

Spatiotemporal Analysis of Soybean Acreage and Yield Trends in Arkansas (2010–2024)

Kamana Kafle¹, John Nowlin²
Arkansas State University



Abstract

This project analyzes fifteen years of soybean acreage across Arkansas using the USDA Cropland Data Layer (CDL)¹ and ArcGIS Pro⁵. County-level soybean acreage was extracted annually to identify long-term spatial and temporal patterns. Results show that soybean cultivation is highly concentrated in the eastern Mississippi Delta region, consistent with historical USDA production summaries¹. Statewide acreage peaked in 2017–2018 before declining sharply in 2019 due to major flooding along the Lower Mississippi River². Acreage stabilized after 2020. These findings highlight the strong geographic concentration of soybean production in Arkansas and provide insight into regional agricultural land-use trends.

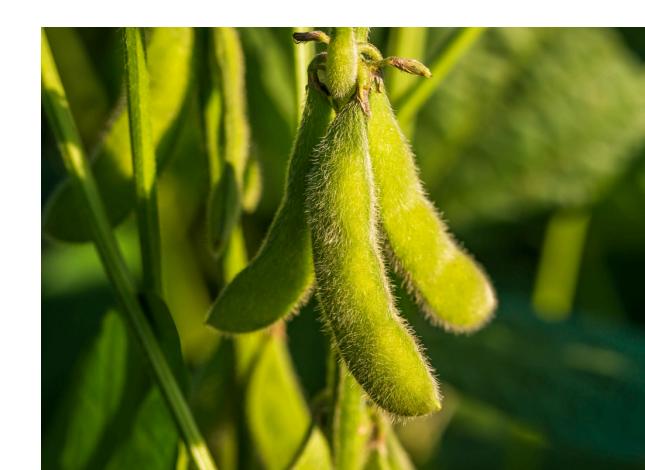
Soybean acreage increased from 2010 to a peak in 2017–2018, then declined sharply in 2019 due to major Mississippi River flooding.² Acreage recovered after 2020 but remained below pre-flood highs. Normalized 2024 values show that soybean production is heavily concentrated in the eastern Delta, with Crittenden (27%), Arkansas (17.2%), Chicot (14%), Phillips (10.2%), and Monroe (8.9%) having the highest land-use percentages. Most non-Delta counties remain below 5%, reflecting long-term USDA-NASS patterns.¹ Overall, soybean production in Arkansas is geographically concentrated and remains dominated by the Delta region.

