# Combining local and scientific knowledge to increase adaptive capacity to global changes among farmers in Mesoamerica.


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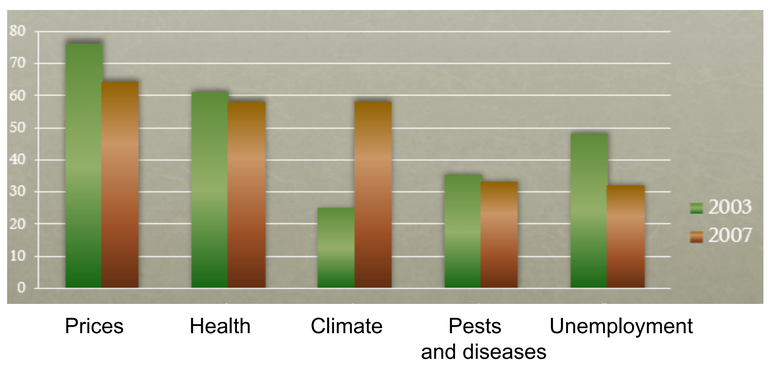
## MESOAMERICA HIGHLY VULNERABLE

- Farmers in Mesoamerica face challenges from climatic variability and extreme weather events. The region is highly exposed to hurricanes, landslides, torrential rainfall and flooding, as well as periodic drought.
- It has also been identified as one of the tropical regions likely to experience major impacts from climate change.
- Extreme climatic events such as hurricane Mitch in 1998, Stan in 2005, and tropical storm Agatha in 2010 severely affected a large portion of the rural population including many smallholder farmers who were already struggling to survive (See figure 1).
- The Mesoamerican region exemplifies many of the challenges in understanding climate change impacts on agriculture and smallholder farmers, due to its complex topography, diversity of ecosystems and farming systems, and large smallholder population.
- The region is particularly vulnerable because production of many of the principal crops is expected to decrease significantly with rising temperatures and the fact that most farmers are smallholders with limited adaptive capacity and much dependence on rainfall for their subsistance production.

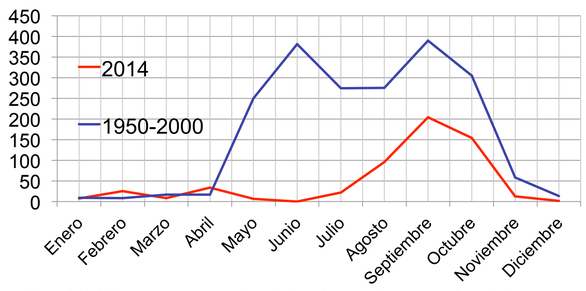
**Figure 1: Stressors faced by small farmers**




Survey with coffee growers from México, Guatemala, Honduras, and Costa Rica. Global Changes and Coffee Project

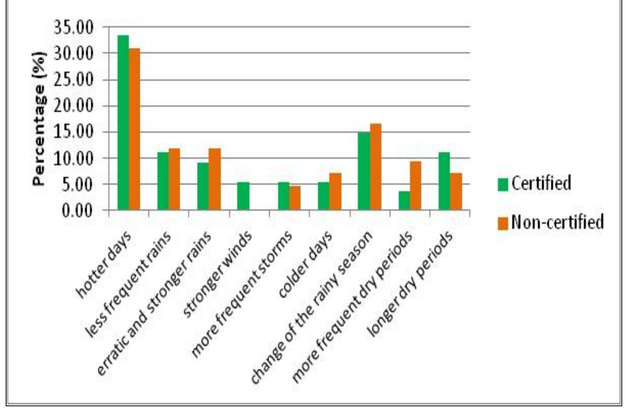
- Farmers did not perceive climate as a major problem when asked in 2003.
- That changed substantially in 2007.
- Still, price fluctuation remained the main concern for farmers.
- They operate under a multiple-stressor environment.

**Monthly rainfall (mm) as measured in coffee plantations in Guatemala**

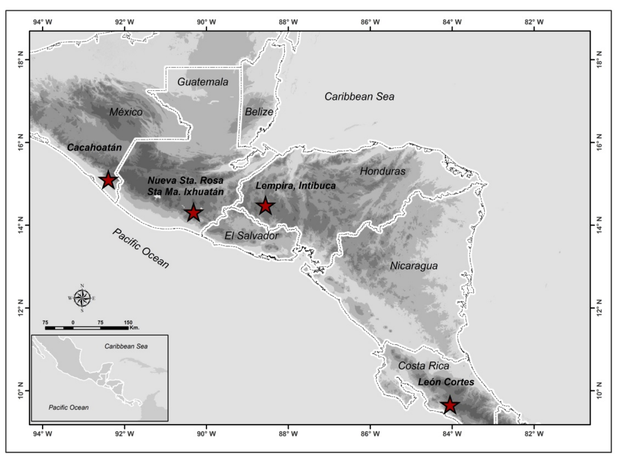



The El Niño events in this decade resulted in a partial drought. The most important effect was the suppression of the May rainfall needed for planting

