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Climate Extremes, Food Insecurity, and Migration in Central America: A Complicated Nexus

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There is growing evidence that climate extremes are having a devastating impact on agriculture in Central America, affecting the livelihoods of millions of farmers and serving as a driver of migration from the region. Both droughts and floods have been shown to have serious financial impacts in many rural areas. Droughts associated with the El Niño/Southern Oscillation (ENSO) phenomenon caused agricultural losses estimated at U.S. $465 million in 2014 alone. Over the last 30 years, losses associated with drought in the Central American Dry Corridor, which extends from Panama all the way up to southern Mexico, approached U.S. $10 billion, half of which were in the agricultural sector. Financial aid to help the recovery of smallholder agriculturalists and others most affected by these catastrophic climatic events, however, has been limited. The International Fund for Agricultural Development (IFAD) and the Climate Policy Initiative reported that in 2017 and 2018 just 1.7 percent of climate finance reached smallholder agriculturalists in developing countries around the world. Some small farmers who can no longer piece together a living from their own earnings and crop yields suffer food insecurity. For some, migration, typically to the United States, has become a last-resort adaptation strategy.

Special Issue: Climate Change and Migration

This article is part of a special series about climate change and migration.

Explore the Issue

Climate extremes, food insecurity, and migration in the region are interconnected, though environmental change is just one of a number of factors that stoke migration. Catastrophic climatic events such as the 2014-16 droughts and the flooding following Hurricanes Eta and Iota, which hit

Central America hard within a two-week span in 2020, have had a devastating effect, including on farmers' livelihoods in El Salvador, Guatemala, and Honduras, impacting their food security and potentially encouraging migration. Nearly half the families from these countries interviewed as part of a 2017 World Food Program (WFP) study on migration were food insecure, and more than 70 percent had adopted emergency measures such as selling land. In 2019, 8 percent of families in the Dry Corridor, many of which were small-scale farmers, planned to migrate in response to the difficult conditions, according to a survey from the Food and Agriculture Organization (FAO) and WFP. This migration, some of which has occurred via high-profile caravans (including one of about 8,000 people that was disbanded by authorities in early 2021), is impossible to measure precisely, but multiple sources estimate that several hundred thousand people have traveled North from this region since 2014.

Still, it is difficult to parse out precisely the role that climate variability and change plays in migration, given the presence of factors including violence and insecurity, as well as long-established migration patterns from the region to the United States. Migratory movements are also affected by significant Central American immigrant populations in the United States that often seek to reunite with relatives left behind as well as the availability of jobs and changing U.S. enforcement and immigration policy.

Further, the relationship between climate extremes, agricultural production, and migration is complex and non-linear in nature. The situation is complicated by failures of climatic monitoring and forecasting as well as limits to analysts' understanding of how the climate affects health, including cases of food insecurity, morbidity, and mortality, due to the region's deficient health-care system and limited health reporting. The result is that researchers have a limited capacity to understand the full spectrum of decision-making processes regarding the intersection of climate, food security, and migration.

This article assesses the climate impact on the livelihoods of subsistence and similar farmers in poor rural communities in Guatemala to evaluate causality and decision-making regarding migration. It describes the relationships between climate disasters, food security, and migration, and the potential points of intervention for adaptation via the provision of climate services, which are the generation, translation, transfer, and use of climate information. It discusses the implications of climate services and the risks of reproducing uneven development by solely advantaging farmers who can afford to capitalize on the information, while exacerbating others' vulnerability to climate variability and change. To illustrate these points, it examines a seasonal forecast system that provides climate services to agricultural communities in Guatemala. These services can be a tool for farmers to adapt to changing climatic conditions and potentially achieve food security by remaining in place, rather than migrating or engaging other behavior. However, this outcome is more likely to occur if climate services are paired with other forms of assistance.

Figure 1. Map of the Central American Dry Corridor

Source: Migration Policy Institute (MPI) rendering of map created by the Food and Agriculture Organization of the United Nations (FAO), available online.

