

Local Agricultural Market Responses to Biofuel Demand: A Fine-Resolution Equilibrium Model Approach

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Abstract

The U.S. agricultural landscape has undergone significant changes over the past few decades alongside the evolution of biofuel mandates. While the corn-based ethanol mandate and production have stabilized, biomass-based diesel, particularly, soybean-based diesel, has recently increased substantially. To meet this growing demand, soybean processing facilities have expanded, notably, into the Northern and Western U.S. in addition to the traditional Heartland. Such geographic evolution has implications for rural economies, as proximity to crop processing plants can increase the local crop prices, expand cropland, and boost employment. Empirical studies have well documented these local responses in the past. Simulation-based studies, by contrast, have focused more on the national-level trends in land use changes and associated environmental impacts. However, the former often lack consideration of national or global economy or counterfactual conditions, such as new soybean crushing plant siting. The latter often ignore the location-specific crop demand from biofuel sectors. This study leverages the fine-resolution partial equilibrium model, SIMPLE-G, to bridge these two groups of studies by incorporating agricultural production and crop demand at granular spatial scales, thus capturing heterogeneous responses in key outcomes, such as land use, crop production and land rents. Preliminary experiments compare a soybean-based biofuel mandate shock without location-specificity, as commonly presented in simulation-based studies, with scenarios that allocate demand increases to farm resource regions, more in the spirit of empirical studies. Across all scenarios, both cropland expansion and crop switching are observed. In the national-level demand shock scenario, land use and allocation changes occur across broader regions, though the Heartland accounts for about half of cropland expansion. When all demand increases are imposed on the Heartland, cropland expansion is smallest, at around 2 million acres, and is instead complemented by the greatest degree of crop switching, accounting for approximately 34% of soybean land expansion. When demand is assigned more heavily to the Northern Great Plains, conversion of pastureland to cropland is greater, with approximately 1 million more acres converted relative to the other two scenarios. The results demonstrate the framework's ability to incorporate region-specific crop demand changes and capture local market responses. The study will be further improved by more realistically modeling the actual locations of processing facilities and their potential evolution, producing implications for rural economies, environmental impacts, and the nuanced spatial assessment needed for policymakers to establish ecologically sound targets and safeguards for the expanding U.S. biofuel portfolio.

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1. Introduction

Biofuel demand in the U.S. has increased steadily over the last two decades, fundamentally transforming the agricultural landscape. The Renewable Fuel Standard (RFS), established by the Energy Policy Act of 2005 and expanded by the Energy Independence and Security Act (EISA) of 2007, mandated an increase in biofuel to 36 billion gallons annually by 2022. While the early years of the RFS were dominated by corn-based ethanol, which currently comprises at least 10% of nearly every gallon of gasoline sold in the U.S., the policy discussion is increasingly shifting toward biomass-based diesel and sustainable aviation fuel (SAF) (Lade & Smith, 2025). Driven by federal mandates and state-level incentives like California's Low Carbon Fuel Standard (LCFS), production of soybean-based fuels—including biodiesel and renewable diesel—is expected to rise steadily (Hubbs & Irwin, 2025; Lade & Smith, 2025; Miao et al., 2025).

Concurrently, the infrastructure supporting these fuels is undergoing a notable geographic evolution. Historically, concentrated in the Heartland, soybean processing facilities are now expanding into the northern and western reaches of the U.S (see Appendix Figure 5). For example, North Dakota's capacity to process its own soybean production recently surged from 6% to 47% (Gerlt, 2025). This expansion has profound implications for local agricultural economies. Proximity to a processing plant reduces transportation costs and typically increases the local prices received by farmers, which is supported by recent empirical evidence (Behnke & Fortenbery, 2011; McNew & Griffith, 2005; Miao et al., 2025; Motamed et al., 2016; Wu et al., 2025).

Despite the importance of these local market signals, a significant gap remains in the literature regarding the spatial heterogeneity of biofuel-induced land use change (LUC). The impacts of policy-driven ethanol demand on crop prices and land use are well-documented. Studies show that the expansion of the ethanol industry led to substantial conversion of non-cropland, particularly grasslands and land enrolled in the Conservation Reserve Program (CRP), into active cultivation as well as corn land expansion (L. Chen et al., 2021; X. Chen & Khanna, 2018; Lark et al., 2022; Li et al., 2019; Mosnier et

al., 2013; Motamed et al., 2016; Wright et al., 2017). However, the impacts of the more recent surge in biodiesel and renewable diesel demand remain relatively underexplored (Miao et al., 2025; W. Wang & Khanna, 2023).

Existing simulation studies, whether using computable general equilibrium (CGE) or partial equilibrium (PE) frameworks, are conducted to study the impacts of soybean-based biofuel growth at the national or global scale (R. Chen et al., 2018; W. Wang & Khanna, 2023; Zhao et al., 2021). These models often utilize relatively coarse spatial resolutions (such as agro-ecological zones or crop reporting districts) and, though their crop production systems are represented in detail, omit local impacts associated with the specific placement of processing facilities that demand feedstocks. Because farmers' land use decisions are driven by local profitability and proximity to terminal markets, aggregate models may overlook critical regional hotspots of land use change or fail to capture the intensive-margin responses (such as crop switching from corn-soy rotations) triggered by new facility entries (Li et al., 2019; Y. Wang et al., 2020).

This study addresses these limitations by utilizing the SIMPLE-G framework, a fine-resolution partial equilibrium model (Baldos et al., 2020; Haqiqi & Hertel, 2025). By incorporating the geographic locations of ethanol refineries and soybean crushing plants, this research investigates how evolving biofuel demands and processing infrastructure dictate the spatial distribution of U.S. crop production and land use. This approach allows for a nuanced assessment of how shifting facilities away from the Heartland may alter rural economies across the U.S. and potentially environmental outcomes at a scale relevant to both local stakeholders and national policymakers.

