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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**

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



Coffee monoculture



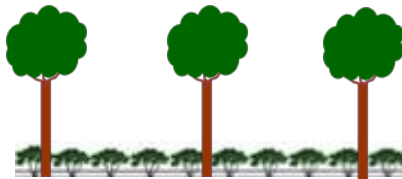
Coffee-bananas



Coffee with service trees



Coffee-fruit trees



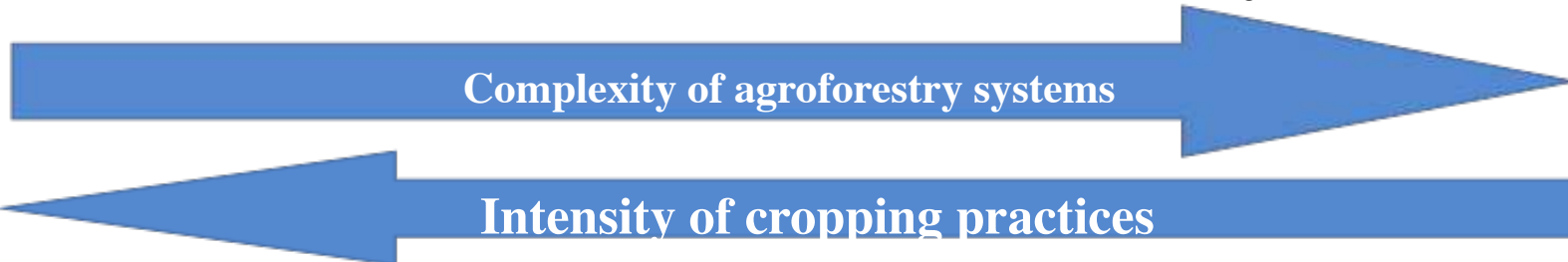
Coffee-timber trees



Coffee rustic plantations



Coffee gardens



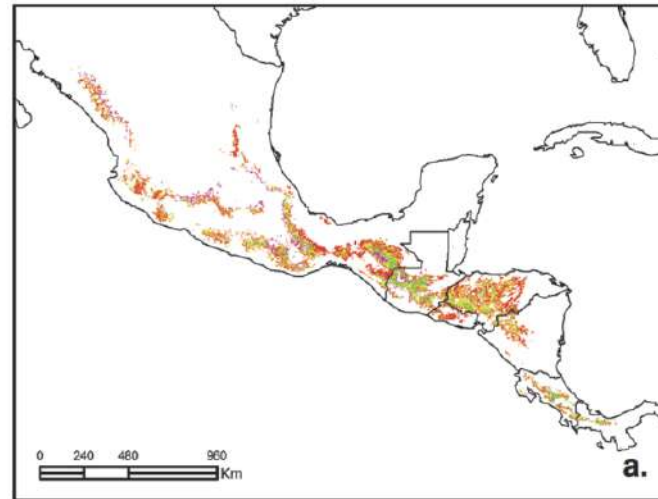
Most common types (Toledo and Moguel, 2012; Cerda et al 2017)

## 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

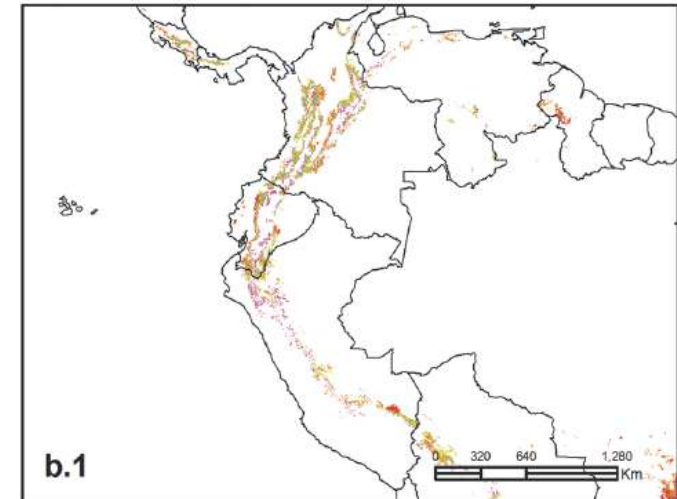
Suitable now: 400-2000 masl

By 2050:

