



The impact of climate change on food vulnerability in Guatemala

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Key messages

- Climate change poses a significant threat to food security in Guatemala.
- Adverse weather conditions and dependence on rain-fed irrigation systems threaten agricultural production levels.
- A legal framework should be created to govern water resources and prioritize agricultural activities that can guarantee food security.

No progress eradicating hunger in Guatemala

The 2015 assessment of the Millennium Development Goals showed that Guatemala is the only country in South America to have made no progress eradicating hunger, with 15.6% of the population living below minimum dietary levels in 2015 (increasing from 14.9% in 1991, according to United Nations data).

The Guatemalan economy relies heavily on agriculture both for food production and employment. More than a third of the working population (15 years and older) are employed in the agricultural sector. Most people employed in this sector have little education and live in rural areas, below the poverty line.

This reliance on the agricultural sector means that food security is an important issue in Guatemala. Unfortunately, low agricultural yields, little use of technology among small-scale farmers - including a dependence on rain-fed irrigation systems - and adverse climate conditions have contributed to the country's failure to eradicate hunger.

Additionally, Guatemala depends on imports of goods such as wheat and rice, making the country vulnerable to rising international food prices.

Climate change scientists predict that low-latitude countries, such as Guatemala, will face much warmer temperatures and changes in rainfall patterns over the coming decades. Extreme weather events, such as droughts and floods, will not only hit Guatemala's agricultural production sector hard, food and waterborne diseases related to these events will also hit the poor rural population where food quality is lower and access to healthcare is limited.

A team of local PEP researchers set out to investigate the impact of climate change on agriculture and other social and economic factors.

The research team aims to provide a reliable indication of what is likely to happen to food security in Guatemala if climate change causes reduced agricultural productivity or drought.



Data and methodology

The research team used a Computable General Equilibrium (CGE) model and a Social Accounting Matrix of the 2011 Guatemalan economy to analyze data from Guatemala's System of Environmental and Economic Accounts and System of National accounts. The CGE model allowed the team to simulate two scenarios: 1) a reduction in agricultural productivity due to climate change, and 2) the effect a drought would have on agriculture.

In 2013, the Economic Commission for Latin America and the Caribbean indicated that grain production in maize, beans and wheat could drop to as low as 8% by 2020. The team's first simulation modelled the effects of what would happen if the total productivity of agriculture for food and for seed dropped to around 8%. In the second simulation, the team modelled the effects on agriculture of a drought that reduces the stock of water by 25%.

Key findings

The analysis indicates that **climate change poses a significant threat to food security in Guatemala.**

The researchers found that a reduction in productivity due to climate change would mean:

- A 1.2% drop in GDP
- Less competitiveness in international markets
- A 2% drop in exports, especially cereals, maize, fruits, vegetables, coffee and bananas
- Lower wages for unskilled laborers, potentially leading to increased inequality
- Reduced consumption of agricultural goods and industrial foods due to higher prices and lower household income
- A drop in tax revenues leading to cuts in government spending



Lower household income and increased food prices would also reduce food security for the most vulnerable sectors of the Guatemalan population.

In the case of a drought scenario, the researchers found that:

- Most negative effects would be concentrated in the agriculture, forestry, and fishing industries (representing 59% of total water use)
- Food prices would rise, particularly for bananas, roots and tubers, and beans
- Wages of unskilled laborers and rural household income would drop
- The exchange rate would depreciate by 7%
- Value added for agriculture would decrease by 23%
- Demand for land would fall by 38% as water scarcity would mean fewer incentives for the population to continue or take up agricultural activities, threatening food security

However, the research team also found that GDP would increase by 1% in the drought scenario. This increase is attributed to the negative effects being largely contained within three industries and other industries and services paying higher remunerations than those affected.

Implications for policy

The results of this study indicate that agricultural production – which is essential for ensuring food security – is likely to be reduced due to adverse weather conditions caused by climate change. Access to sufficient water supplies in order to maintain or improve agricultural yield is vital to ensuring agricultural production levels. Despite the existence of a National Irrigation Policy in Guatemala, the framework is incomplete due to a lack of a strategic water allocation system.

As such, **the research team strongly recommends that the Guatemalan government create a legal framework to govern water resources and water allocation that prioritizes economic activities that guarantee food security.**

Guatemala can learn from the experience of Australia, which, due to its history of mega-droughts, reformed its water allocation system so that water entitlements are expressed as a share of the available resource, rather than as a specified quantity of water.

As well as boosting food security, ensuring agricultural production levels will help to maintain exports, which is necessary for the government's export-led growth strategy.



In 2012, with support of the UK Department for international Development (DfID) and the International Development Research Centre (IDRC) of Canada, PEP launched a new program to support and build capacities in “Policy Analyses on Growth and Employment” (PAGE) in developing countries.

This brief summarizes the outcomes of [MPIA-12867](#) supported under the 3rd round of the PAGE initiative (2015-2016). To find out more about the research methods and findings, read the PEP [working paper 2017-01](#).

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