2. Method

2.1. Model: SIMPLE-G-US

To capture the spatial heterogeneity of the biofuel landscape, this study adopts the fine-resolution (5 arcminute; over 100,000 grid cells for the contiguous U.S.) partial equilibrium model, the Gridded

Simplified International Model of agricultural Prices, Land use, and the Environment (SIMPLE-G) (Baldos et al., 2020; Haqiqi & Hertel, 2025). This paper extends the original SIMPLE-G by disaggregating the crop composite into multiple crop varieties, including corn and soybeans, and by incorporating the existing and potential locations of crop processing facilities into this geospatial model. In the model, the U.S. is only gridded and the rest is aggregated into 15 regions.¹ To improve the model, key model parameters, such as elasticities governing land conversion between cropland and non-cropland and land allocations among crops, are calibrated at the county level using a bilevel optimization approach based on the changes in key agricultural outcomes, including land use and allocation, between 2017 and 2022.

2.2. Data

Major datasets used for model updates include the USDA NASS Cropland Data Layer for land use, the IFPRI Spatial Production Allocation Model for crop production, USDA ERS data for crop-specific input costs and final uses, and the GTAP database for commodity trade. The spatial distribution of ethanol plants is sourced from the U.S. EIA (2025) and Limb et al. (2024). Due to the lack of publicly available information on the locations and capacities of soybean crushing plants, their locations are approximated using multiple sources, including the American Soybean Association (Gerlt, 2025), National Oilseed Processors,² Soybean Meal Info Center,³ Wu et al. (2025), and Miao et al. (2025). Maps of ethanol plants and soybean crush plants, recovered from these sources, are drawn in the Appendix Figures 5 and 6 .

¹ Eastern Europe, North Africa, Sub-Saharan Africa, South America, Brazil, Australia + New Zealand, European Union + Britain, South Asia, Central America + Caribbean, South Africa, Southeast Asia, Canada, China, Middle East, Japan + Korea, Central Asia.

² National Oilseed Processors Association <https://www.nopa.org/about-us/nopa-plant-locations/>

³ Soybean Meal Info Center <https://www.soymeal.org/processors/>

2.3. Scenarios

Based on our baseline year, circa 2017, we conduct a preliminary experiment following the U.S. EIA Annual Energy Outlook 2026 reference case⁴ by simulating a 50% increase in soybean-based diesel production. We assume that biodiesel and renewable diesel are not distinguished and that the same quantity of fuel is generated from a given soybean input, although approximately 7.5 pounds of feedstock are required to produce one gallon of biodiesel and around 8 pounds to produce one gallon of renewable diesel.⁵

The first experiment, consistent with other PE/GE studies (R. Chen et al., 2018; W. Wang & Khanna, 2023; Zhao et al., 2021), assumes that the biofuel demand shock is imposed at the national level. Under this scenario, farmers across the U.S. simultaneously respond by adjusting production, while minimizing costs. The second analysis explores the case in which all new soybean crush facilities supplying soybean oil to soybean-based diesel refiners are located in the Heartland and therefore draw feedstock only from this region. The final scenario splits feedstock demand between two Farm Resource Regions, the Heartland and the Northern Great Plains, to reflect the recent trend of soybean crushing plants expanding westward and northward.

It should be noted that the results only account for the changes in biofuel feedstock demand and do not consider technological change, other policies such as land conservation programs, or the impacts of tariff changes and wars.

3. Results

The results highlight how the impacts of national and region-specific demand shocks differ. The analysis focuses on changes in crop production, land use, and land rents across regions.

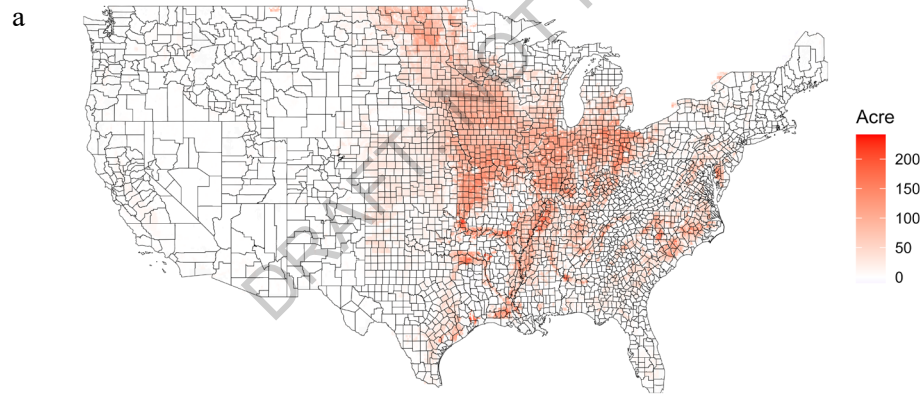
⁴ <https://www.eia.gov/outlooks/aeo/>

⁵ Gerverni, M., T. Hubbs and S. Irwin. "Biodiesel and Renewable Diesel: What's the Difference?" *farmdoc daily* (13):22, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, February 8, 2023. <https://farmdocdaily.illinois.edu/2023/02/biodiesel-and-renewable-diesel-whats-the-difference.html>

3.1. Scenario 1: National-level Demand Shocks

A 50% increase in soybean biofuel demand across the U.S. results in a 2.3-million-acre expansion of total U.S. cropland (Figure 1a), almost all of which converted from pastureland (99%) (Appendix Table 1). Soybean acreage increases by slightly more, 2.6 million acres, highlighting the role of crop switching (e.g., from continuous corn to corn-soy rotation or other crops to soybean). Approximately half of this soybean expansion occurs in the Heartland region (Figure 1b,c). The remainder is distributed across other regions, including the Mississippi River Portal (12%) and the Southern Seaboard (9%).