+2°C ; -70mm/year

800-2500 masl

Change of suitability: -24%



### South America

Suitable now: 500-1500 masl

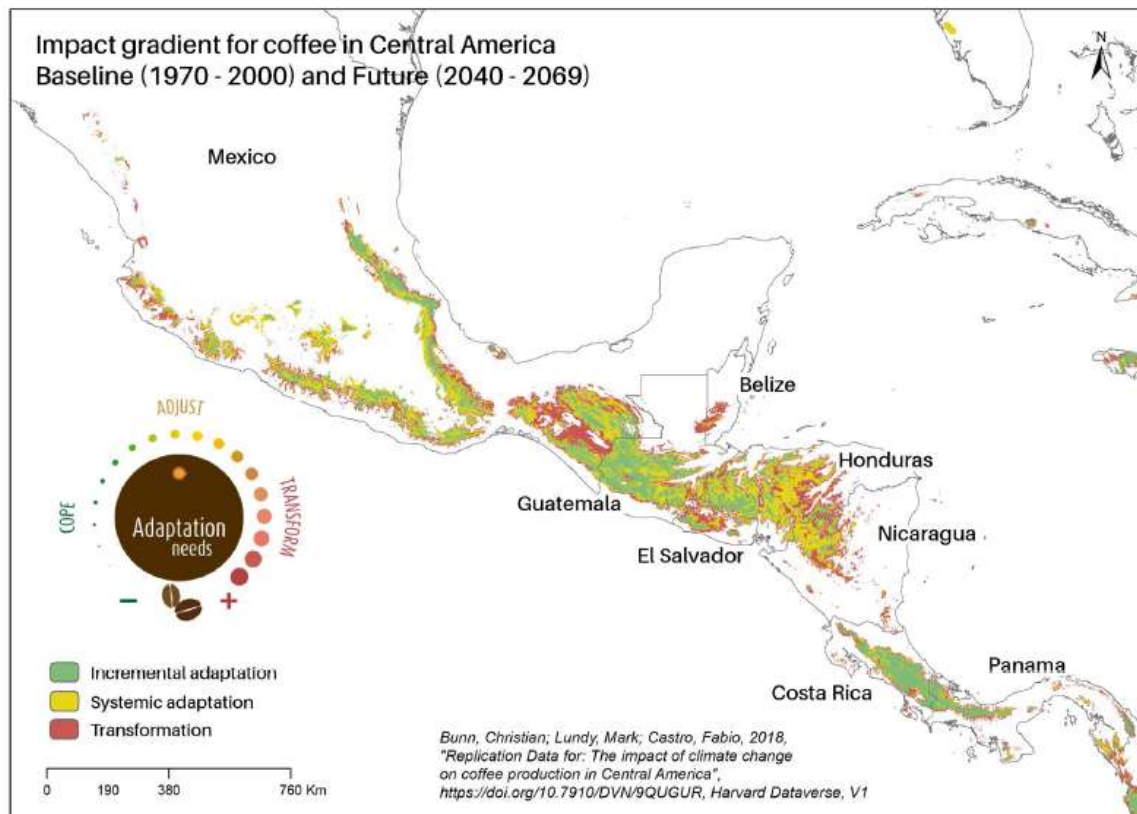
By 2050:

+2.5°C ; +270mm/year

1000-2800 masl

Change in suitability: -20%

## Suggested adaptation strategies



**Incremental** **Systemic** **Transform**

**For sustainable intensification is essential :**

New varieties and hybrids

+cropping practices

Agroforestry

Reduce production costs

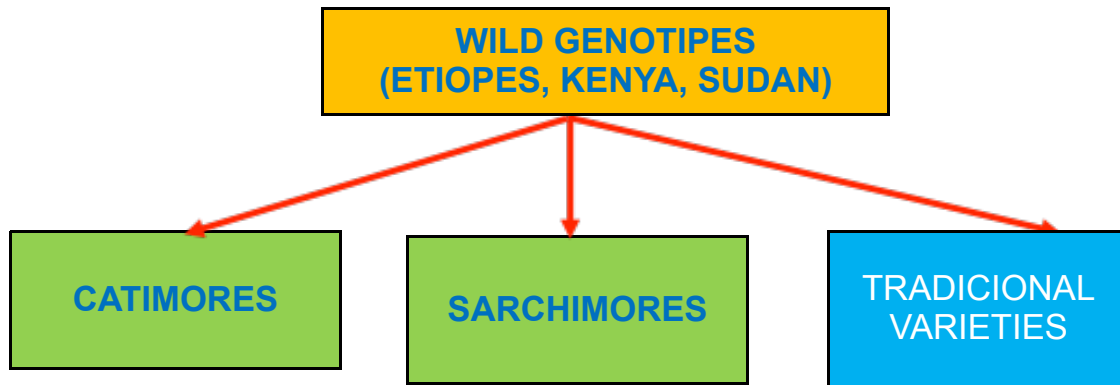
Training  
(farmers, students, technicians)

**We can share this with Ethiopia**

# International coffee collection of CATIE

Type of material	N° of Accessions
Wild genotypes	880
Varieties. mutants	923
Hybrids	184
<b>TOTAL</b>	<b>1992</b>





