



Spatial and Temporal Patterns of Returns to U.S. Field Crop Production

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Outline

1. Introduction
2. Scope of the Work
3. Summary Statistics
4. Spatial and Temporal Patterns of Net Returns
5. Concluding Remarks



Introduction



Is US farm economy getting BETTER..?

Inflation and a Farm's Bottom Line; Operational costs have risen, yes, but so have corn and soybean prices.

Publication info: Wall Street Journal (Online) ; New York, N.Y. [New York, N.Y.] 17 Dec 2021.

[#ProQuest document link](#)

FULL TEXT

If Blake Hurst wants to report on inflationary costs to his farm operations ("Inflation isn't 'Transitory' on My Farm" op-ed, Dec. 15), wonder if he would be kind enough to tell the Journal's readers about the effects of the increase in corn and soybean prices. He farms these crops but has somehow neglected to tell us about their spectacular price rise in the past year. Doesn't this, as much as Mr. Hurst's costs, fall to the bottom line of his operation?

Farmers Swap Soybeans for Corn as Coronavirus Scrambles Demand; Prices have fallen further for corn than soybeans as ethanol production stalls

Maltais, Kirk. Wall Street Journal (Online) ; New York, N.Y. [New York, N.Y.] 12 May 2020.

[#ProQuest document link](#)

FULL TEXT

Some farmers are shifting acres from corn to soybeans this year, a reversal that reflects the coronavirus pandemic's broad impact on demand for many agricultural products.

U.S. farmers grow corn and soybeans to feed people and livestock, and corn for the same reasons as well as to make ethanol. Demand for ethanol has evaporated as energy prices have plummeted, with people staying home around the world. A corn byproduct of ethanol production is also a top livestock feed, prompting some hog and cattle farmers to buy more soybeans instead.

As a result, some farmers who had favored corn in recent years after the trade war with China curbed soybean exports are switching back. The Department of Agriculture said Tuesday that it expects higher export demand for soybeans this year and for U.S. exports of the crop to rise by 375 million bushels to over two billion bushels.

"There's a better chance for exports of soybeans throughout the world," said Bret Davis, who plans to switch 400 of the 3,400 acres he farms in central Ohio from corn to soybeans.

Mr. Davis said he needs a strong crop this year after flooding destroyed what he had planted on 800 of his acres last season. Last spring topped the wettest 12 months on record in the Midwest, prompting farmers to leave a record 20 million acres unplanted.

Business News: Prices Climb for Soybeans, Corn, Wheat --- Demand in China and dry weather in many key growing regions alter earlier forecasts

Dezember, Ryan; Maltais, Kirk. Wall Street Journal, Eastern edition; New York, N.Y. [New York, N.Y.] 17 Nov 2020: B.6.

[#ProQuest document link](#)

FULL TEXT

Dry weather, China's push to fatten its pigs and the lockdown-induced baking bonanza are lifting prices for U.S. row crops.

Futures prices for soybeans, corn and hard red winter wheat -- the kind used for baking bread -- have risen by about

Drivers Are Returning to the Road. That Is Good News for Corn Growers. Higher demand expected for gasoline additive ethanol could lift already lofty corn prices

Maltais, Kirk. Wall Street Journal (Online) ; New York, N.Y. [New York, N.Y.] 30 Mar 2021.

[#ProQuest document link](#)

FULL TEXT

Corn prices have hit their highest levels in almost eight years. Analysts say they are likely to get a further boost from motorists.

Drivers returning to the road are expected to lift demand for ethanol. About 40% of the U.S. corn crop goes to producing the gasoline additive, and consumption has plunged amid the pandemic. Now ethanol producers envision a rebound powered by economic reopenings and a potential wave of bioenergy-friendly regulations from the Biden administration.

U.S. News: **More Farmers Are Facing Bankruptcy**

Newman, Jesse. Wall Street Journal. Eastern edition, New York, N.Y. [New York, N.Y.] 07 Aug 2020. A.3.

[JFPAQuest document link](#)

FULL TEXT

More U.S. farmers are filing for bankruptcy, as federal payments projected to reach record levels this year fall short of compensating for the coronavirus pandemic and a yearlong slump in the agricultural economy. About 580 farmers filed for chapter 12 bankruptcy protection in the 12-month period ended June 30, according to federal data. That was 8% more than a year earlier, though bankruptcies slowed slightly in the first half of 2020 partly because of an infusion of federal aid and hurdles to filing during the pandemic, according to agricultural economists and attorneys.

Farm input cost set to rise with increase in fertiliser prices [Agriculture]

Tiwari, Rithung. The Economic Times. New Delhi [New Delhi]. 09 Apr 2021.

[JFPAQuest document link](#)

FULL TEXT

The farm input cost is set to rise sharply with a steep increase in fertilizer prices on account of spike in international prices of the raw material. The country's largest fertilizer seller - Indian Farmers Fertiliser Cooperative (IFFCO) - has raised the prices of non urea fertilizers by upto 50%. A 50 kg bag of most popular nutrient DAP will now cost Rs 1900 as against Rs 1200 a bag. Similarly, the price of SPK will range from Rs 1500-1600 a bag - a rise of almost 50% from earlier price tag. Other companies have also announced rise in fertilizer prices. IFFCO, however, clarified that the company will not sell fertilizer immediately at the increased prices. "We will sell the 11.26 lakh tonnes of complex fertilizer which will be sold at old rates only. Materials with new rates are not for sale to anyone. There is enough material in the market with old rates and I have instructed the IFFCO marketing team to sell only previously packed material with old rates to farmers," tweeted U S Awasthi, managing director and chief executive of IFFCO. Awasthi tweeted that the prices of complex fertilizers mentioned by IFFCO are only tentative. "The international prices of the raw materials are yet to be finalized by companies. Indeed, there is a sharp increase seen in the trends of international raw material prices," he tweeted.