Cropland rents increase most in the Heartland, by 1.9%, compared with a national average increase of 0.9%, suggesting moderate regional variation. The results indicate that even without region-specific processing plant locations, the Heartland, as a major player in the soybean market, is particularly sensitive to shifts in the composition of biofuel demand. Overall, the first analysis demonstrates the framework's ability to capture the spatial distribution of biofuel policy impacts to generate region-specific insights.



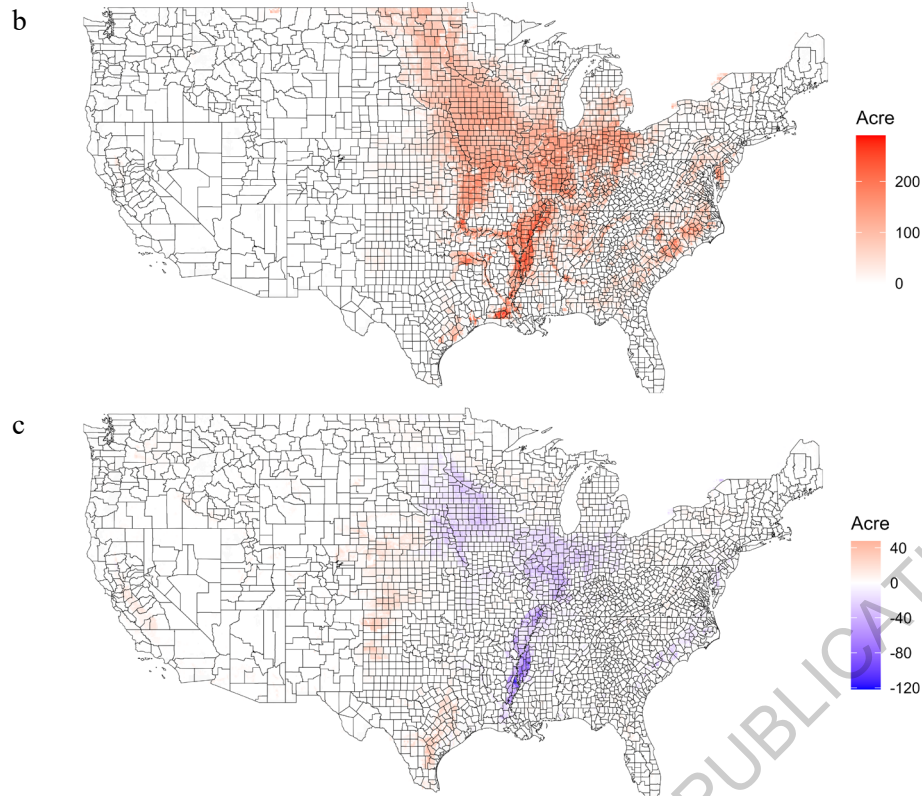


Figure 1 Scenario 1 results. (a) cropland acreage change; (b) soybean land acreage change; (c) corn land acreage change.

3.2. Region-specific Demand Shocks

3.2.1. Scenario 2: Only from Heartland

The second experiment assumes that the Heartland region supplies the increase in biofuel feedstock demand. By incorporating such region-specific biofuel sector demand for crops, this scenario allows the model to explore more nuanced and policy-relevant questions, including how relocating processing facilities away from the Heartland to other locations could alter agricultural outcomes (e.g., cropland expansion) as well as rural economic impacts.

A 50% increase in soybean biofuel demand supplied solely by the Heartland results in a 2-million-acre expansion of total U.S. cropland. More than 2.2 million acres of pastureland are converted to cropland. Total forestland increases by around 200 thousand acres nationally, although the Heartland loses forest

acreage. This suggests that while forestland supplying timber declines in the Heartland, forestland expands in the rest of the U.S., partly through the conversion of grazing land.

The Heartland accounts for most of the cropland expansion, with 1.6 million acres, or 77% of the total increase. Other regions experience small but notable market-mediated effects, with cropland expanding by 173 thousand acres in the Prairie Gateway and by 68 thousand acres in the Northern Great Plains.

Within the Heartland, soybean land expands by approximately 2 million acres, while acreage for other crops declines. Corn experiences the largest reduction, losing 320 thousand acres. Most of the land for soybean expansion comes from the conversion of grazing land, at 1.3 million acres, along with 240 thousand acres of forestland. As in the first scenario, soybean acreage increases more than total cropland, highlighting the role of both land-use change and crop switching. Compared with the national demand shock scenario, however, crop switching plays a relatively larger role. In the first experiment, crop switching accounts for 26% of the soybean land increase, whereas in the second experiment it accounts for 34% (the third scenario falls between these two cases, at 30%). These results suggest that when a large amount of feedstock demand is concentrated in a region with more limited land-use change due to already a high share of cropland as in the Heartland, additional demand is met increasingly through crop switching.

Outside the Heartland, soybean production declines as land shifts toward other crops. Corn acreage expands by 220 thousand acres nationally outside the Heartland, with the largest increase occurring in the Prairie Gateway, which accounts for 34% of this expansion, followed by the Northern Crescent at 17%. Meanwhile, the Heartland loses 320 thousand acres of cornland. This pattern suggests a potential redistribution of corn production outside the Corn Belt as the Heartland shifts more strongly toward soybean production. Cropland rents increase only in the Heartland, rising by 3.5%. This increase drives the national average cropland rent upward by 0.8%, while the rest of the United States experiences modest declines.

