Household Food Security and Agricultural Production in the United States: A Spatial Analysis

Background

Food insecurity within the United States increased drastically after the great recession in 2008 and remains above pre-recession levels. In fact, 40 million Americans (or one in eight) are still food insecure in 2018. Understanding the geographical distribution of this insecurity is critical for potential policy solutions.

Further, food security is traditionally narrowly associated with agricultural production. Though this limited focus is increasingly being challenged as oversimplified and inadequate, it remains. I hope to use this exploration of the continental United States as a national case study to see if a strong relationship between food security and agricultural production holds.

Research Questions

1. What, if any, are the trends of food insecurity across the continental United States?

2. Is food security in the United States related to agricultural production at the state level?

Data & Methodology

Data Sources

- The U.S. Census Bureau, 2017 estimates
- The USDA Current Population Survey Food Security Supplement, 2014-2016
- The USDA Economic Research Service
- The USDA National Agricultural Statistics Service

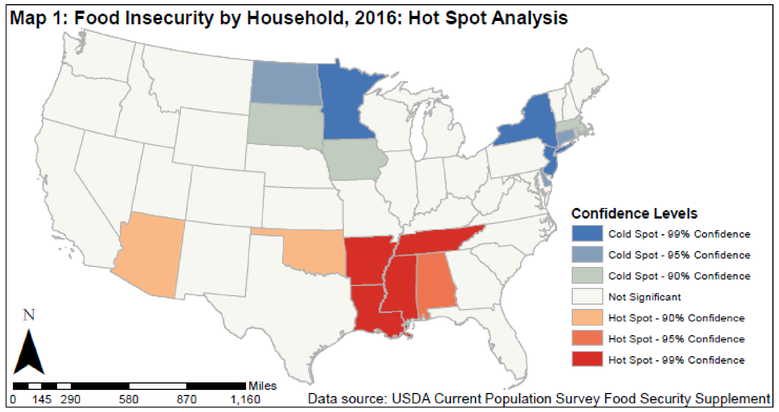
Indicator Definitions

1. Prevalence of food insecurity by household, 2016
   - Percentage of households unable to provide adequate food for one or more household members due to lack of resources
2. Farmland per capita (acres), 2017
   - Traditionally associated with agricultural production
   - Standardized with 2017 population estimates
3. Total cash receipts (USD), 2017
   - Cash income the farm sector receives for commodity sales
   - Higher cash receipts indicate higher agricultural production

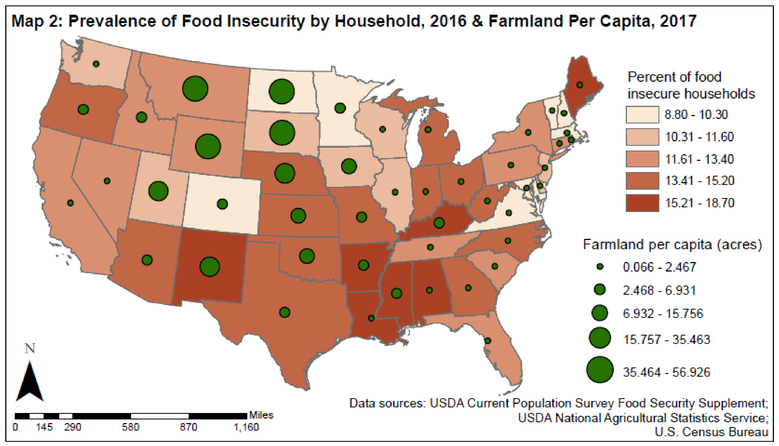
Methodology

I used arcMap to assess relationships between food security and proxies for agricultural production. The analysis includes hot spot analysis to show distribution of food insecure households and farmland, and choropleth correlation maps to assess potential relationships between food insecurity and proxy indicators for agricultural production. Multiple linear regressions with OLS were conducted as well, but results were biased and therefore are not reported here.