**Perceived climatic variations**




**Map 1: Mesoamerica and selected sampling sites in the Global Changes and Coffee study**

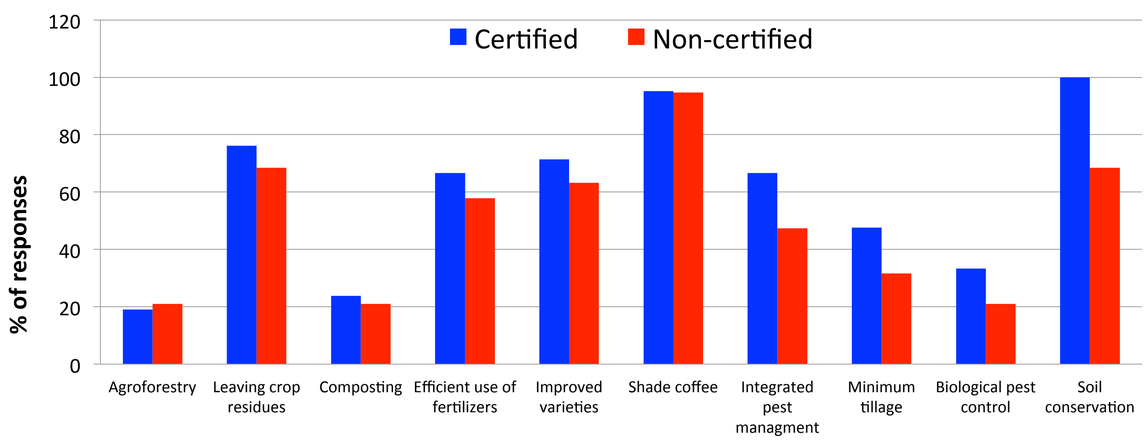



- Most farmers interviewed indicated **more warmer days** and more **variability in the rainfall** pattern, particularly at the beginning and at the end of the rainy season. Also, rain seems to fall more intensely in shorter periods of time.
- Most farmers interviewed reported an **increase in pest incidence** and **aggressiveness** of infestation. Certified and non-certified plantations did not differ significantly in levels of infestation of coffee rust, which was the strongest stressor to production in 2012.
- The main **strategies** used by farmers to confront these challenges include economic diversification, change in farming practices and coffee varieties, social organization, and shade management.

## FARMERS ALREADY ADAPTING

- Farmers are always producing in a changing environment. They are used to facing uncertain weather, and therefore apply corrective measures as they see the need.
- This autochthonous adaptation can work under certain climate extremes. Beyond that, farmers face possible loss of their crops and investments.
- Some of these practices have been used for centuries by indigenous farmers.
- The local crops in particular (maize, for example) are well adapted to the climate variability. Different varieties respond well in various climatic conditions.

**Figure 2: Agricultural practices by small farmers**




## WAYS TO HELP FARMERS ADAPT

1. Access to credit: with affordable interest rates to enable small farmers to finance diversification projects.
2. Insurance: against crop losses.
3. Technical Assistance: pest management, soil conservation, social organization, market and financial mechanisms.
4. Access to information: weather forecasts, economic fluctuations.
5. Organizational capacities: strengthen grass-root organizations.
6. Fair trade: direct marketing of products to the end consumer.
7. Organic production: to reduce the cost of chemical inputs; increased environmental benefits.
8. Environmental services: to recognize the benefits of environmentally-friendly practices such as agroforestry.
9. Disaster preparedness: to strengthen emergency responses; early warning.

## COMMUNICATING SCIENCE TO STAKEHOLDERS

- Science can contribute effectively to increase the adaptive capacity of vulnerable populations.
- Local knowledge must be complemented with scientific knowledge to this end. Both types of knowledge are needed in an effective adaptation process.
- The global and regional changes confronting farmers are bigger than anything experienced by them in the past, including climate change.
- Science must be communicated to stakeholders at three levels.
  1. High-level decision makers, including political leaders.
  2. Practitioners in supporting organizations and middle-level technical officers in governments.
  3. Local people directly impacted by multiple stressors.
- This imposes a challenge to scientists for several reasons:
  - ✓ Each of the listed groups needs a particular communication strategy.
  - ✓ Scientists often do not have the communication skills needed.
  - ✓ Even if they do, they do not have the time to do both science and communication.
- Scientific teams must work together with communication specialists. This additional expense should be supported by funding organizations.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