Policy, Market, and Climate Change Impacts on Maize Production in Mexico

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Introduction

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- Mexico is the seventh largest producer of maize worldwide, and maize is an important staple crop for regional food security
- There have been significant changes in maize landscapes across Mexico over the last few decades
  - Abandonment and adoption
  - Increased irrigated area
  - Changes in management: tillage, sowing date, variety



Introduction

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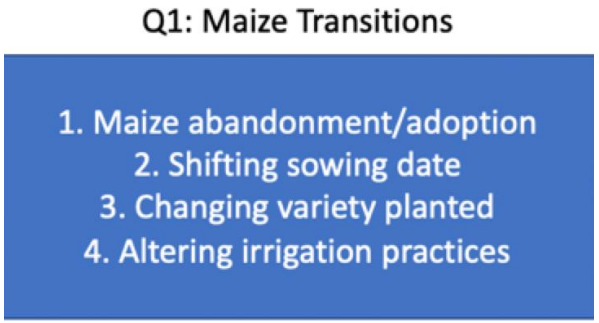
- Mexico is the seventh largest producer of maize worldwide, and maize is an important staple crop for regional food security
- There have been significant changes in maize landscapes across Mexico over the last few decades
- To date it remains unclear why such changes have occurred, and how climate change will impact these new maize landscapes in the future

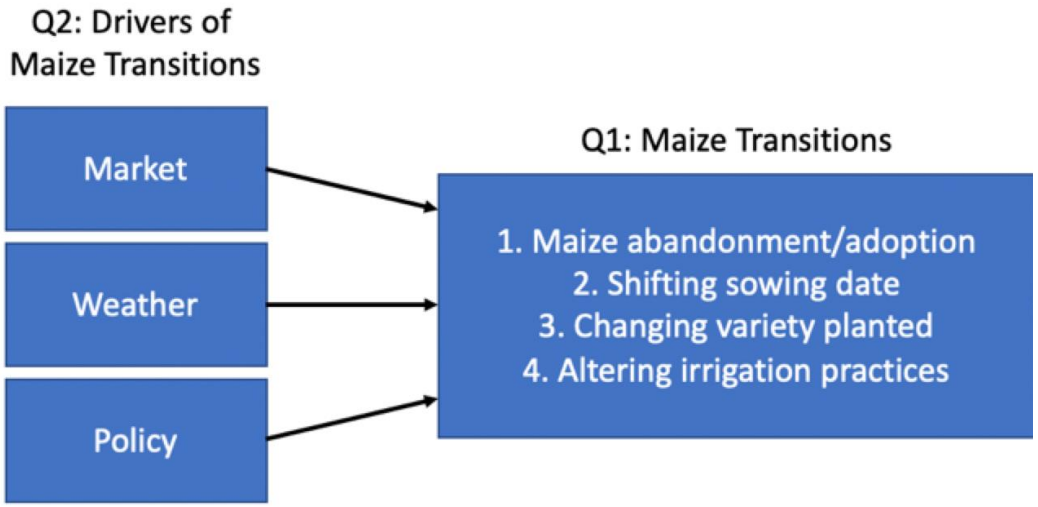
Main Research Questions

- Q1: How have maize landscapes transitioned in Mexico from 2000 to the present?