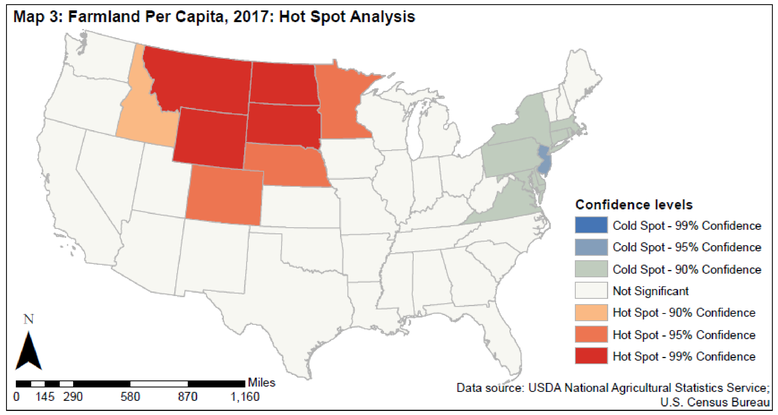
Map 1: Food Insecurity by Household, 2016: Hot Spot Analysis



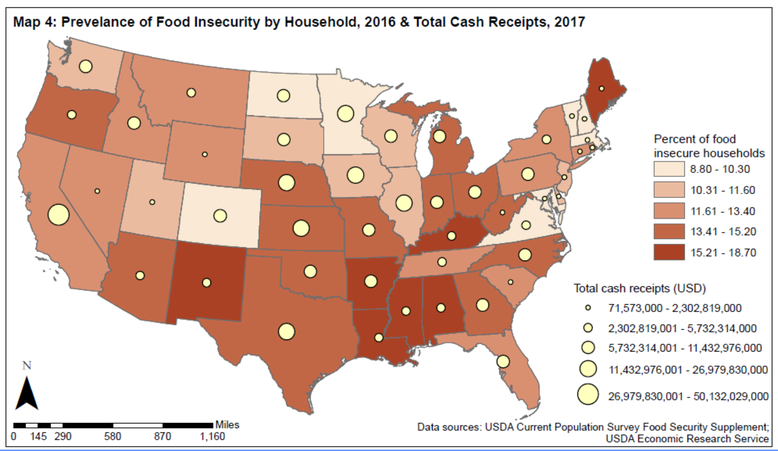
Map 2: Prevalence of Food Insecurity by Household, 2016 & Farmland Per Capita, 2017



Map 3: Farmland Per Capita, 2017: Hot Spot Analysis



Map 4: Prevelance of Food Insecurity by Household, 2016 & Total Cash Receipts, 2017



Findings & Results

Distribution of Food Insecurity in the United States

The prevalence of food insecurity is generally distributed across the country (Maps 2 and 4), but hot spots do exist.

- **Map 1** shows that several states in the south have significantly higher burdens of food insecurity, while a group of states in the north and northeast have significantly lower burdens of insecurity.

Food Security and Agricultural Production

If production is heavily correlated with food security, as the traditional development view suggests, one would expect to see areas with high levels of production associated with areas of low levels of food insecurity. Neither of the proxies reveal this association, however.

Farmland Per Capita

- **Map 2** – The correlation map does not show any apparent relationship between the prevalence of food insecurity and farmland per capita.
  - Some states with high food insecurity also have high rates of farmland per capita (e.g. New Mexico), while other states have low rates of food insecurity and concurrent low rates of farmland per capita (e.g. Massachusetts, Washington).
- **Map 3** – The hot spot analysis of farmland per capita shows that the northeast is a cold spot for farmland. This means the northeast has both significantly lower rates of food insecurity, *and* significantly lower rates of farmland per capita.

Total Cash Receipts

- **Map 4** – Total cash receipts are another proxy for agricultural production, but the correlation map between prevalence of household food insecurity and total cash receipts by state does not show an association.
  - For example, higher cash receipts indicate higher production, but states with high cash receipts still have high rates of food insecurity (e.g. Arkansas, Texas, Kansas).

Conclusion & Policy Implications

Proxy indicators for agricultural production by state do not have an obvious relationship to the prevalence of food insecurity by household in the United States. This suggests that factors of production are not sufficient to predict and respond to food insecurity. These findings support existing research that asserts that improving food security entails more than simply increasing agricultural production.

Policy solutions must also consider issues of food distribution and access, quality, and diet diversity in response to persistent food insecurity within the United States. A narrow focus on agricultural production alone will not be enough.

This assessment has global significance, as well. Global hunger is increasing, population is growing at an unprecedented rate, and climate change threatens the agricultural productivity and predictability of existing yields. Policy responses to these interrelated dilemmas must be coordinated and comprehensive to ensure adequate food for all.

Caroline Andridge • MGA 60710 Geographic Information Systems • University of Notre Dame