## First generation of F1 HYBRIDS (1992 – 2005)

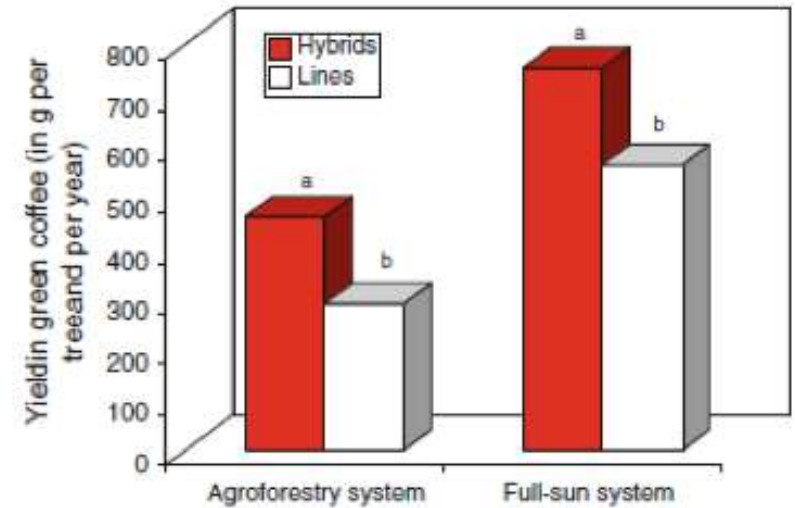


Fig. 4 Comparison of the mean yield of lines and of hybrids according to the cropping system. Two different *letters* indicate significant differences at  $P < 0.05$  between cropping systems

Source: Euphytica, 2011 (181: 147-158)

Must be propagated as clones



## 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

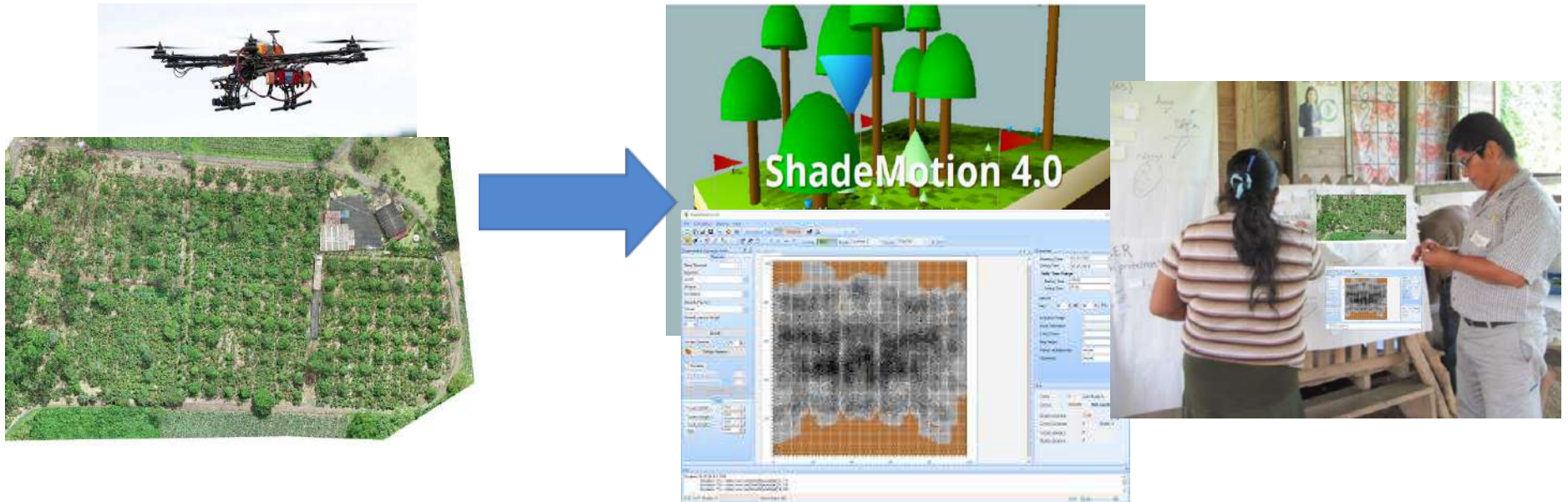


## Optimal agroforestry systems:

- Improve soil quality
  - Regulate microclimate
- ↓
- Reduce use of inputs  
(-costs and -carbon footprint.)
- NAMA**  
Nationally Appropriate  
Mitigation Actions  
CAFÉ DE COSTA RICA
- Good coffee yields and diversification (-financial risks)



# We need modernization-training to design-manage agroforestry



Example: COFFEE CLOUD

Use of technology:



<https://play.google.com/store/apps/details?id=com.coffee.cloud.anacaf&hl=es>

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

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## **South-South cooperation:**

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

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# Thank you

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