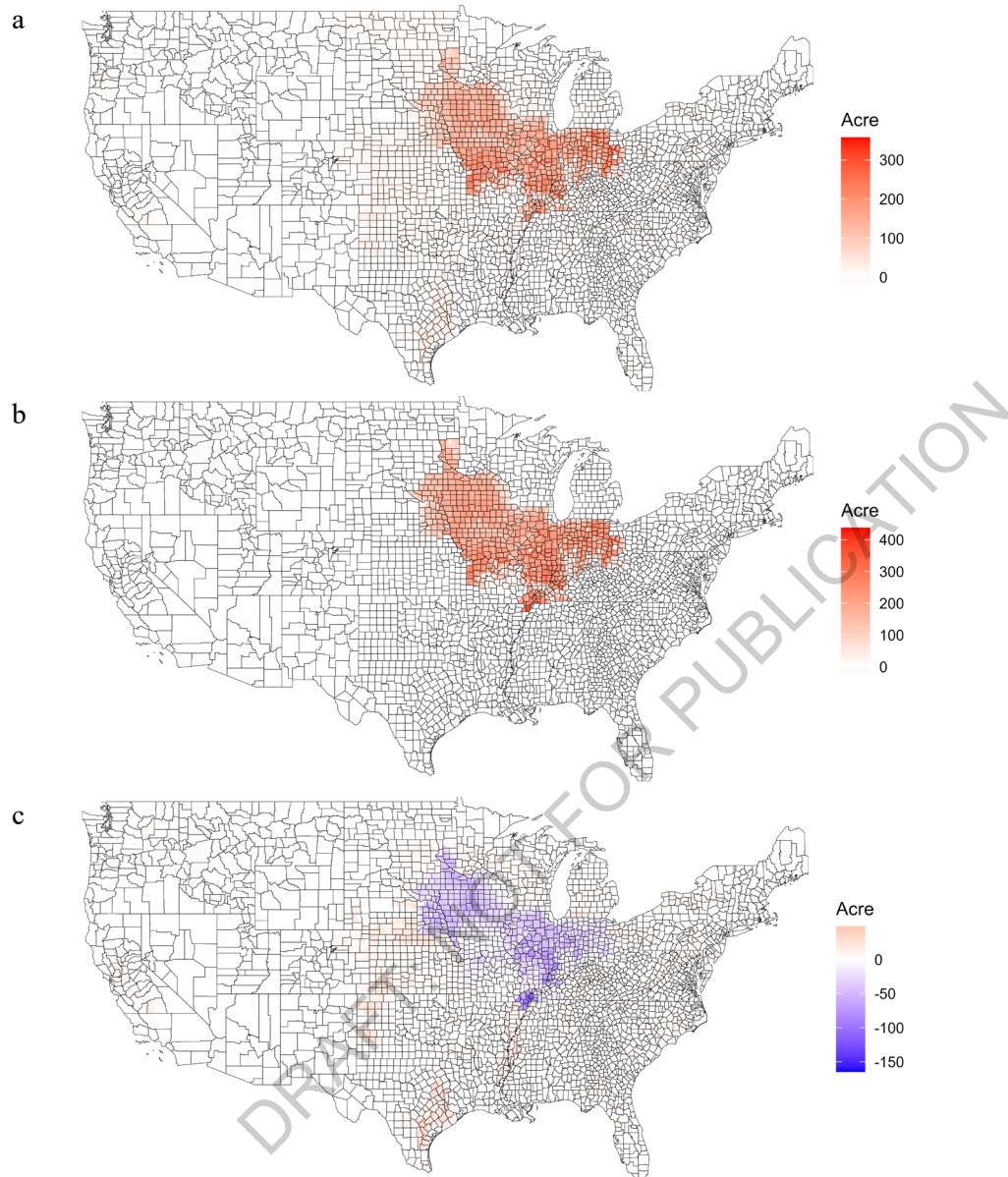


Figure 2 Scenario 2 results. (a) cropland acreage change; (b) soybean land acreage change; (c) corn land acreage change.

3.2.2. Scenario 3: Distributed between Heartland and Northern Great Plains

This scenario examines a 50% increase in soybean biofuel demand supplied equally by the Heartland and the Northern Great Plains, reflecting the current trend of new processing facilities moving westward and northward. The results show striking differences across key outcomes.

First, this experiment results in a 3.4-million-acre expansion of total U.S. cropland, the largest increase among the three scenarios. More than 3.2 million acres of grazing land and 250 thousand acres of forestland are converted to cropland. This differs from the scenario in which the demand increase is imposed solely on the Heartland, where forestland increases nationally. Cropland expansion is concentrated in the Northern Great Plains, which gains 2.5 million acres, or 75% of the total increase, followed by the Heartland, which gains 0.7 million acres, or 21%. In both regions, approximately 85% of new cropland comes from pastureland, while the remainder comes from forestland.

Soybean acreage expands by more than total cropland in both regions: by 943 thousand acres in the Heartland and by 2.8 million acres in the Northern Great Plains. However, the sources of soybean expansion differ. In the Heartland, conversion from corn and other cropland to soybean land accounts for 23% of soybean acreage expansion, whereas in the Northern Great Plains, crop switching accounts for only 9%. This indicates that the Northern Great Plains experiences more conversion from non-cropland to cropland when exposed to region-specific demand shocks.