Farmers Feel the Squeeze of Inflation: **Higher costs for seeds, fertilizer, weedkillers and labor** could push up grocery bills this year, researchers say

Comney, Vanessa. Wall Street Journal (Online). New York, N.Y. [New York, N.Y.] 15 Feb 2022.

[JFPAQuest document link](#)

FULL TEXT

Inflation is growing on the farm. American farmers are paying significantly higher prices for their weedkilling chemicals, crop seeds, fertilizer, equipment repairs and seasonal labor, ending some of 2021's windfall from rising crop prices. Higher farm costs could help push up grocery bills further in 2022, analysts say, following a year in which global food prices rose to decade highs. "I just don't see how I'm going to get paid this year," said Brooks Barnes, a second-generation farmer in Wilson County, N.C.

Fertilizer crisis delivers profits and pain as **Ukraine fallout** broadens

U.S. farmer: Farmers aren't buying what they need they are buying what they can afford, one expert said

By David L. Johnson and Laura Roper

For the Associated Press

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Is US farm
economy
getting
WORSE..?

Crop Profitability

- Positive factors
 - Increases in output prices
 - Better accessibility to foreign market: exports of corn and soybeans ...
- Negative factors
 - Increases in input prices
 - Weather shocks and lower yields

Research Objectives

- Build crop production and cost data at the county level for 42 years (1980 – 2021)
- Compute the net return of crop and the difference in average
- Visualize the spatial and temporal pattern of net returns

Scope of Work

Scope of the work

- Spatial Scope
 - County-level, entire U.S.
- Temporal Scope
 - Annual, 1980 – 2021
- Crops
 - Corn, Soybeans, Rice, Wheat (Spring, Winter), Cotton (Upland), Oats, Sorghum, Barley

Variables of Interest: Net Return

$$\text{Net Return}_i = \text{Return}_i - \text{Cost}_i$$

- $\text{Return}_i = (\text{Quantity}_i \times \text{Price}_i) \div \text{Planted acre}_i$
 - $\text{Quantity}_i = \text{Yield}_i \times \text{Planted acre}_i$
 - Price_i : annual price received
- Data source: USDA, National Agricultural Statistics Service
 - Yield, planted acre: annual, county-level
 - Price: annual, state-level

Variables of Interest: Cost

- $Cost_i = Seed_i + Fertilizer_i^{1)} + Chemicals_i + Custom\ Services_i^{2)} + Fuel_i + Repairs_i$
 - 1) Cost of commercial fertilizers, soil conditioners, and manure
 - 2) Cost of custom operations, technical services, and commercial drying
- Data source: Commodity Costs and Returns (USDA ERS)
 - Annual Costs per planted acre, state-level
 - Note that this data is reported using ERS Farm Resource Regions, so we match ERS regions and the states

Summary Statistics

Summary Statistics

(Unit: Real \$/Planted acre)

VARIABLES	Average in 1980-1989		Average in 1990-2006		Average in 2007-2021	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
CORN						
Return	352.4	103.3	388.3	105.7	597.8	136.6
Cost	193.8	9.0	225.4	18.6	308.2	23.6
Net Return	158.6	106.0	162.9	103.3	289.6	134.7
No. of Counties	2,585		2,383		1,896	
SOYBEANS						
Return	261.7	68.1	281.6	68.4	437.0	93.3
Cost	95.0	13.9	114.3	11.0	156.4	19.2
Net Return	166.7	63.7	167.3	66.4	280.6	97.1
No. of Counties	1,878		1,929		1,701	
Rice						
Return	602.8	95.4	645.4	112.0	982.9	278.4
Cost	317.4	13.3	415.4	48.2	449.6	19.8
Net Return	285.4	93.3	230.0	88.4	533.3	271.5
No. of Counties	112		115		85	

(Unit: Real \$/Planted acre)

VARIABLES	Average in 1980-1989		Average in 1990-2006		Average in 2007-2021	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Wheat, Spring						
Return	182.7	78.1	197.6	88.2	307.0	131.1
Cost	132.2	55.2	145.2	38.6	130.7	31.2
Net Return	50.4	73.3	52.3	72.7	176.3	125.5
No. of Counties	390		367		223	
Wheat, Winter						
Return	201.8	62.9	199.8	63.0	296.3	92.3
Cost	160.0	49.8	168.7	38.9	139.3	32.8
Net Return	41.7	61.7	31.1	61.2	157.0	79.0
No. of Counties	2,224		2,108		1,102	
Cotton, Upland						
Return	470.9	198.1	524.8	164.8	600.2	151.8
Cost	483.6	158.9	493.3	101.5	373.3	90.7
Net Return	-12.7	275.9	31.5	168.2	226.9	145.2
No. of Counties	539		587		390	