GIS Workflow

Raster Calculator → Extract by Mask → Zonal Statistics → Join → Mapping

Data and Materials Used

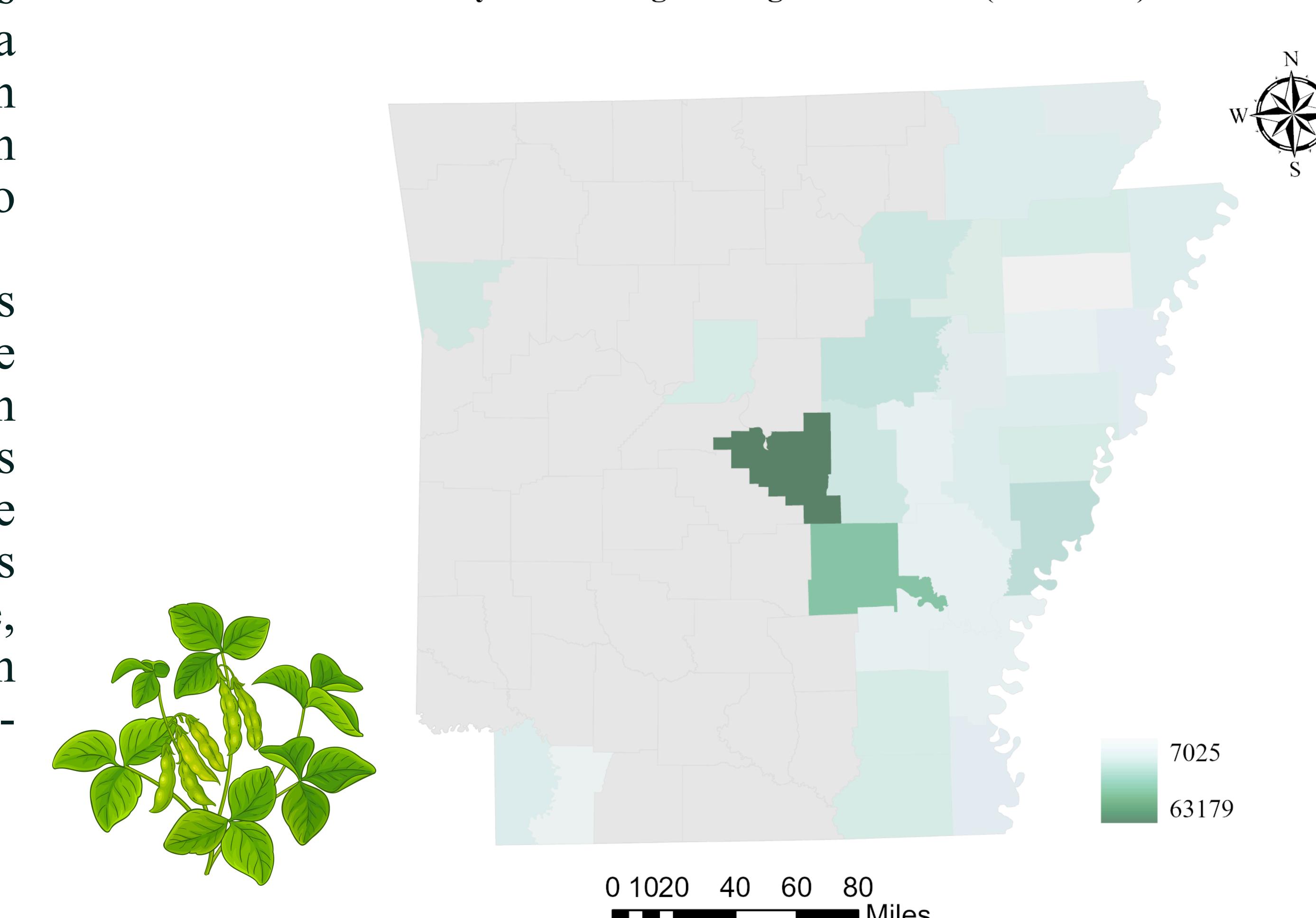
- Primary Dataset:
USDA Cropland Data Layer (CDL, 2010–2024) – 30 m raster data, soybean = Class 5
- Boundary Files: Arkansas state and county shapefiles (U.S. Census Bureau, 2023)
- Software: ArcGIS Pro (v3.3.1) – raster extraction, masking, zonal statistics, mapping
- Additional Tools: Microsoft Excel (graphs)