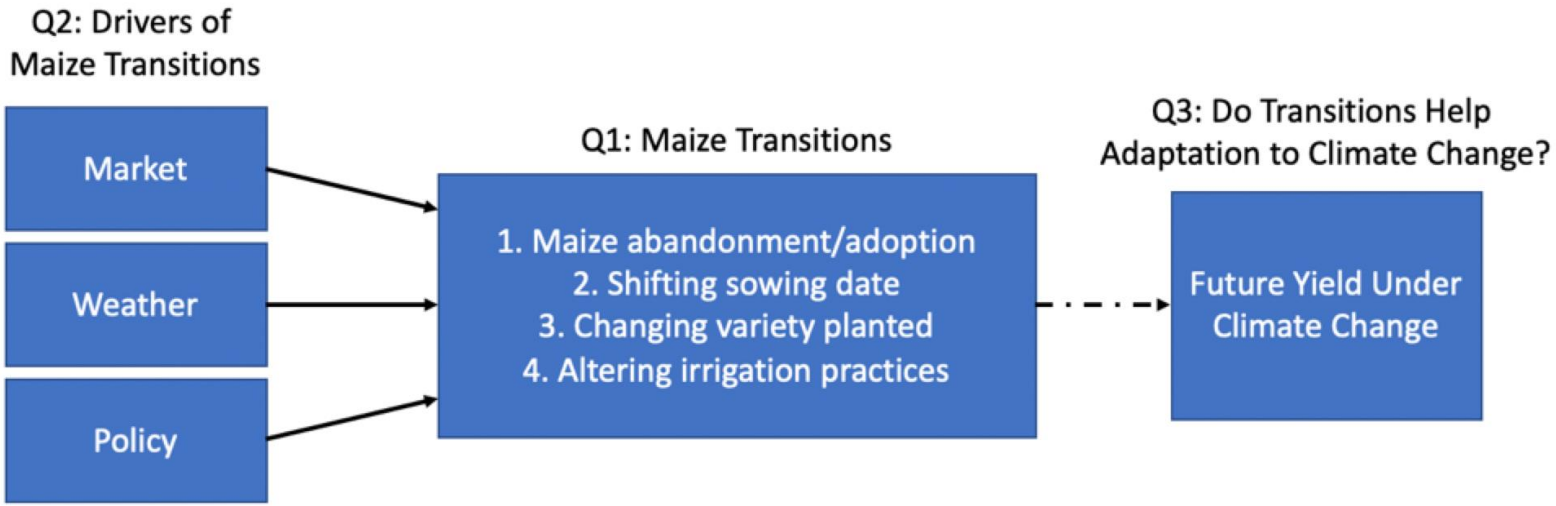
Main Research Questions

- Q2: How have market, weather, and policy factors driven these transitions? What is their relative importance?



Main Research Questions

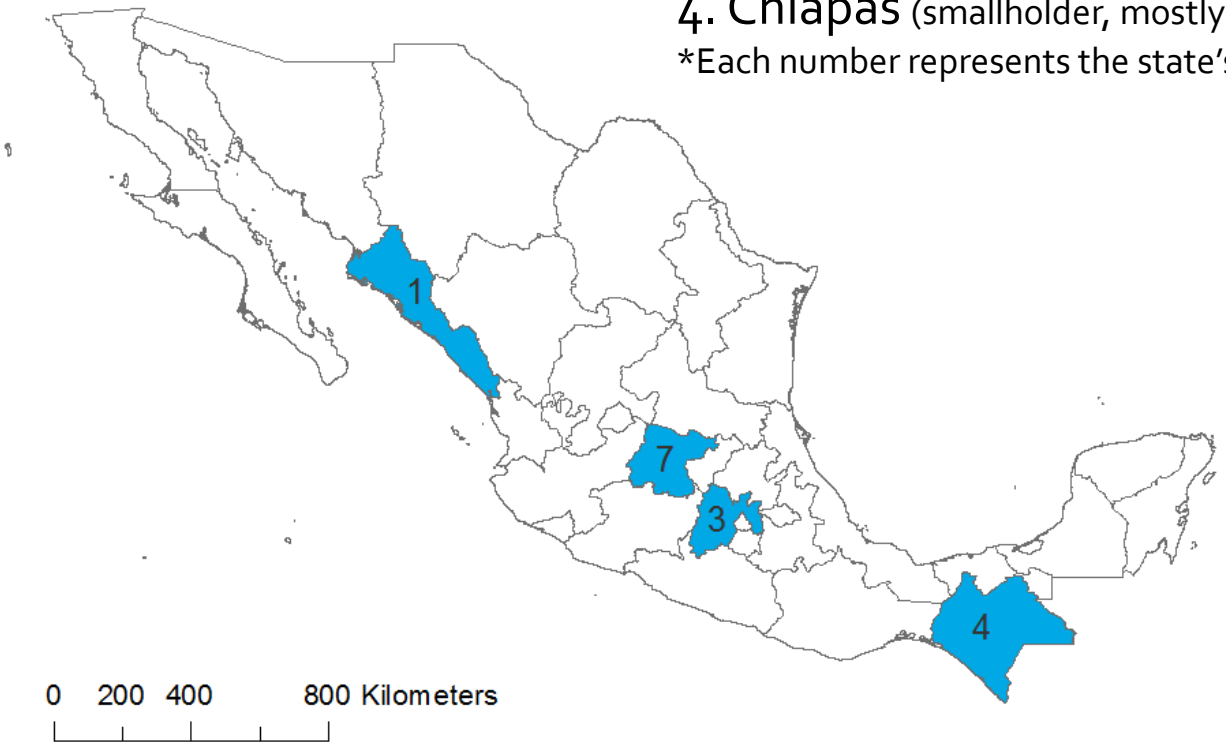
- Q3: How do these transitions influence projected climate change impacts on maize landscapes? Are these transitions adaptive or maladaptive considering future yield and food production?



Study Region

1. Sinaloa (large-scale industrial, mostly irrigated)
7. Guanajuato (medium scale, partially irrigated)
3. Mexico (medium-scale, mostly rainfed)
4. Chiapas (smallholder, mostly rainfed)

*Each number represents the state's rank in maize production.