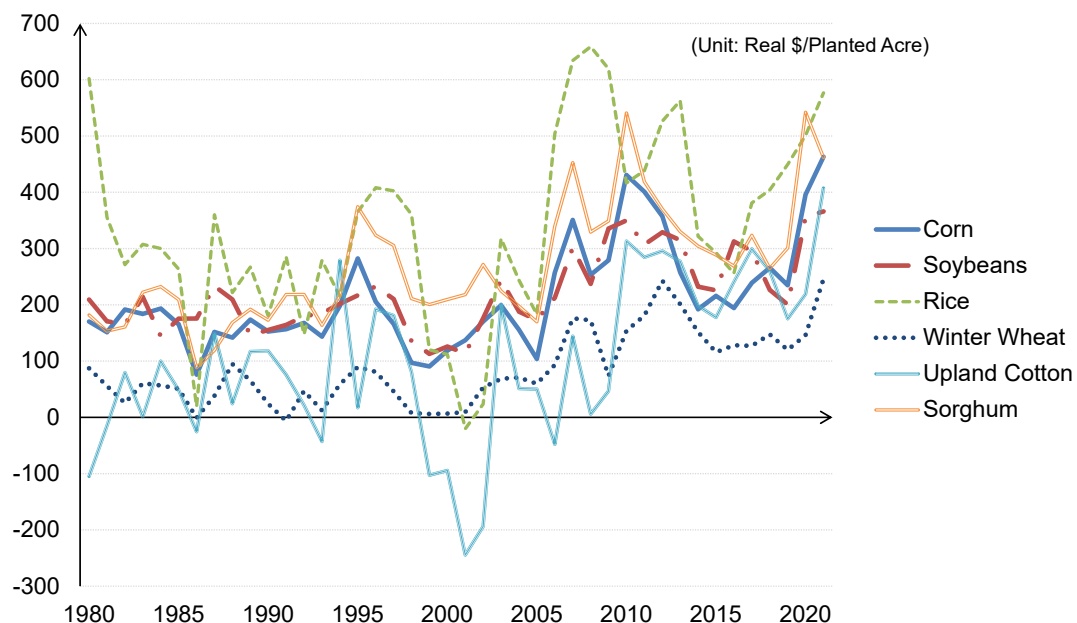
(Unit: Real \$/Planted acre)

VARIABLES	Average in 1980-1989		Average in 1990-2006		Average in 2007-2021	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Oats						
Return	141.4	32.6	133.8	35.4	187.2	45.8
Cost	64.0	1.3	69.9	4.2	105.7	19.3
Net Return	77.4	32.7	63.9	34.6	81.5	50.0
No. of Counties	1,901		1,580		668	
Sorghum						
Return	286.7	74.1	355.3	118.2	543.8	174.4
Cost	99.3	5.9	121.2	16.9	137.2	17.2
Net Return	187.4	75.7	234.2	110.8	406.5	169.1
No. of Counties	493		886		371	
Barley						
Return	266.7	67.3	217.9	84.4	290.3	113.2
Cost	107.0	2.6	118.1	24.3	131.4	28.9
Net Return	159.7	67.9	99.8	77.3	158.9	100.1
No. of Counties	44		339		225	

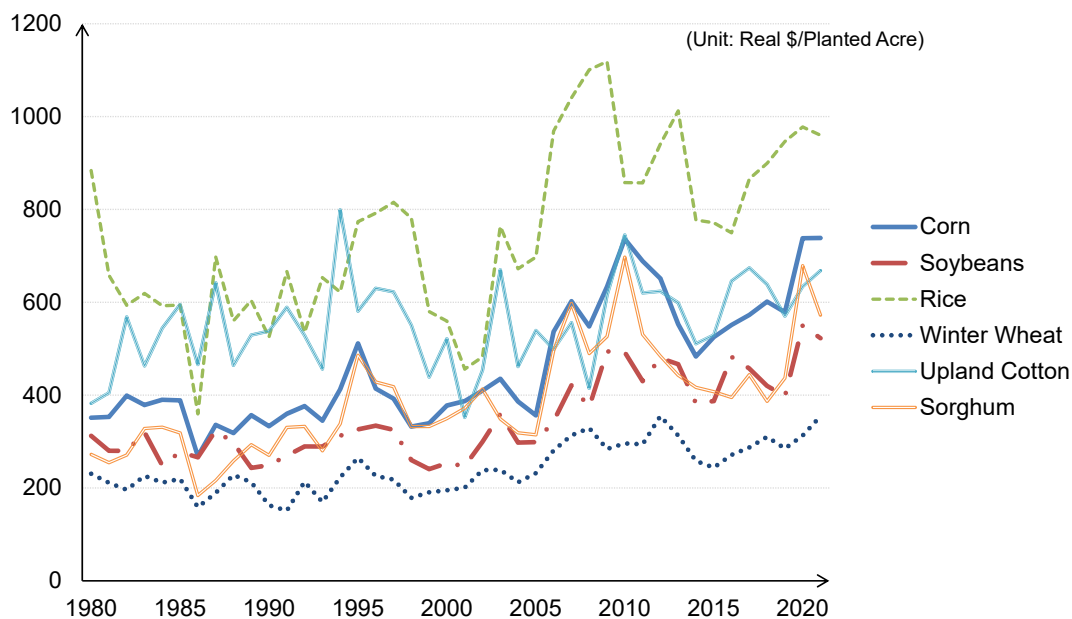


Spatial and Temporal Patterns of Net Returns

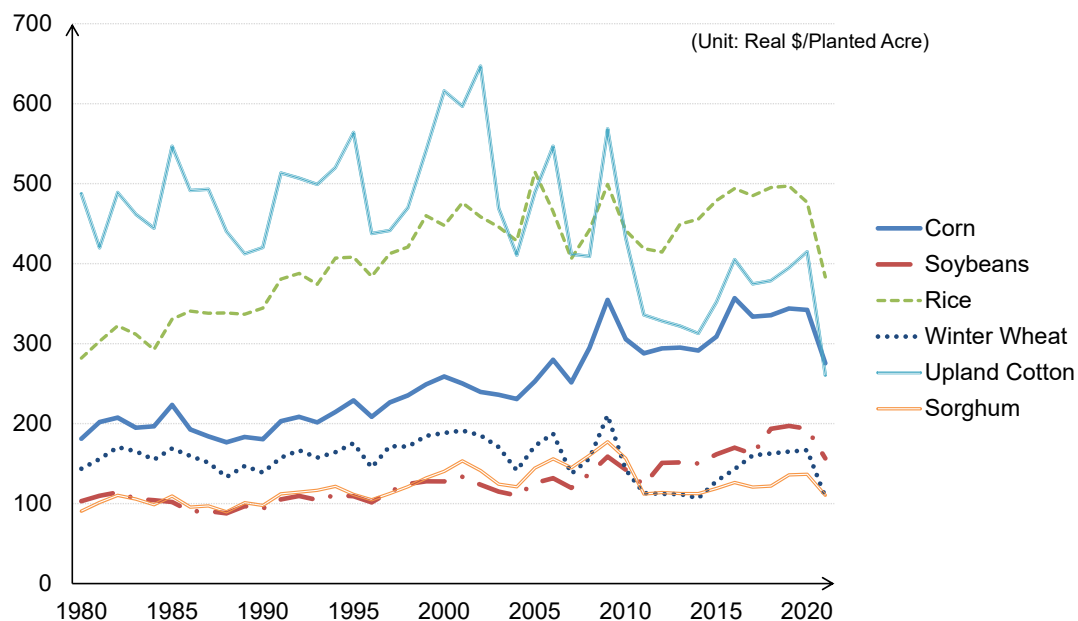
U.S. National Average Net Return by Crops