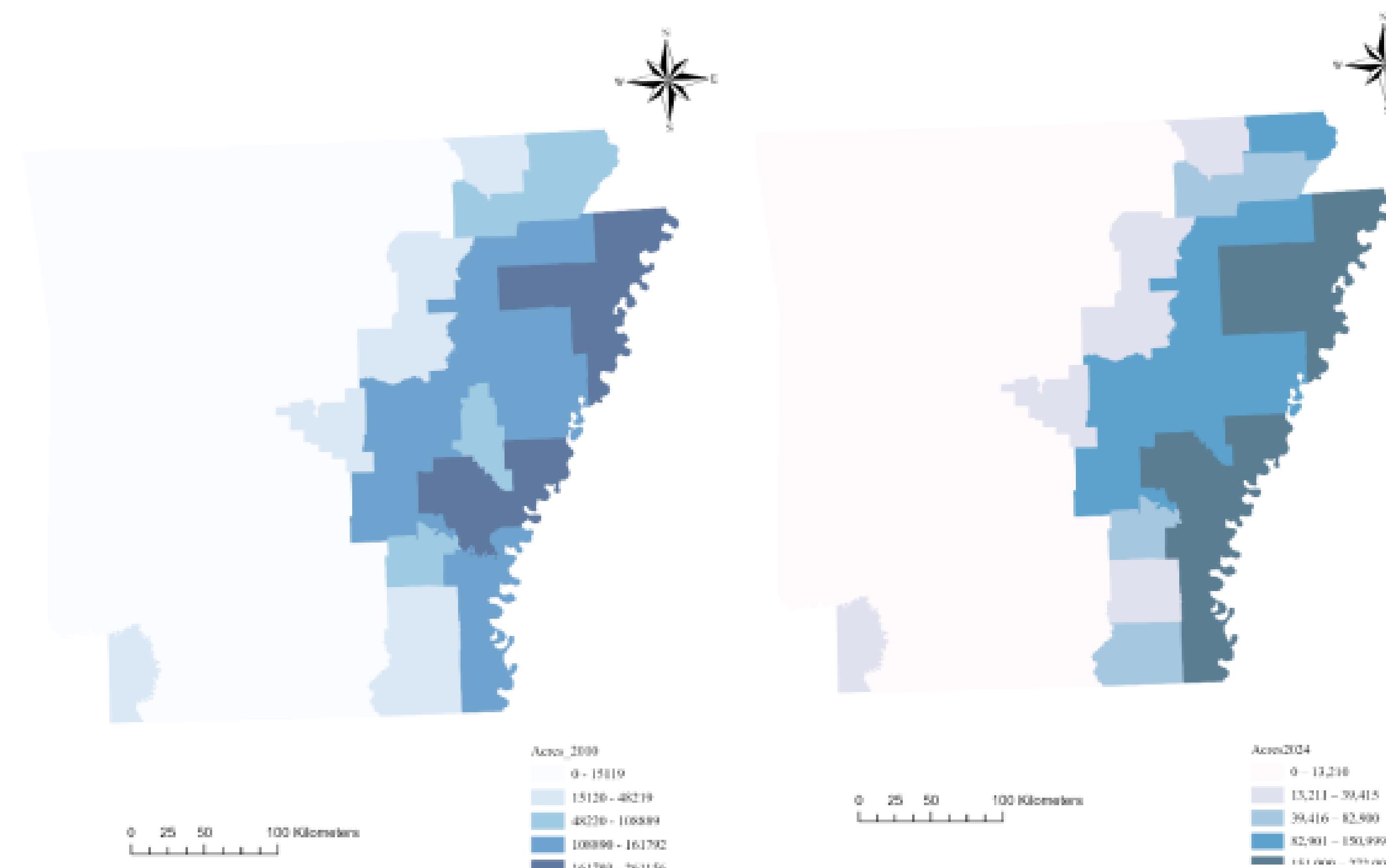
Results and Discussion

Soybean acreage patterns across Arkansas from 2010 to 2024 show a strong and persistent spatial concentration of production in the eastern Mississippi Delta region. The 2010 map indicates that soybean cultivation was already heavily clustered in Delta counties, while much of central, western, and northern Arkansas had little or no soybean acreage. By 2024, this pattern remained consistent, with high-acreage counties continuing to appear almost exclusively in the eastern part of the state.