As the article will demonstrate, early policy interventions can mitigate the effects of climate extremes on food insecurity, hunger, and, ultimately, migration. But in order to develop effective policy, a deeper understanding of farmers' livelihoods and how climate variability and environmental change might affect them is required. This is an urgent matter for policymakers because, if left unaddressed, the invisibility of linkages connecting climate, food security, and migration might translate into increased climate vulnerability as populations face future exposure to climate hazards.

Definition

Climate services are tools or aids that use scientific climate information to assist actions and decision-making by individuals and communities. They can include analyses, monitoring, and projections designed to help users respond to climate impacts.

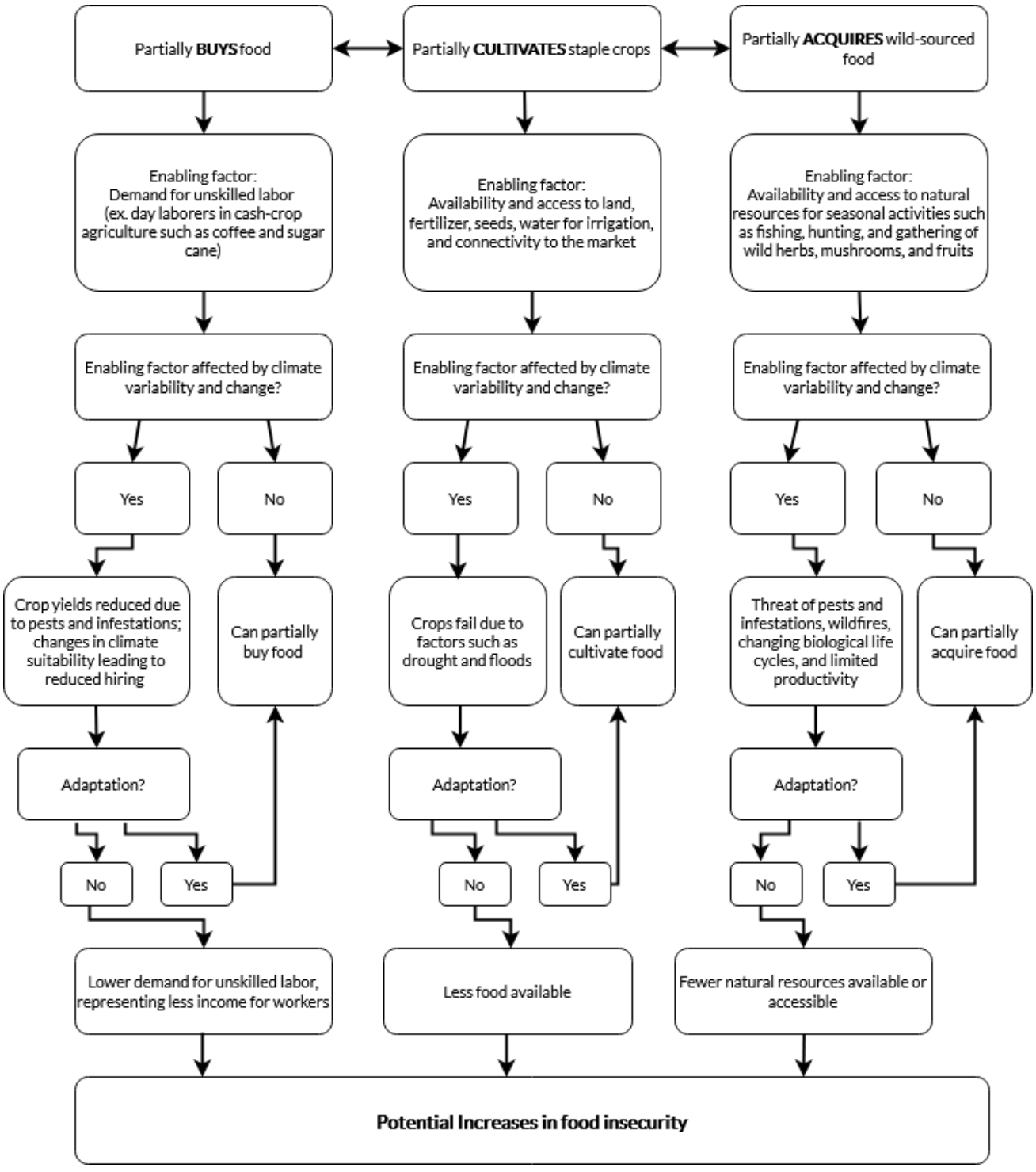
Unpacking the Effects of Climate Change on Food Security