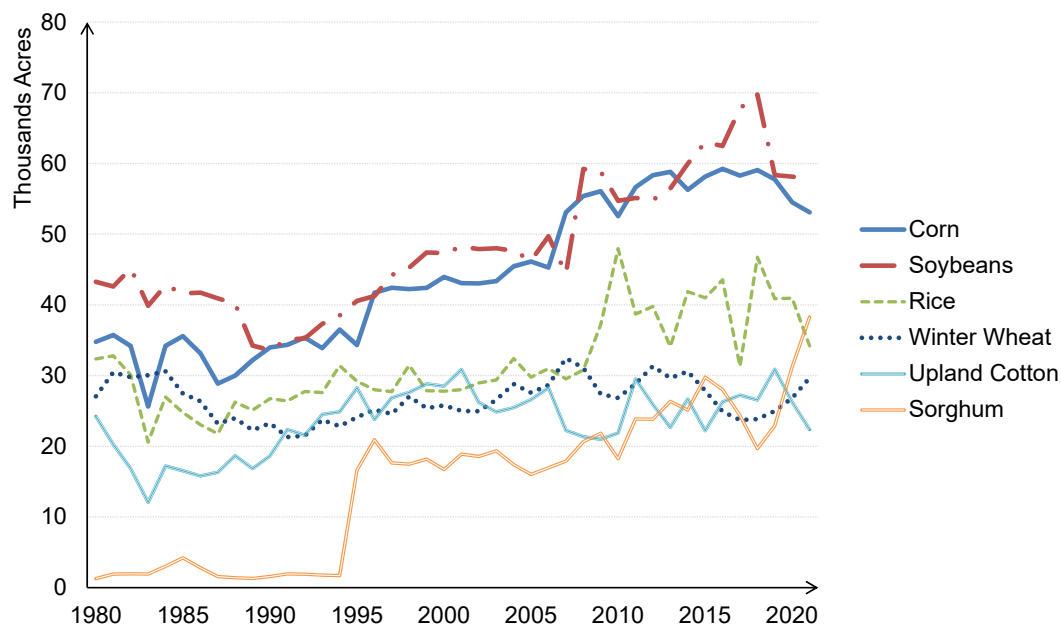
U.S. National Average Return by Crops



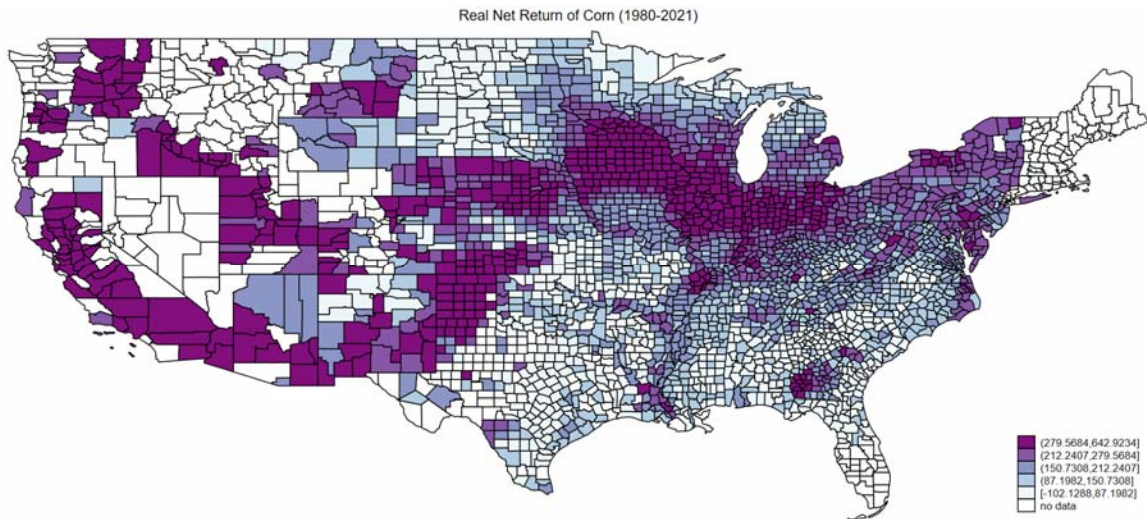
U.S. National Average Cost by Crops



U.S. National Average Planted Acres by Crops

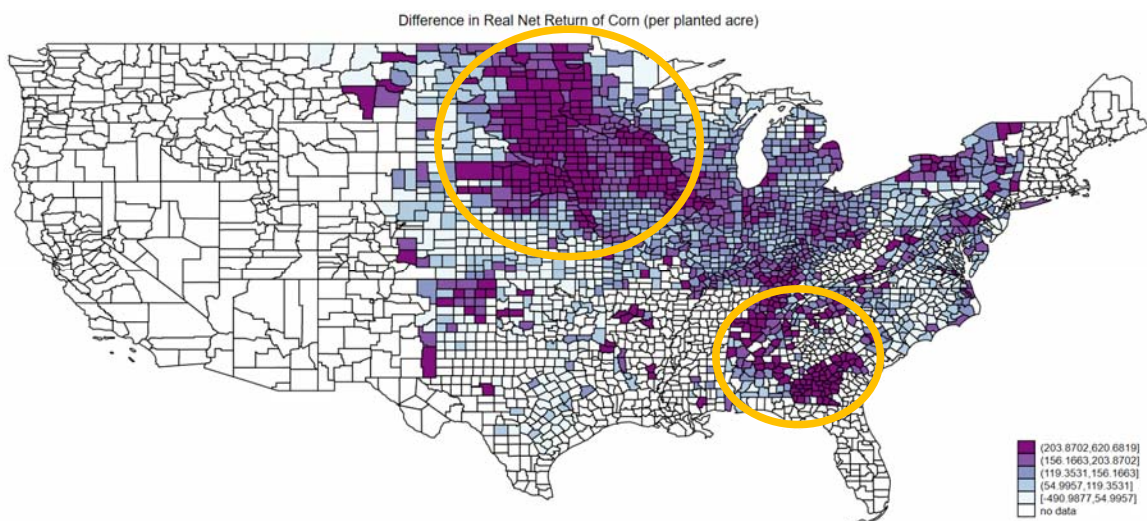


Overall Average of Net Return of Corn (per planted acre)



