Illinois Agriculture: An Examination of the Relationship between Annual Corn Crop Yield and the Application of Atrazine Dalton Allen, Gebremichael Esayas Department of Geology, Texas Christian University

Introduction

- Herbicides are chemicals frequently used in agriculture to manage, or remove, unwanted vegetation that may negatively impact crops through resource competition; thus, increasing cropland productivity.
- Atrazine is a herbicide that is widely used in the state of Illinois and is predominately applied in the agriculture of corn and soybeans.
- This project seeks to examine the relationship between corn crop yield and Atrazine application.
- It is hypothesized that a positive correlation will exist between crop yield and atrazine application.



Methods

- Illinois atrazine (kg), corn crop yield (bushels) and total corn crop planted (acres) data were retrieved from the USGS and soil type data were retrieved from the Harmonized World Soil database.
- Atrazine concentration and corn yield data were normalized by total corn crop planted (acres) for each county. These n values were then ranked into 5 bins (very low, low, medium, high, and very high) that were symbolized for spatial representation.
- To examine the relationship between corn yield and atrazine application, corn yield was normalized to atrazine applied per planted acre of corn, These values were then ranked and symbolized for qualitative assessment.
- To determine whether corn crop yield (bushels) per atrazine applied (kg/acres) was influenced by soil type, an ANOVA was performed followed by a post-hoc Tukey-Kramer test using Minitab 19 statistical software.



Conclusions

- While it was hypothesized that a positive relationship would exist between corn yield and atrazine concentration, this relationship was not always found to be the case. In some counties, the inverse relationship was observed with lower crop yields resulting in counties that applied greater amounts.
- This lead us to examine whether other factors were influencing crop yield, such as soil characteristics. It was found that soil types varied throughout Illinois agricultural land with significant differences in the crop yield existing between soil type regardless of atrazine application. Thus, it was concluded that while atrazine appears to play a part in crop yield, other factors needed to be address before this relationship could be analyzed further.
- Future Directions: The project would look to acquire historical atrazine and crop data for the state of Illinois to analyze potential temporal trends as well as broader climate and plant health data to determine other potential confounding variables.

References:
United States Department of Agriculture. USDA's National Agricultural Statistics Service Illinois Field Office. USDA 2020. www.nass.usda.gov/Statistics_by_State/Illinois/Publications/County_Estimates/. Accessed (05 Mar. 20).

United States Geological Survey. Pesticide National Synthesis Project. USGS 2020. https://water.usgs.gov/nawqa/pnsp/usage/maps/county-level/. Accessed (02 Mar. 20).

Environmental Protection Agency. Herbicides. EPA 2019. https://www.epa.gov/caddis-vol2/cad

Results