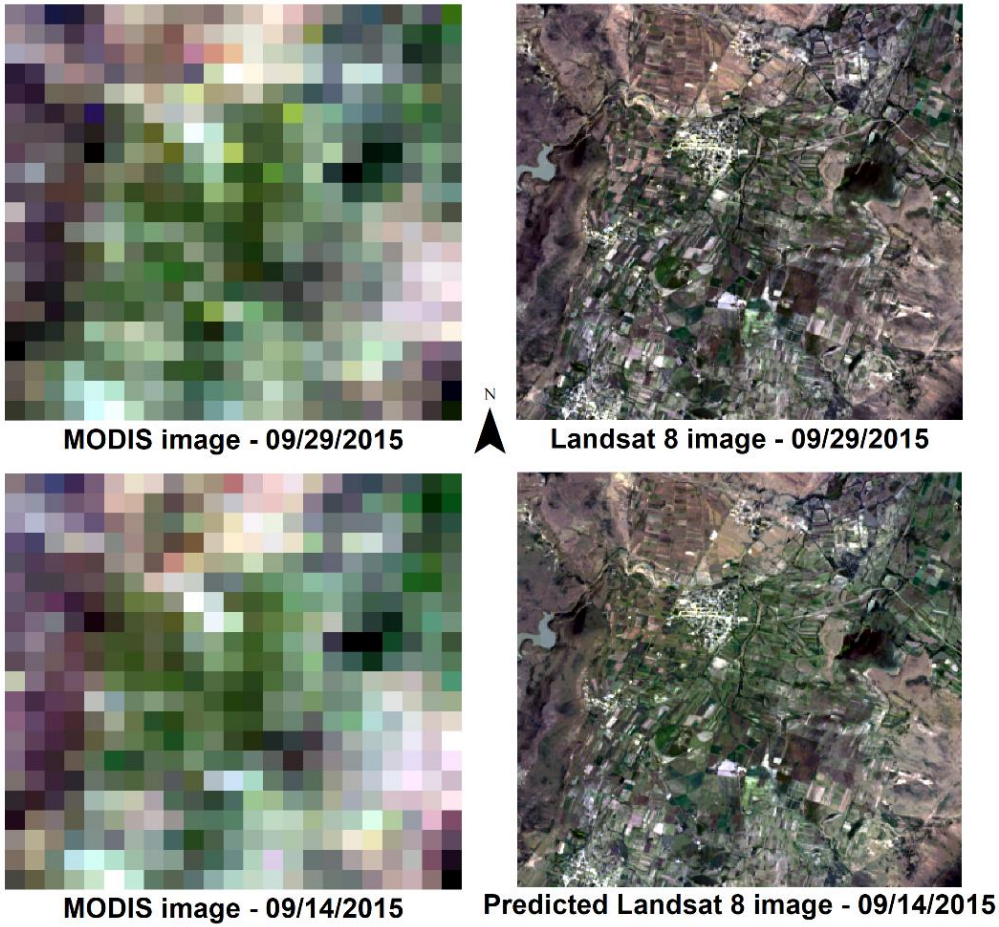


Methods

- We will use satellite derived long-term datasets on farmer decision-making to examine maize transitions through time

Data Type	**Variable**	**Data Source**	**Resolution** (2000-present)
Q1. Agricultural Transitions	Maize area	Census, SIAP	Municipality; Seasonal
		Landsat-MODIS (harmonized Landsat-Sentinel-2)	30 m; every 5 years
	Sowing date	Landsat-MODIS (harmonized Landsat-Sentinel-2)	30 m; Seasonal
	Varietal length	Landsat-MODIS (harmonized Landsat-Sentinel-2)	30 m; Seasonal
	Tillage practice	Sentinel 1, Sentinel 2, Landsat, MODIS	30 m; Seasonal
	Evapotranspiration	Landsat-MODIS	60 – 250 m (depending on data availability); Seasonal

Landsat-MODIS fused data product



Methods

- We will couple these long-term remote sensing datasets with price, weather, and policy datasets in econometric panel regressions to identify the causal drivers of agricultural transitions

Data Type	**Variable**	**Data Source**	**Resolution** (2000-present)
Q2. Drivers of Transitions	Maize prices	Census, SNIIM	State; Weekly
	Rainfall & Temperature	CHIRPS, CPC	0.05 – 0.5 degrees; Daily
	Policies	Literature Review	State to National; Annual

Methods

- We will then use future climate projections and crop model simulations parameterized with agricultural transition data to identify the impacts of future climate change

Data Type	**Variable**	**Data Source**	**Resolution** (2000-present)
Q3. Future Climate Projections	Rainfall & Temperature	CMIP6	Varying (>= 0.25 degrees); daily

Methods

- We will conduct household-level fieldwork to understand the drivers of farmer decision-making and collect ground truth information for our remote sensing analysis

Data Type	**Variable**	**Data Source**	**Resolution** (2000-present)
Q1 & Q2: Field Data	Drivers of decision-making	Household survey data	Household; one time step
	Ground truth data	Household survey data	Household; one time step

Broader Impacts and Societal Significance

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- Determine whether there are any adaptive strategies that may help farmers enhance their resilience to future change
- Identify the potential barriers to climate change adaptation
- Produce high-resolution maps on sowing date, maize varietal length, tillage practices, and irrigation

Thanks!

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