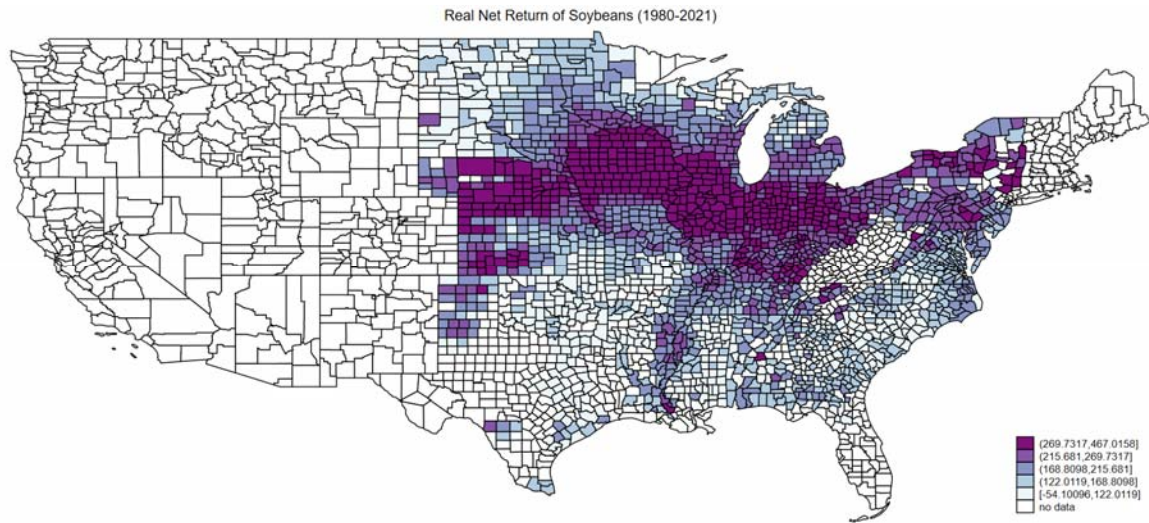
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Difference in Net Return of Corn (per planted acre) 1980 – 1994 vs 2007 - 2021



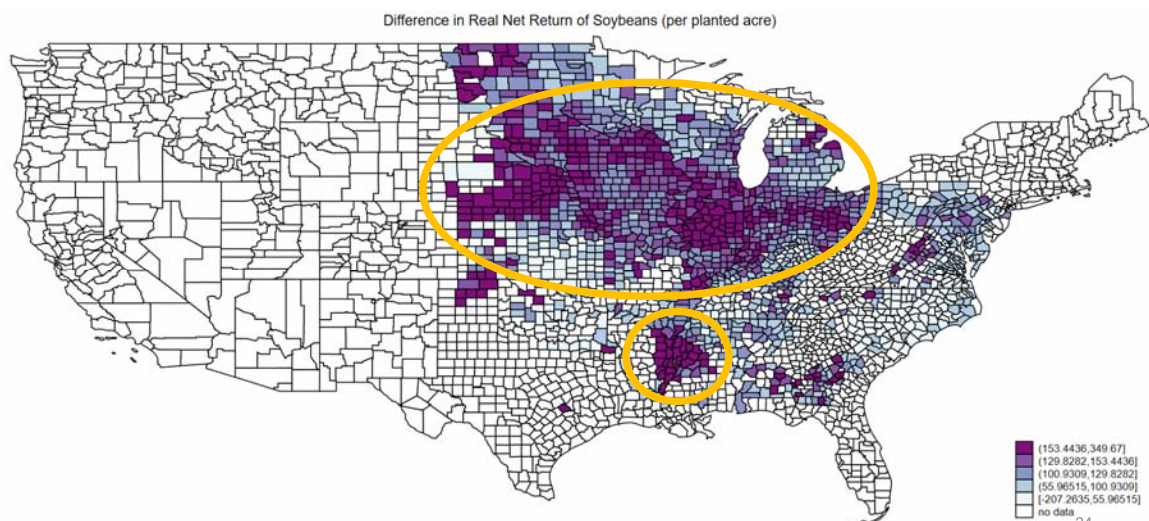
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Overall Average of Net Return of Soybeans (per planted acre)