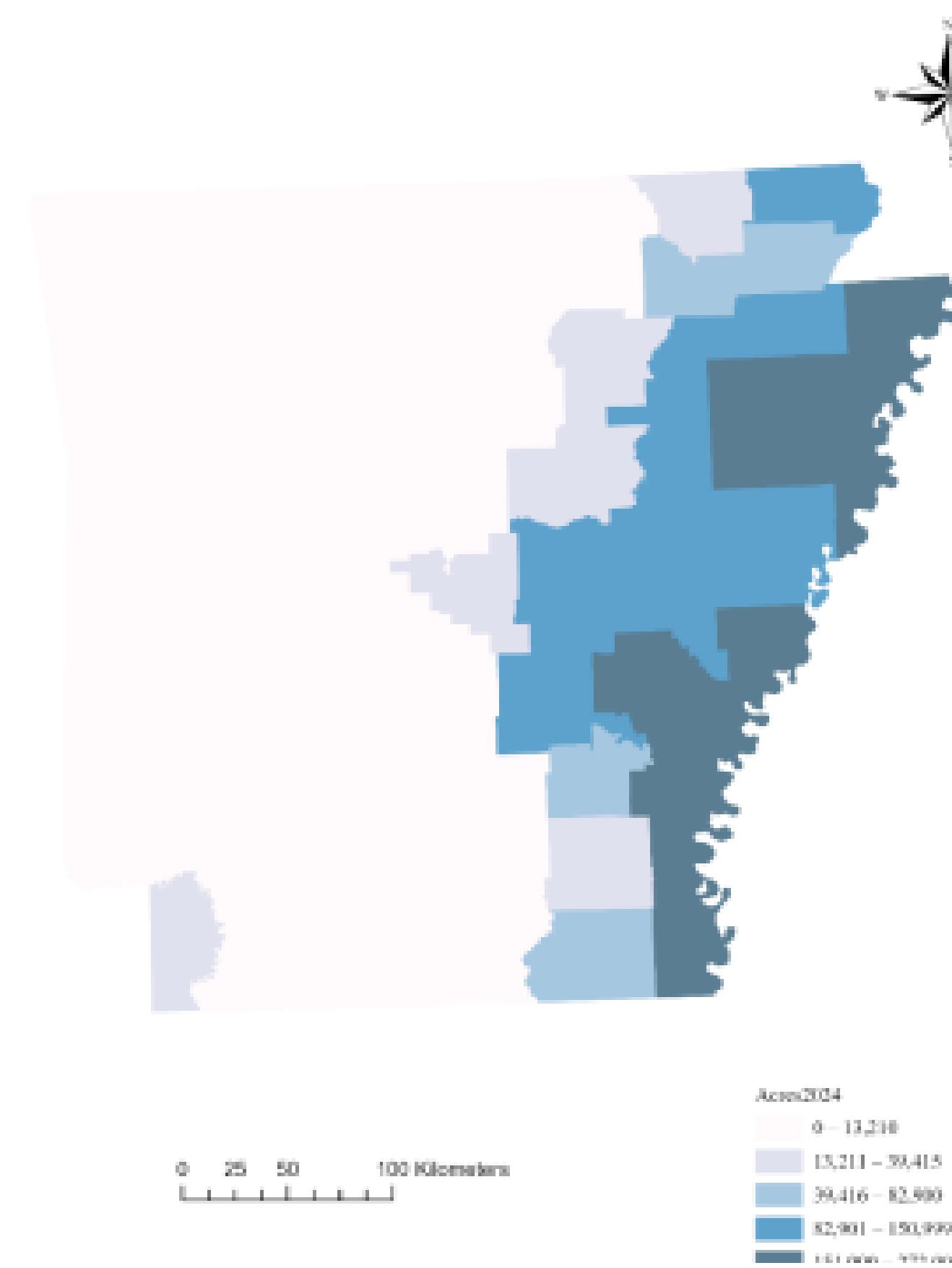
The acreage change map (2010–2024) further emphasizes this geographic pattern. After applying a minimum-acreage threshold to exclude counties with negligible soybean production, the mapped results highlight only those counties with meaningful change, while low-production counties are symbolized in gray. The counties showing the largest increases include Crittenden, Arkansas, Chicot, Phillips, and Monroe, which aligns with long-term USDA-NASS production summaries identifying these counties as major soybean-producing regions in Arkansas.¹



