

Prompt 3

Crop Diversification, Agricultural Land,
and Production Metrics

Author -- Elaine Swanson + Ginger Harris

HDSI Agri Datathon

October 2024

Background Info:

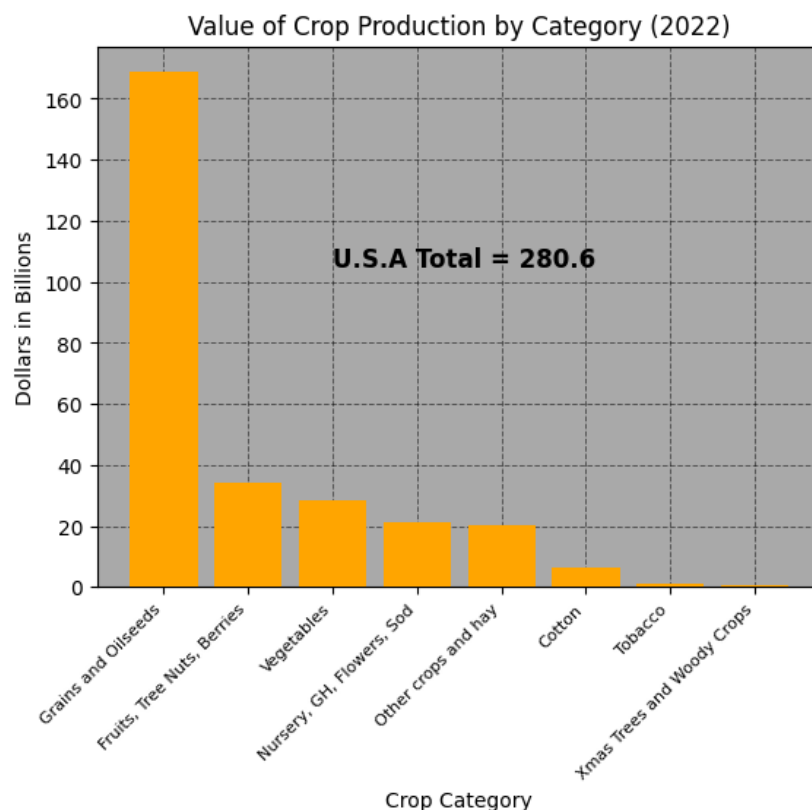
Since 1974, the Census of Agriculture has defined a farm as “any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year.” This definition ensures that a wide array of crop types and locations that meet a sales threshold will be included in any comprehensive data collection.

Your team's task is to investigate the historical and spatial relationship between crop diversification, land, and production across the contiguous United States or within a specific region characterized by similar crops or climatic conditions—such as the Midwest, Southeast, California, or the Pacific Coast States. By combining these areas, your team will explore how shifts in crop production patterns could be related to changes in land value,

farmland size, and/or production, and even consider the impact of external factors such as urban expansion for crop movement.

This is the only competition prompt that offers your team greater flexibility in its design and is suited for teams that want an extra challenge.

The graph to the left shows the value of crop categories from the 2022 census in billions of dollars.



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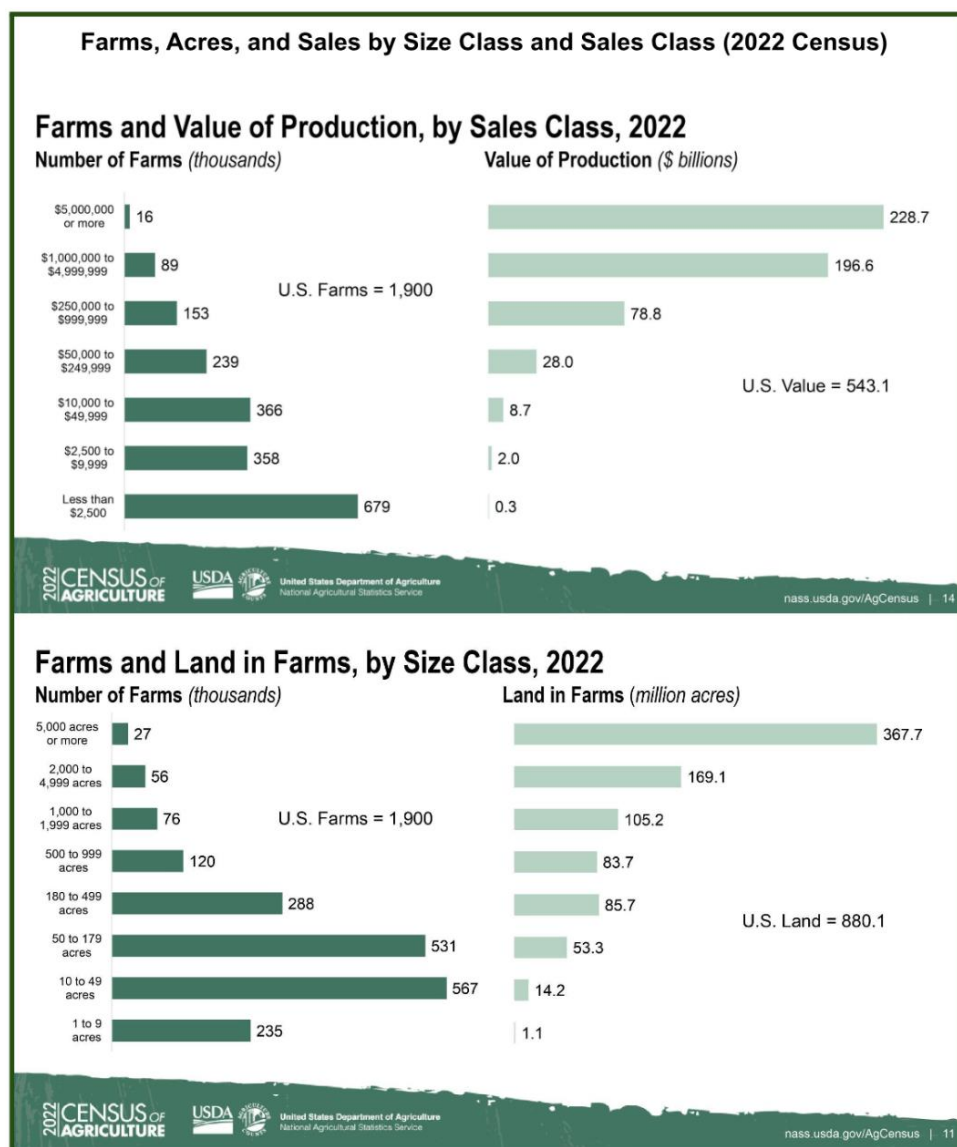
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From a simple graph, we can come up with a few questions:

- Have previous census years' graphs looked similar to this?
- If so, have land values remained constant as well?
- What is happening to the acres of land that these crops have historically grown on?

The goal is to uncover how these factors interact over time, providing insights into how agricultural crop choices have evolved in response to regional and economic factors.



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For example, looking at the two graphics above on production value and land ownership. They indicate a clear depiction that land ownership and economic wealth is increasingly concentrated in the hands of a small number of very large operations.

The first graphic on *"Farms and Values of Production by Sales Class, 2022"* shows that there are 16,000 farms each making \$5,000,000 or more annually. Together, these farms generate a staggering \$228.7 billion in production value. This is contrasted with all other farms combined, which generate a total of \$314.4 billion. Despite their smaller numbers, these high-revenue farms are very close to completely dominating the agricultural economy. We can come up with a few more questions:

- What do these farms grow?
- Have they always grown these crops?
- When did this concentration begin?

The second graphic, *"Farms and Land in Farms by Size Class, 2022"* further illustrates this concentration by showing that 27,000 farms, each with 5,000 acres or more, collectively control 367.7 million acres of farmland. While the total land area managed by all other farms, 512.3 million acres, is greater, these large farms though few in number, command a significant portion of the country's agricultural land in total. Similarly, we can ask:

- When did this concentration begin?
- Where in the US is this occurring?

As we integrate crop diversification with economic measures, the conversation shifts toward the impact of crop diversification within a region and its connection to land value and economic output. There's a lot to explore here, especially when considering the dominance or decline of certain crops and how that interacts with the economic production of the land. Additionally, regional factors, including farm consolidation and the expansion of urban areas, add further depth to the discussion, shaping both crop diversification and the valuation of agricultural land.

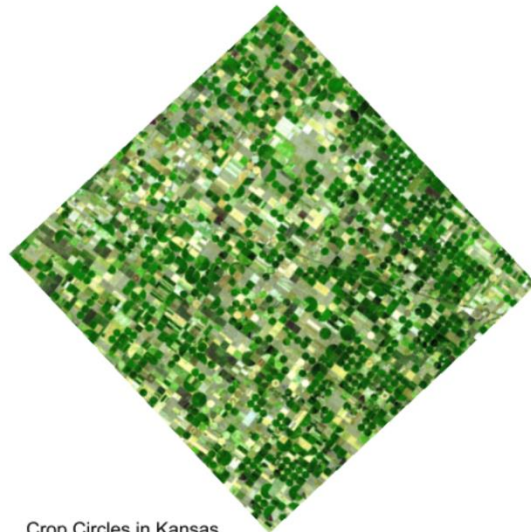
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Crop Circles in Kansas
<https://earthobservatory.nasa.gov/images/5772/crop-circles-in-kansas>

How to Complete this Prompt:

We want your team to analyze how crop diversification patterns have shifted over time across various regions. There is bound to be an interesting dynamic hidden within a region, with some crops becoming increasingly dominant while others gradually diminish. Alongside this, we want you to analyze shifts in farm size, whether we consider acreage operated or the revenue generated. Then build a model to predict out these values.

Again, in terms of the geographic location you are doing your analysis and your exact methods, are up to your team. You can even bring in outside (public) data to explore further.

1. Read the provided Toolkit for notes about FIPS code, special characters, and inflation adjustment
2. This is a very open prompt, and your team can develop your overall analysis, but here are some beginning ideas:
 1. Analyze the historical trends in crop diversification by the crop types and sales grown in a county and how they relate to the economic valuation of agricultural land.

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2. Explore the relationship between urban growth and the economic production of agricultural land, assessing how these external factors influence crop diversification and land value (you could bring in outside data for this)

What your team has:

land_use_farm_ops.csv – The dataset captures a comprehensive overview of agricultural land use and management practices, focusing on cropland, pastureland, and woodland metrics, alongside farm operation details. It provides a robust foundation for analyzing land efficiency, risk management through crop insurance, and the economic health of farming operations across various regions.

Prompt3_wide_3.0.csv – The dataset focuses on measuring the extent of crop production and the number of farming operations associated with diverse crops, emphasizing both harvested and irrigated land. It serves as a valuable resource for analyzing trends in agricultural practices, crop yields, and resource allocation across different regions.

Viz Hints:

To create your team's final visualizations, it will be beneficial to map your values across the counties of the contiguous United States. **A choropleth map is a type of map that uses color to represent data across geographic areas. The term comes from the Greek words choros (region) and plethos (multitude).** Using a tool like Python Plotly's choropleth maps can enhance your visual analysis. For more information and examples, visit [Plotly's choropleth map](#) documentation and ways to create [USA County Choropleth Maps in Python](#).