This pattern is consistent with the other experiments and highlights differences in baseline land conditions and regional capacity for cropland expansion. In the Heartland, cropland already accounts for 64% of total available agricultural land, whereas in the Northern Great Plains it accounts for only 35%. As a result, the Northern Great Plains has more room for cropland expansion, while the Heartland relies more heavily on crop switching. Thus, although soybean acreage expansion in the Northern Great Plains is nearly three times greater than in the Heartland, the amount of other cropland switching to soybeans is similar across the two regions. Spatially, soybean acreage expansion is concentrated mainly in North Dakota and South Dakota, along with parts of Minnesota that fall within the Northern Great Plains.

Land rent outcomes also show a striking regional difference. Cropland rents increase by approximately 20% in the Northern Great Plains, compared with only 1.5% in the Heartland, while rents in the remaining regions do not increase.

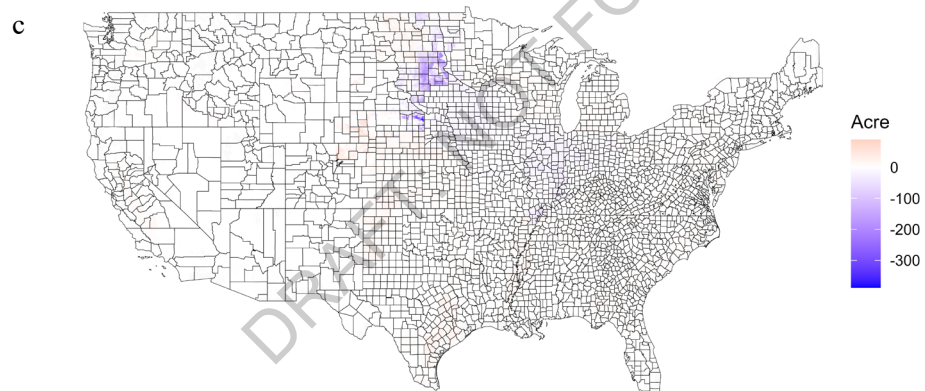
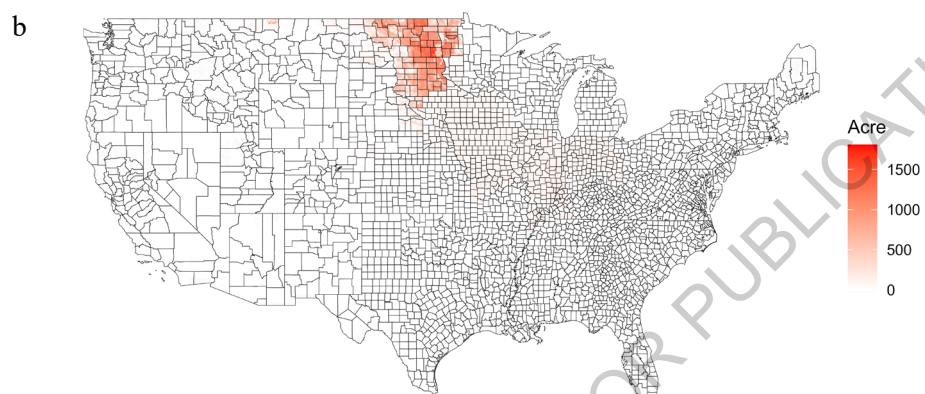
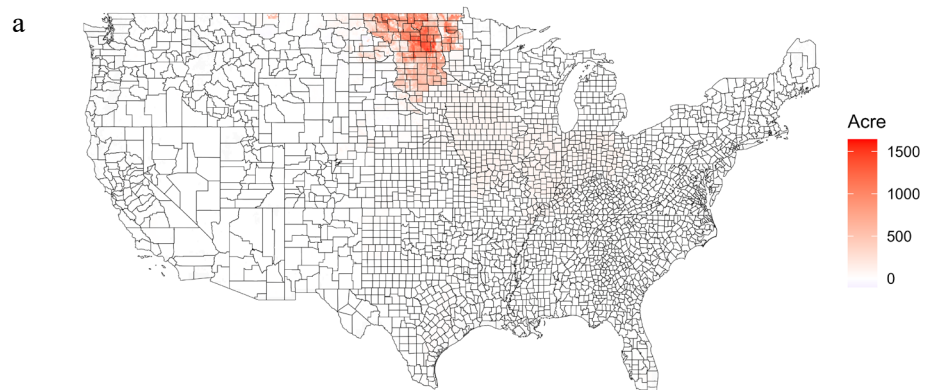


Figure 3 Scenario 3 results. (a) cropland acreage change; (b) soybean land acreage change; (c) corn land acreage change.

4. Discussion

The results demonstrate that the spatial allocation of soybean-based biofuel demand strongly shapes agricultural land-use responses, crop allocation, and regional land rents. While all three scenarios produce increases in soybean acreage and total cropland, the magnitude and location of these changes differ substantially depending on whether demand is imposed nationally or assigned to specific regions. This highlights the importance of incorporating location-specific biofuel feedstock demand into assessments of potential biofuel policy impacts. A national demand shock captures broad market-mediated responses, but it may obscure the more concentrated local impacts that occur when processing facilities are located in specific production regions.

A central finding is that region-specific demand shocks generate distinct patterns of cropland expansion and crop switching. When the demand shock is imposed at the national level, cropland expansion and soybean acreage increases are distributed across multiple regions, although the Heartland remains the dominant contributor. When the same demand increase is concentrated in the Heartland, total cropland expansion is smaller, and a larger share of soybean expansion occurs through crop switching rather than conversion of non-cropland. In contrast, when demand is split between the Heartland and the Northern Great Plains, total cropland expansion is largest, driven primarily by conversion of grazing land in the Northern Great Plains. This difference reflects baseline land availability: the Heartland already has a high share of land in crop production, whereas the Northern Great Plains has more land available for conversion from pasture or grazing uses.