There is a common narrative that Guatemalan farmers in poverty and extreme poverty—defined as those living on less than U.S. $1.90 per day—consume only what they produce, but the reality is more complex. Most produce some of their own food, work seasonally to pay for much of it through unskilled labor such as on coffee farms, and acquire additional food from natural sources such as forests or water bodies. Virtually all of them rely on a combination of all three food sources. Hence, climate variability and environmental change may impact these farmers in many different, entangled ways, affecting their food security at multiple levels (see Figure 2).

Leaving aside other structural problems such as poverty and lack of access to health care and financial services, these different general pathways illustrate the difficulty of identifying causality in how climate

variability and change affect food insecurity and migration among Guatemalan farmers. In a practical sense, it helps explain analysts' difficulties anticipating the hunger crisis that prompted thousands of Guatemalans to join caravans with migrants from Honduras and El Salvador heading to the United States in recent years.

Figure 2. Pathways of Food Security for Poor and Extreme Poor Farmers in Guatemala



Source: Developed by the author.

First, the poor and extreme poor in rural Guatemala buy most of their food. To do so, farmworkers might depend on being hired as unskilled laborers for agricultural activities such as coffee picking. Yet demand for this labor has declined. Coffee farm owners have faced climate extremes and pests

associated with climate variability, and many of them have been pushed out of business by the lack of transparency in the value chain; producers often receive just a fraction of coffee's retail price, and they have been especially vulnerable to price slumps in recent years. Because the price of coffee is structured in a way that has little to do with farming conditions, farmers have been saddled with the financial burden of increased production costs associated with climate changes. Producers bear the risk and cost of climate shocks on behalf of the entire sector. Moreover, the true cost of sustainably producing coffee is not yet understood or built into pricing. According to a 2019 Specialty Coffee Association report, "many farmers, the majority of whom are smallholders in countries with little to no social safety nets, are operating at a loss." Even as the retail price for Arabica coffee increases in the United States and elsewhere, farmers are left with an ever-decreasing percentage of the total value. Overall, low coffee prices and increasing production costs have diminished the capacity of coffee farmers to remain profitable, hence reducing the demand for unskilled labor. If used appropriately, climate services can help farmers adapt their production to changing climate conditions, allowing them to hire more workers.

The second pathway for securing food relates to cultivating staple crops such as maize and beans. In this pathway, the most evident way in which climate variability and change impacts food production is by affecting optimal climatic conditions during sowing dates, the amount of available rainfall during critical stages, and soil moisture. Cropland can be affected by torrential rain (such as floods produced by hurricanes) or persistent drought. In addition, smallholder farmers might encounter increased production costs associated with the disaster-related loss of infrastructure such as bridges and roads, which can limit their access to markets. Here, climate services can inform the strategies that poor farmers use to efficiently grow their crops.

Lastly, poor and extreme poor households rely in part on fishing in bodies of water and foraging for herbs, mushrooms, and other foodstuffs in forests. A 2019 FAO study highlighted the diverse number of plants used by communities as seasonal food sources collected from the forests. These resources, however, are shrinking, partly due to effects of ENSO and other climatic events. Guatemala's forests have shrunk in recent decades, from covering 44 percent of the country's land area in 1990 to 33 percent in 2016. In terms of fishing, warm ENSO years are usually associated with a decrease in fish availability. In this particular pathway, natural resource agencies could use climate services to aid people's adaptation in the remaining forests.