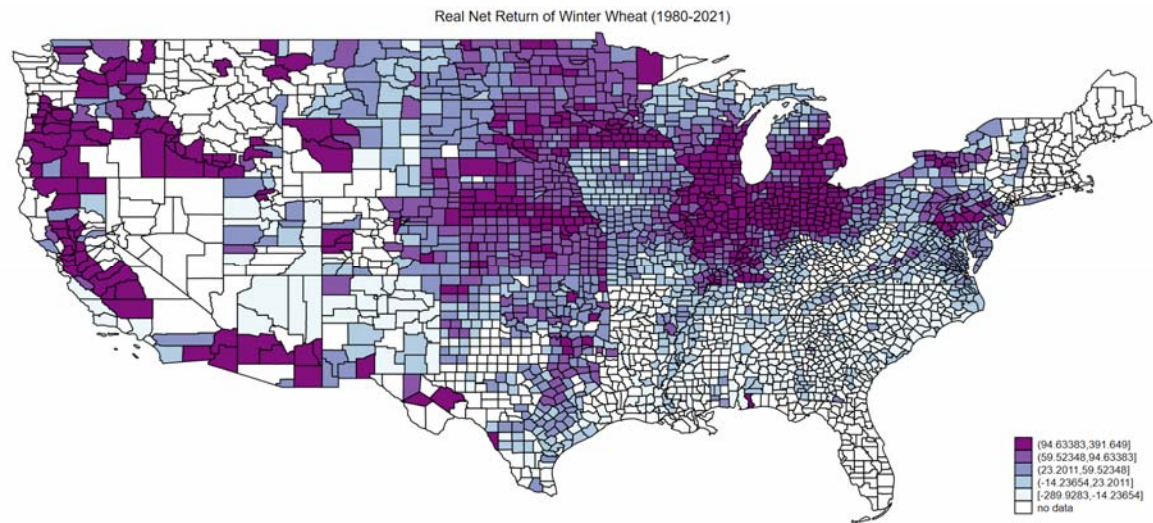
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Difference in Net Return of Soybeans (per planted acre) 1980 – 1994 vs 2007 - 2021



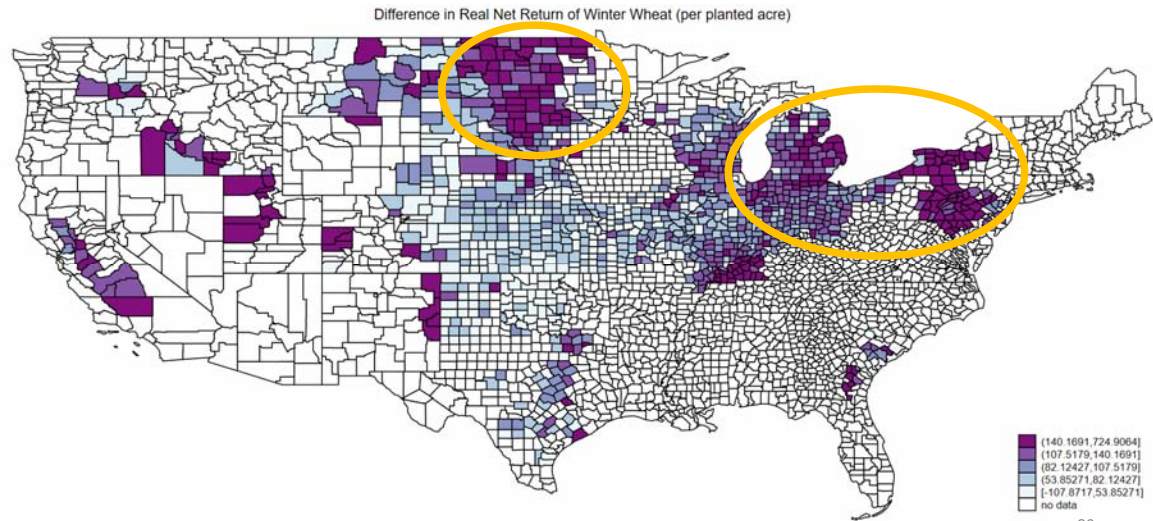
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Overall Average of Net Return of Winter Wheat (per planted acre)



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**Difference in Net Return of Winter Wheat (per planted acre)
1980 – 1996 vs 2007 - 2021**