These findings have important implications for environmental assessment. Biofuel policies are often evaluated in terms of their impacts on direct land-use change, indirect land-use change, and associated greenhouse gas emissions. The results suggest that the environmental consequences of soybean-based biofuel expansion depend not only on the total level of feedstock demand changes, but also on where that demand occurs. Concentrating demand in regions with limited scope for cropland expansion may induce more crop switching, whereas locating demand in regions with more available pastureland may lead to

greater extensive-margin expansion. This distinction matters for carbon sequestration, nitrogen leaching, water quality, water quantity, and biodiversity outcomes. For example, conversion of grazing land and forestland to cropland may release previously stored carbon and could create new environmental hotspots, particularly if expansion occurs in areas more vulnerable to erosion, nutrient runoff, or water stress.

The results also speak to the design and effectiveness of land conservation policies, such as CRP. If new soybean crushing or biofuel processing facilities increase local feedstock demand and raise land rents nearby, participation incentives in conservation programs may weaken. In regions where cropland rents rise sharply, existing rental payments may no longer be sufficient to keep environmentally sensitive land out of production. This is particularly relevant for the Northern Great Plains scenario, where cropland rents increase by approximately 20%. Such a result suggests that conservation policy may need to be spatially adaptive, with rental rates and safeguards adjusted to reflect local market pressure from biofuel-driven crop demand.

Beyond land-use and environmental outcomes, the scenarios also highlight the uneven rural economic effects of biofuel expansion. Biofuel policy is often justified not only as an energy security policy, but also as a rural development strategy. However, the results suggest that the economic benefits are unlikely to be evenly distributed across all agricultural communities. Instead, gains are likely to accrue more strongly to regions located near soybean crushing facilities and biofuel supply chains. In the Heartland-only scenario, cropland rents increase only in the Heartland, while other regions experience modest declines. In the Heartland–Northern Great Plains scenario, the Northern Great Plains experiences the largest rent increase, indicating that local demand can substantially alter regional land markets.

This has broader implications for farmers' exposure to market volatility. Farmers located near ethanol plants, soybean crushing plants, or renewable diesel feedstock supply chains may be partially shielded from instability in international commodity markets. Local processing demand can absorb production that might otherwise depend more heavily on export markets, potentially supporting a stronger local basis and reducing income losses during trade disruptions. Thus, the siting of processing facilities may influence

not only land-use outcomes but also the resilience of rural economies to trade shocks, tariff changes, and global market instability.

The framework also provides a bridge between empirical studies and simulation-based models. Empirical studies have documented local land-use and price responses near biofuel and crop-processing facilities, while PE and CGE models have typically focused on broader national or global market responses. By incorporating region-specific crop demand into a fine-resolution partial equilibrium model, this study connects these two approaches. The results are also broadly comparable to recent empirical findings on biodiesel-induced land-use change, which report soybean acreage expansion and cropland expansion concentrated in regions where crushing facilities are located (Miao et al., 2025).

At the same time, the results should be interpreted as preliminary. The current experiments isolate the effect of changes in soybean-based biofuel feedstock demand and do not account for technological change, yield improvements, climate-induced shifts in crop suitability, conservation policy adjustments, tariff changes, wars, or changes in the composition of renewable diesel feedstocks. These omissions are important because crop production has already been shifting northward and westward (Cho & McCarl, 2017; Fei et al., 2023), and future climate change may further alter the relative productivity of corn and soybeans across regions. If soybean productivity increases in the Northern Great Plains over time, future biofuel-driven expansion in that region could be even more pronounced. Conversely, conservation constraints, water limitations, or changes in feedstock technology could dampen expansion.

A key next step is to incorporate actual and potential soybean processing facility locations more explicitly. The current region-level scenarios approximate location-specific demand by assigning feedstock demand to Farm Resource Regions, but actual plant siting decisions are more spatially detailed. A more realistic model would allow each facility to source soybeans based on nearby production, transportation costs, processing capacity, and competition with other facilities (Elliott et al., 2014; Sun et al., 2020). This would allow the framework to estimate how new or relocated soybean crushing plants alter local crop prices, land rents, cropland expansion, and crop switching at finer spatial scales.

Overall, the findings suggest a central policy tradeoff. Concentrating soybean-based biofuel feedstock demand in the Heartland may limit total cropland expansion because the region already has extensive cropland and responds more through crop switching. However, this may concentrate economic benefits in an already dominant agricultural region and at the same time, worsen negative environmental consequences. Expanding processing capacity into the Northern Great Plains may distribute rural economic benefits more broadly and support emerging soybean-producing areas, but it may also induce greater conversion of grazing land. Therefore, biofuel policy design should consider not only national production targets, but also the spatial organization of feedstock demand, processing capacity, land availability, and environmental safeguards.

The study demonstrates that fine-resolution, spatially explicit modeling can generate more nuanced insights into the regional consequences of biofuel expansion. By linking biofuel demand, processing facility location, crop production, and land-use change, the framework can help policymakers evaluate where biofuel expansion is most likely to generate rural economic benefits, where it may create environmental risks, and how complementary conservation policies may need to be designed to ensure that the expanding U.S. biofuel portfolio remains economically beneficial and ecologically sound.

