young people especially

Challenges

• Continuous selection of drought and pest tolerant hybrids and varieties
• Create capacities to propagate the hybrids
• Massification of strategies for re-design of agroforestry systems, production, added value, circular economy.
• Specific diagnosis of the vulnerability and adaptive capacity to make-decisions
• Strengthening of traceability systems (blockchain)
• Inclusive strategies (youth, women, family)
• Mechanization and irrigation?

All levels:
Farms
Cooperatives/associations
Private sectors
Institutions
Universities/students
Public policies
Markets
South-South cooperation:

How to increase the genetic diversity of coffee in Latin America? Ethiopia could provide more diversity for breeding?
Thank you

Rolando Cerda rcerda@catie.ac.cr