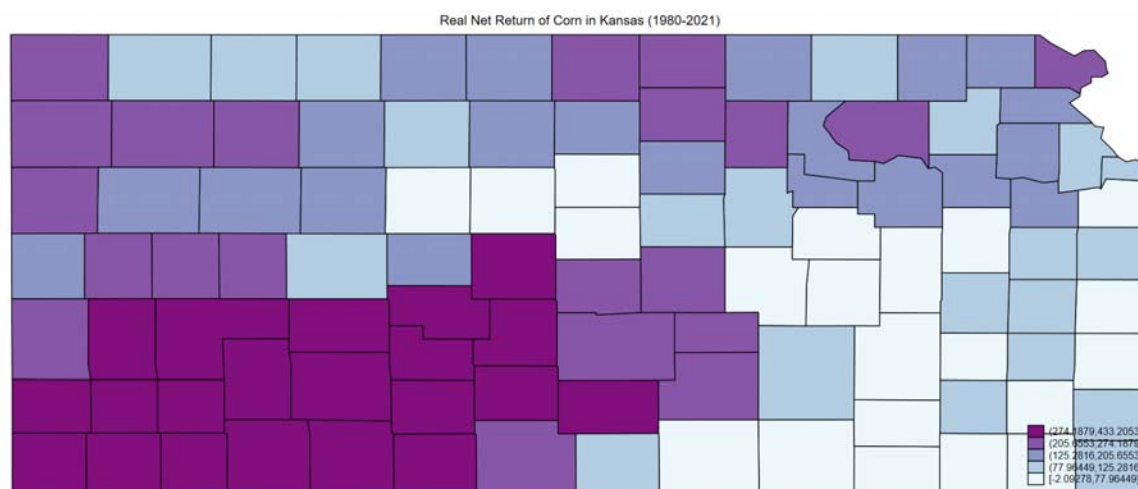


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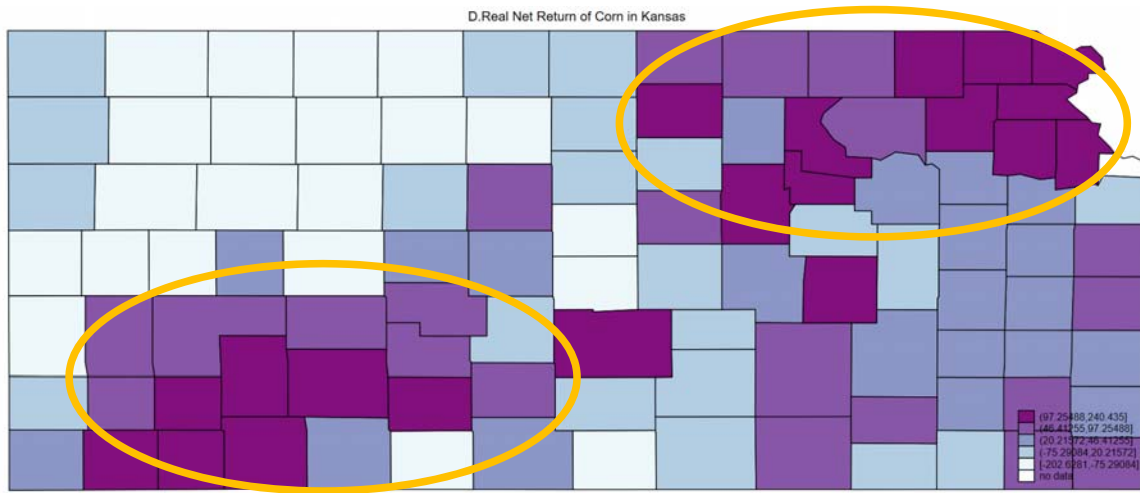
Summary of the Observations: U.S.

- Corn and soybeans became more profitable
 - Mostly corn belt states
 - For corn, Dakotas/Nebraska and Alabama/Georgia
 - Southern Seaboard typically experienced the highest prices in 2012
 - Irrigation in the Southern Seaboard (1996–2010) accessed to relatively low-cost groundwater (Schaible and Aillery, 2012).
 - For soybeans, Nebraska and Arkansas/Mississippi
- Winter wheat has been slow in terms of profitability growth
 - Dakotas, Michigan, New York and Pennsylvania