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DRAFT: NOT FOR PUBLICATION

Appendix

A. Farm Resource Regions Grouping

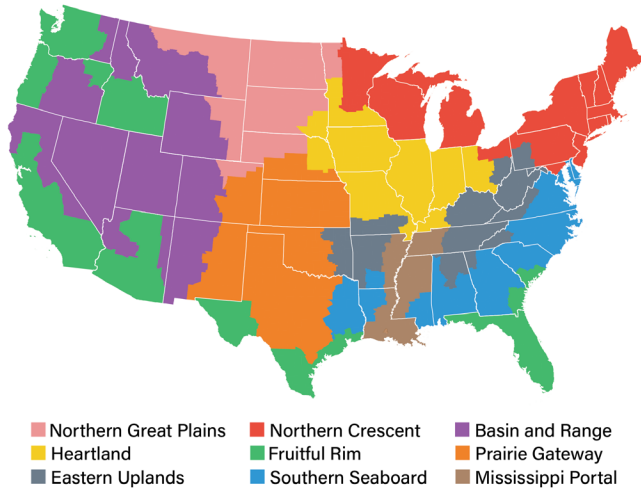


Figure 4 Map of Farm Resource Regions (Source: USDA ERS)

B. Results Summary Table

Table 1 Changes in crop land, grazing land, and forest land

Farm Resource Region	Crop Land (Thousand Acre/Percent)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	952 (0.99 %)	1553 (1.62 %)	728 (0.76 %)
Northern Crescent	199 (0.63 %)	57 (0.18 %)	22 (0.07 %)
Northern Great Plains	245 (0.7 %)	68 (0.2 %)	2548 (7.29 %)
Prairie Gateway	258 (0.42 %)	173 (0.28 %)	75 (0.12 %)
Eastern Uplands	211 (0.8 %)	51 (0.19 %)	12 (0.05 %)
Southern Seaboard	211 (0.63 %)	32 (0.1 %)	2 (0.01 %)
Fruitful Rim	58 (0.16 %)	41 (0.12 %)	20 (0.06 %)
Basin and Range	14 (0.1 %)	17 (0.12 %)	5 (0.03 %)
Mississippi Portal	183 (0.69 %)	27 (0.1 %)	6 (0.02 %)
Farm Resource Region	Grazing Land (Thousand Acre/Percent)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	-829 (-2.06 %)	-1310 (-3.25 %)	-624 (-1.55 %)
Northern Crescent	-216 (-1.03 %)	-114 (-0.54 %)	-58 (-0.27 %)
Northern Great Plains	-257 (-0.44 %)	-117 (-0.2 %)	-2147 (-3.7 %)
Prairie Gateway	-322 (-0.33 %)	-262 (-0.27 %)	-129 (-0.13 %)
Eastern Uplands	-231 (-0.85 %)	-117 (-0.43 %)	-55 (-0.2 %)
Southern Seaboard	-195 (-0.96 %)	-129 (-0.63 %)	-68 (-0.33 %)
Fruitful Rim	-75 (-0.48 %)	-73 (-0.46 %)	-40 (-0.26 %)
Basin and Range	-40 (-0.34 %)	-44 (-0.38 %)	-23 (-0.2 %)
Mississippi Portal	-137 (-1.81 %)	-51 (-0.68 %)	-25 (-0.33 %)
Farm Resource Region	Forest Land (Thousand Acre/Percent)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	-122 (-0.97 %)	-241 (-1.92 %)	-104 (-0.83 %)
Northern Crescent	17 (0.04 %)	56 (0.14 %)	36 (0.09 %)
Northern Great Plains	12 (0.16 %)	48 (0.62 %)	-398 (-5.12 %)
Prairie Gateway	64 (0.43 %)	89 (0.59 %)	54 (0.36 %)
Eastern Uplands	20 (0.09 %)	66 (0.3 %)	42 (0.2 %)
Southern Seaboard	-16 (-0.02 %)	97 (0.14 %)	65 (0.1 %)
Fruitful Rim	17 (0.08 %)	31 (0.14 %)	20 (0.09 %)
Basin and Range	25 (0.28 %)	27 (0.3 %)	18 (0.2 %)
Mississippi Portal	-46 (-0.28 %)	25 (0.15 %)	18 (0.11 %)

Table 2 Changes in land for corn, soybean, and other crops

Farm Resource Region	Corn Land (Thousand Acres)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	-132	-320	-104
Northern Crescent	8	36	33
Northern Great Plains	9	20	-91
Prairie Gateway	50	76	68
Eastern Uplands	4	21	19
Southern Seaboard	-1	22	22
Fruitful Rim	17	20	21
Basin and Range	4	3	4
Mississippi Portal	-40	20	21
Farm Resource Region	Soybean Land (Thousand Acres)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	1198	2075	943
Northern Crescent	204	-6	-16
Northern Great Plains	223	-6	2793
Prairie Gateway	176	-4	-14
Eastern Uplands	225	-4	-16
Southern Seaboard	241	-13	-23
Fruitful Rim	35	-2	-4
Basin and Range	1	0	0
Mississippi Portal	304	-18	-32
Farm Resource Region	Other Crop Land (Thousand Acres)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	-114	-203	-111
Northern Crescent	-16	26	5
Northern Great Plains	7	48	-168
Prairie Gateway	24	93	17
Eastern Uplands	-19	34	9
Southern Seaboard	-32	23	4
Fruitful Rim	2	20	2
Basin and Range	5	9	-1
Mississippi Portal	-82	25	18

Table 3 Changes in corn and soybean production

Farm Resource Region	Soybean Production (%)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	5.27	9.19	4.18
Northern Crescent	5.79	-0.61	-0.8
Northern Great Plains	5.61	-0.59	41.72
Prairie Gateway	5.98	-0.63	-0.82
Eastern Uplands	5.79	-0.57	-0.75
Southern Seaboard	5.81	-0.62	-0.81
Fruitful Rim	6.19	-0.67	-0.88
Basin and Range	6.49	-0.61	-0.76
Mississippi Portal	5.39	-0.59	-0.78

