

Wheat Yield under Drought

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Wheat is considered as one of the most important crops for farmers all over the world because it is a critical food resource and has a constant yield. It is grown all over the world for its wider adaptability and high nutritive value. Colorado has a long and proud history of wheat production, with researchers setting many trails in this area of science (figure 1).

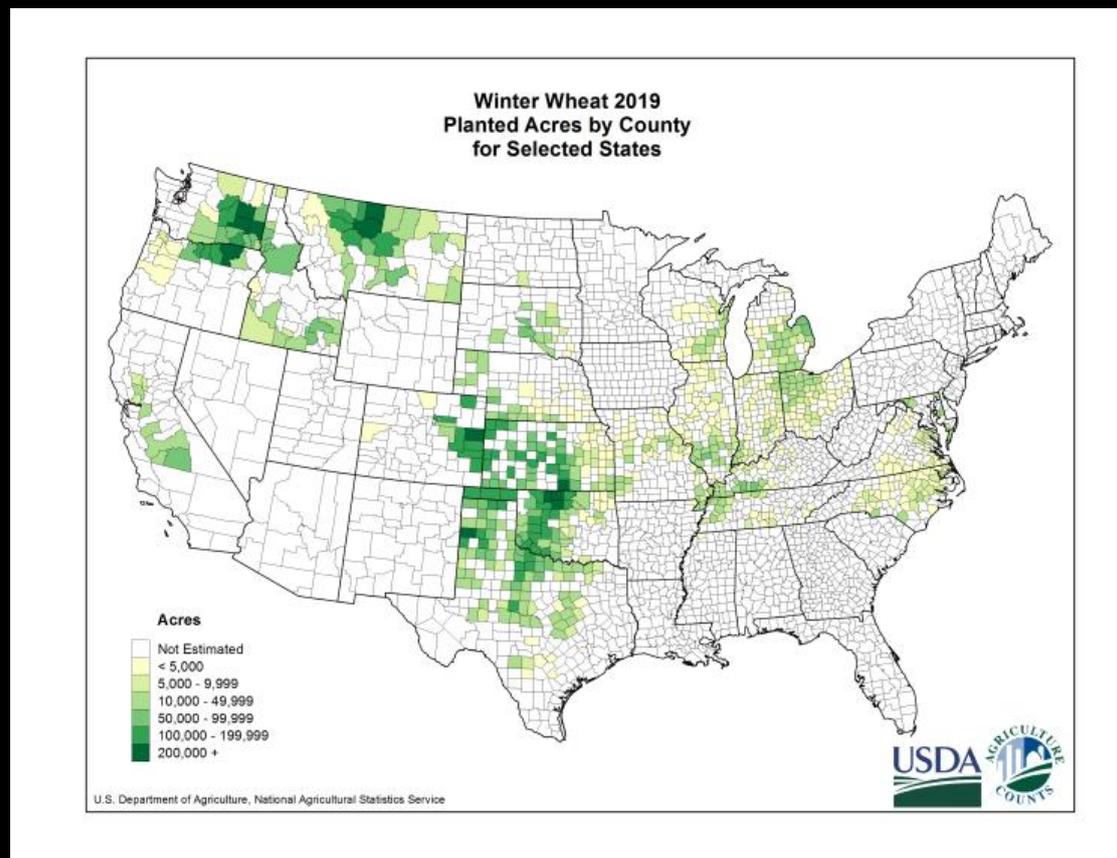


Fig. 1. Winter wheat planted acres (1 hectare = 2.47 acres), 2010, by county in the United States. (<https://www.nass.usda.gov/Charts and Maps/Crops County/ww-pl.php>, accessed 5 April,2021).

The purpose of this project was further exploring the relationship between precipitation, temperature and winter wheat yield while exploring the response of different varieties of winter wheat yield to climate change. From 1990 to 2020, The database for varieties trials includes data from the state testing programs in Colorado (CSU) and other state universities. This data includes the yield of different varieties of winter wheat from annual trials. We also collected the daily precipitation and temperature data in the weather station close to the area from 1990 to 2020. During

this process, Dr. Vigil gave us many useful tips and background information for the project.

But actually, our mentor Dr. Catherine Stewart provided a schedule framework for our project, preparation of background information, data acquisition, data processing and the final report. At the beginning, I and John have no idea about the next step. We just follow the instruction and use more time to find the papers that may give us some inspiration.

In the beginning, without any proof, I assumed there was a positive correlation between average annual precipitation and wheat yield. It is a total mistake I made during the project. Because if a researcher wants to publish or state their result, the first thing they need do is to prove their idea with data. But what I did is I hope to use a different way to process the data to make it “looks” like proof of my statement.

Luckily, Dr. Miner gives me the feedback and indicates the mistake I made when I was processing the data. She emphasizes that if a researcher can't remove all of the external factors, like insect, fertilizer, rotation (for our project). He/she cannot make a comparison for the yield of different varieties. For example, we have the yield of Yuma from 1990 to 2000 and the yield of Akron from 2000 to 2010. It is unrealistic to make a comparison of whose data or combine the yield data form different time period. Because you can't exclude all the external factors which may affect the result.

Here is an interesting story about our data processing. We all know Excel is powerful but it is a poor performer on plotting (if we want to combine serval charts into one). So, I and my research partner, John, spent serval hours in this process. And we need to acknowledge that the graph is the best way for us to understand the data we have. We have the graph of Yield VS Temperature/Precipitation for single wheat varieties in Excel, it looks irrelevant. We put all the varieties into one graph, and it becomes more clear.

Besides, I learned a fun fact about data. At the beginning of the semester, I used the annual average precipitation to make the plot. But the definition of precipitation is diverse. We have annual average precipitation, annual maximum precipitation, annual growing season average precipitation, etc. We need to consider which one is most suitable for our research question.

In conclusion, the result of my research does not make me satisfied. But the experience has been helpful for my future development as a researcher.