Overall Average of Net Return of Corn in Kansas

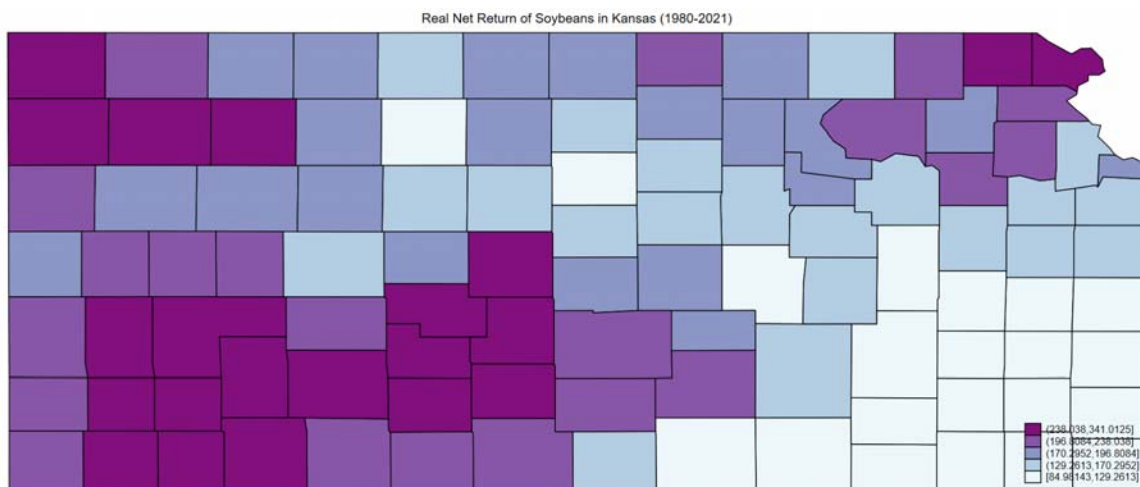


Difference in Net Return of Corn (per planted acre) 1980 – 1994 vs 2007 - 2021



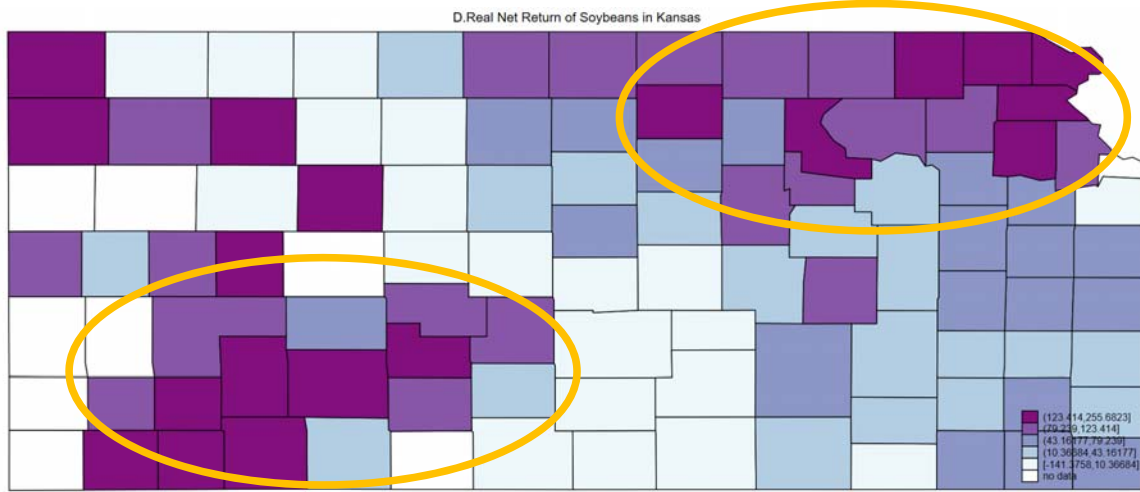
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Overall Average of Net Return of Soybeans in Kansas



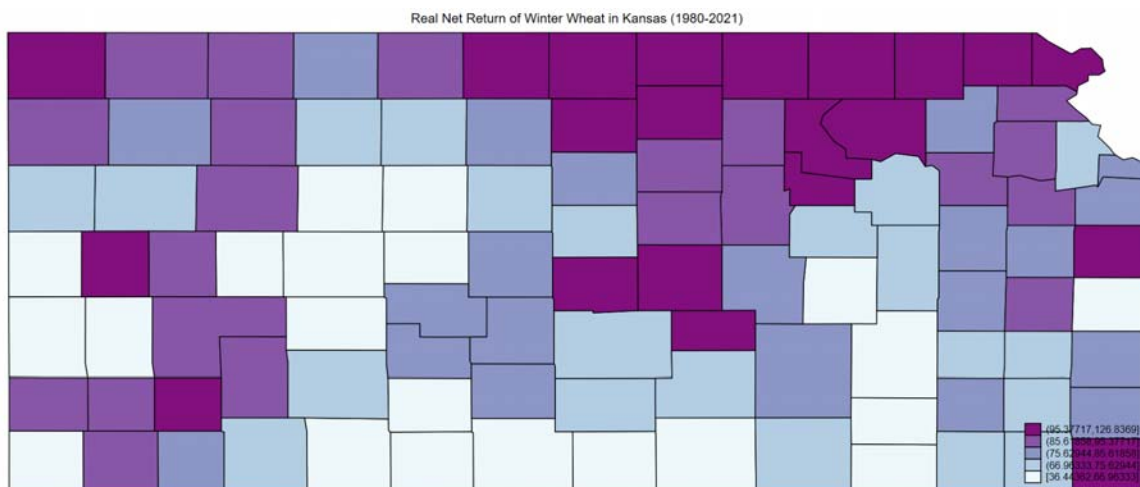
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Difference in Net Return of Soybeans (per planted acre) 1980 – 1994 vs 2007 - 2021



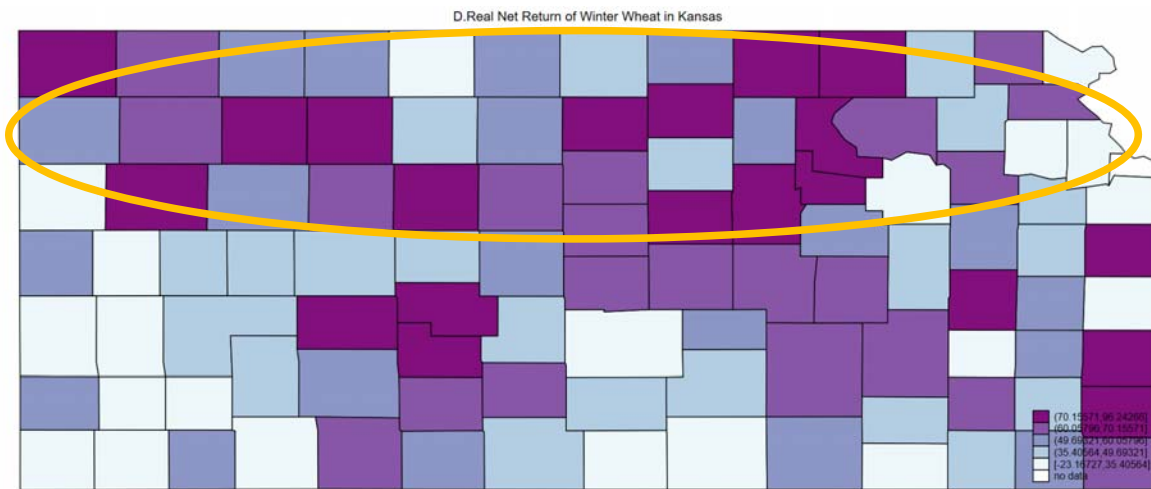
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Overall Average of Net Return of Winter Wheat in Kansas



32

Difference in Net Return of Winter Wheat (per planted acre) 1980 – 1996 vs 2007 – 2021



33

Summary of the Observations: Kansas

- Corn
 - North Eastern Kansas counties: Higher yields for non-irrigated corn
 - South Western Kansas counties: Higher yields with irrigation
 - Note that irrigation costs are not in the calculation
- Soybeans: Similar Patterns as Corn
- Winter Wheat: Mostly northern areas



Concluding Remarks



Concluding Remarks

- This is a preliminary work based on data compiling and visualization exercises.
- We visualize where and which crops have been growing in terms of “net return”.
- We are missing many other cost variables – irrigation, rental rates, and labor.
- Where do we go from? Any suggestions?