Farm Resource Region	Corn Production (%)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	-0.77	-1.62	-0.58
Northern Crescent	-0.23	0.28	0.34
Northern Great Plains	-0.28	0.3	-7.75
Prairie Gateway	0.1	0.24	0.3
Eastern Uplands	-0.24	0.32	0.39
Southern Seaboard	-0.15	0.28	0.34
Fruitful Rim	0.2	0.19	0.26
Basin and Range	0.26	0.19	0.27
Mississippi Portal	-0.56	0.3	0.37

Table 4 Changes in cropland rents

Farm Resource Region	Cropland Rent (%)		
	Scenario 1	Scenario 2	Scenario 3
Heartland	1.88	3.51	1.54
Northern Crescent	0.66	-0.36	-0.27
Northern Great Plains	0.77	-0.44	20.42
Prairie Gateway	0.13	-0.35	-0.23
Eastern Uplands	0.51	-0.46	-0.35
Southern Seaboard	0.56	-0.24	-0.2
Fruitful Rim	0	-0.06	0
Basin and Range	-0.16	-0.12	-0.16
Mississippi Portal	1.53	-0.25	-0.21

C. Feedstock Processing Plant Locations

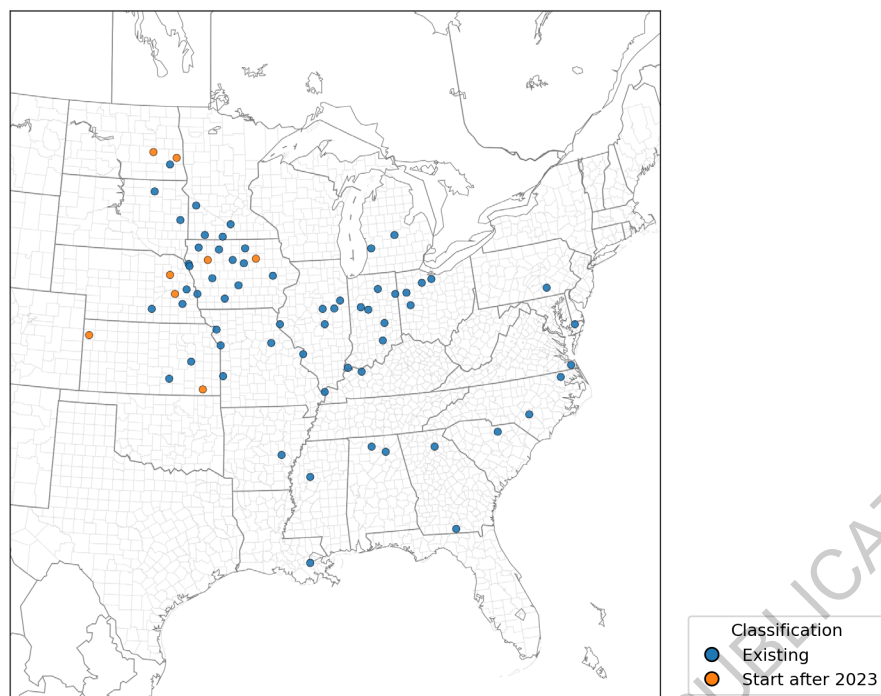


Figure 5 Soybean Processing Plant Locations: Existing vs. Start after 2023

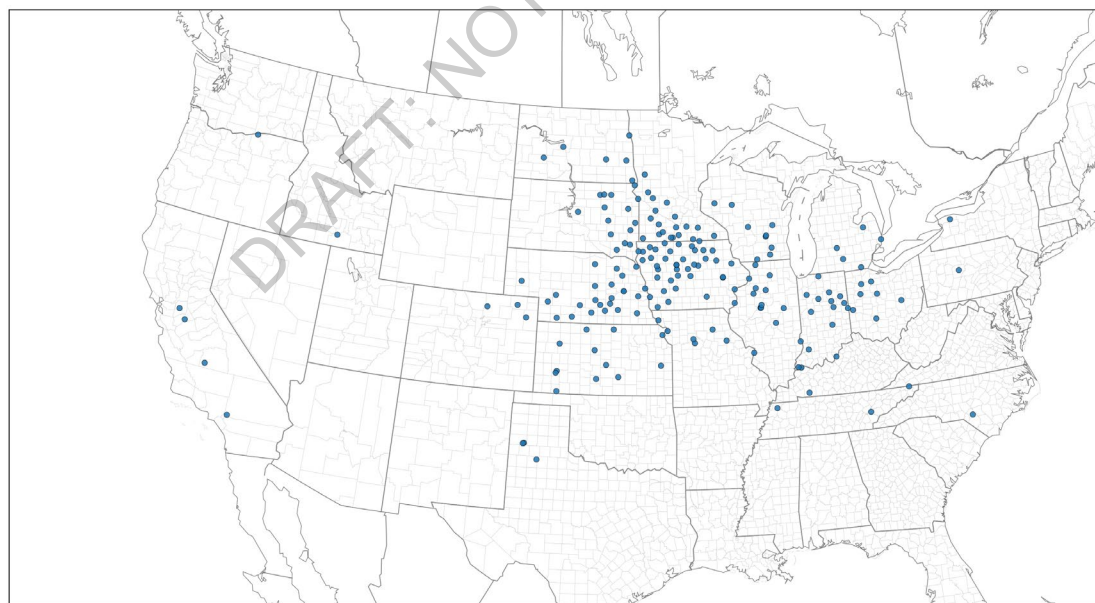


Figure 6 Ethanol Plant Locations