The changing climate's effect on food security is hardly linear. Interactions among the pathways might impact rural agricultural communities constructively or not, depending on how they employ adaptation strategies at different points and times. Only by understanding the full scope of food security can researchers and policymakers draw implications for a household's propensity to migrate.

The Potential of Climate Services and Complementary Resources

Studies in Guatemala suggest that there is a close relationship between precipitation extremes, crop failure, and hunger, particularly in children ages 5 and younger. Being able to anticipate droughts or floods could enable communities to make more informed decisions, maximize crop production, and improve food security—all of which could affect their propensity to migrate.

In recent years, policymakers around the world have paid more attention to the use and sharing of climate information, generation of which is the first pillar of climate services. Agricultural losses associated with climate extremes have triggered a high demand for tailored, comprehensive information that farmers can use to manage agricultural risk and forecast seasonal changes.

In addition to new climate forecasting technologies, more innovative ways of translating and transferring knowledge have allowed for the distribution of more inclusive, actionable climate

information. Climate services have the potential to help farmers adapt to changing conditions in the short term, such as by planning which seeds to plant the following season or harvesting water from rain for irrigation. Ultimately, over the long term, climate services could aid farmers to transform their agricultural systems, potentially as an alternative to migration. Additionally, the lessons learned from providing climate services can help researchers understand how climate information disseminates through communities. That could reveal whether specific individuals and communities pose barriers to the spread of this information, as well as how to increase communities' access to and use of climate services.

However, access to climate information and predictions alone does not necessarily lead agricultural producers to develop actionable, farm-level adaptation strategies. In order for climate services to have the greatest impact, governments and development organizations must identify and provide funding and other resources to implement adequate adaptations. Climate services are most effective when these providers consider farmers' socioeconomic conditions. Governments and organizations, therefore, must go further than solely providing climate information to farmers; they must understand the overall interrelated livelihoods of these communities, including their different pathways for securing food, as well as their climate vulnerabilities and how financial support can help different actors capitalize on the information.

Climate Services Provision and Power Dynamics in Guatemala

One example of a project designed to generate climate information in Guatemala is NextGen, a forecasting system able to create tailored regional climate forecasts by identifying variables relevant to users. It also tackles some of the traditional barriers that have kept climate information from being considered useful by farmers: spatial scale and predictability at a timescale deemed relevant for them to make decisions. The system was developed as part of ACToday, a project launched in 2017 by Columbia University's International Research Institute for Climate and Society that aims to use climate knowledge to improve food security and combat hunger in six countries heavily reliant on agriculture and vulnerable to climate variability and change.

This seasonal forecast system has the potential to aid decision-making processes throughout Guatemala. Still, the challenge remains to identify the demands for cash crops (such as coffee and cacao) and staple crops (such as maize and beans) and connect users with information in a way that does not promote uneven development, foster inequality, or reproduce unequal power dynamics. Without the addition of financial aid, large-scale farmers will be the only ones who can afford to capitalize on this climate information. Smallholder farmers might not have the resources to implement adaptation strategies, forcing them to consider alternative coping mechanisms such as working for larger farming operations or migrating.

Migration and other adaptation strategies, then, are affected in unexpected ways by farm-level adaptations such as the provision of climate services. Just as the linkages between climate change, food insecurity, and migration are complex, so too are the repercussions of potential policy interventions. Hastily produced policies could have unintended consequences exacerbating inequality or only partly achieving their goals. In other words, the provision of climate services is not a silver bullet that guarantees food security and shifts the calculus of migration to enable farmers to remain in place if they so choose. Rather, climate services must be paired with financial assistance or other mechanisms to allow smallholders to benefit from forecasts on par with wealthier landowners.

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