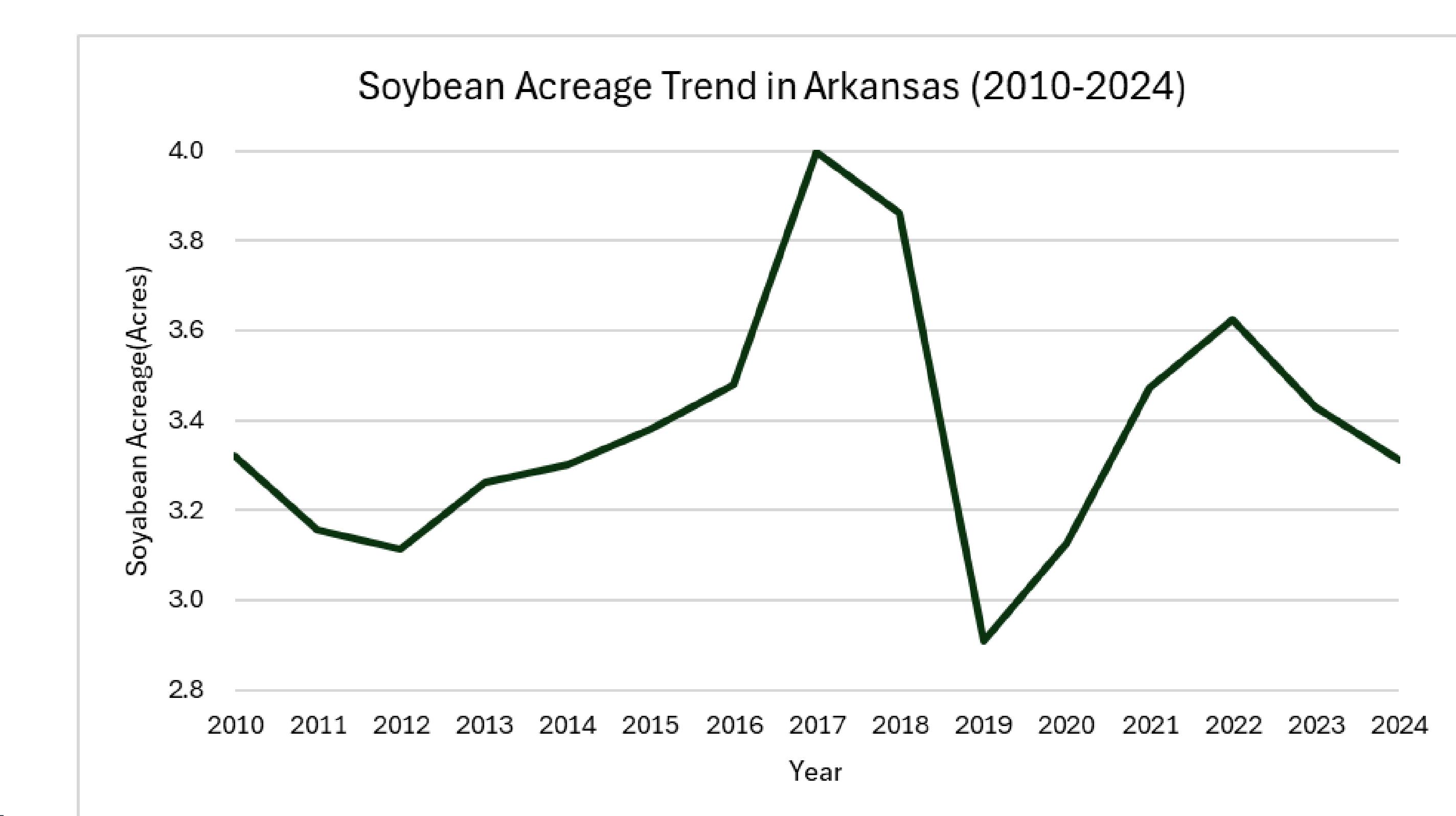
Soybean Acreage in Arkansas (2010)



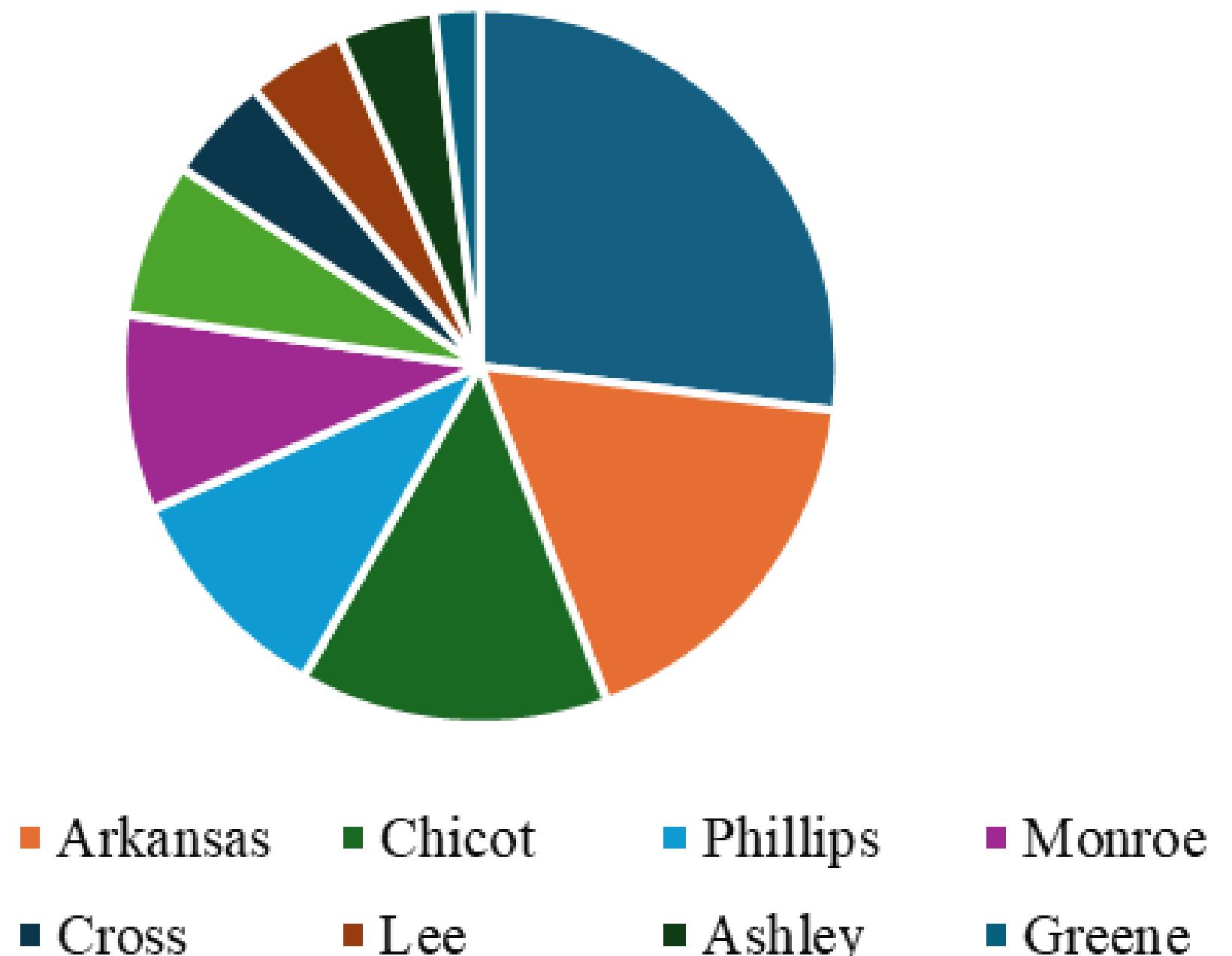
Soybean Acreage in Arkansas (2024)



Soybean Acreage Change in Arkansas (2010–2024)



Top Ten Arkansas Counties by Percentage of County Area Planted in Soybeans (2024)



References

- ¹ USDA-NASS County Soybean Acreage Reports (2010–2024)
- ² USDA, National Weather Service Reports – 2019 Mississippi River Flooding
- ³ USDA National Agricultural Statistics Service. 2010–2024. Cropland Data Layer (CDL). <https://nassgeodata.gmu.edu/CropScape/>
- ⁴ U.S. Census Bureau. 2023. Arkansas State and County Boundary Shapefiles. <https://www.census.gov/geographies/mapping-files/time-series/geo/carto-boundary-file.html>
- ⁵ Esri. 2024. ArcGIS Pro (Version 3.3.1) [GIS software]. <https://www.esri.com/en-us/arcgis/products/arcgis-pro/overview>