Field to Market®

SOYBEAN: SUSTAINABILITY INDICATORS

Understanding Soybean Trends in Field to Market's 2021 National Indicators Report

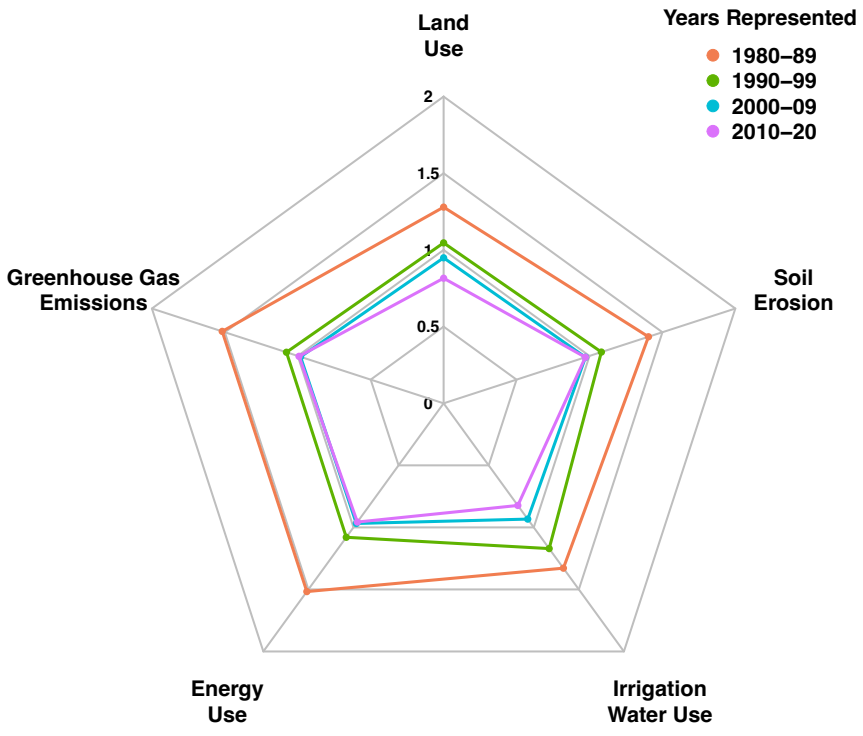
Field to Market's 2021 National Indicators Report – *Environmental Outcomes from On Farm Agricultural Production in the United States* – analyzes sustainability trends from 1980-2020 at the national scale for 11 commodity crops. Released every five years since 2009, the fourth edition of this peer-reviewed report analyzes trends over time in sustainability performance for U.S. commodity crop systems, providing a critical assessment of where U.S. agriculture has made progress in driving improved environmental outcomes, and where additional efforts are needed to advance industry-wide sustainability goals.

Use this factsheet to explore key findings from the report for Soybean, identifying trends in Land Use, Irrigation Water Use, Energy Use, Greenhouse Gas Emissions (GHG) and Soil Erosion. Explore the full findings and learn how to properly cite the 2021 National Indicators Report at www.fieldtomarket.org/Report.

KEY FINDINGS FOR SOYBEANS

Soybeans are widely grown throughout the eastern half of the country, with the greatest production in Iowa, Illinois, Indiana, Missouri, and Minnesota. Over time, a larger share of acreage has shifted farther west into the Dakotas and Nebraska.

This figure illustrates the difference in the average indicator value for each decade and demonstrates clear improvement for soybeans from 1980-2000 with continued improvement in Land Use and Irrigation Water Use through to 2020. The figure also illustrates the plateauing (no change) of Soil Erosion, Energy Use and Greenhouse Gas Emissions in the past two decades. Smaller values, closer to the center of the figure, represent a smaller environmental impact and more sustainable production.



Indicator averages for 1998-2002 used to scale data for display on radar chart

Indicator	Value	Units
Land Use	0.0267	Planted Acres Per Bushel
Irrigation Water Use	0.73	Acre-inches Per Bushel
Soil Erosion	4.78	Tons Soil Loss Per Acre
Energy Use	43,100	BTU Per Bushel
Greenhouse Gas Emissions	8.06	Pounds of CO_2 Eq. Per Bushel

The table below provides the value for each indicator at the beginning of each decade (estimated from a fitted trend line).

Year	Land Use	Irrigation Water Use	Energy Use	Greenhouse Gas Emissions	Soil Erosion
	Planted Acres Per Bushel	Acre Inches Per Bushel	BTU Per Bushel	Pounds of CO_2e Per Bushel	Tons of Soil Loss Per Acre
1980	0.0371	1.0839	72,726	13.6	7.4
1990	0.0303	0.8921	54,184	10.1	5.8
2000	0.0264	0.7436	42,333	8	4.7
2010	0.0236	0.6822	41,464	7.9	4.6
2020	0.0197	0.4194	40,035	7.9	4.8

- Land Use efficiency has consistently improved throughout the study period, indicating improvement in crop yield.
- Irrigation Water Use efficiency for soybeans has improved overall from 1980-2020, with some variation. A consistent improvement trend leading up to 2000 was reversed until the early 2010s, likely a result of significant rainfall deficit across large regions. Since 2010, Irrigation Water Use efficiency has again been improving.
- Energy Use efficiency per bushel of soybeans showed improvement from 1980-2000, with a largely flat trend over the past two decades, indicating the increase in was accompanied by increased use of fertilizers, herbicides and fungicides since 2000.
- Greenhouse Gas Emissions per bushel of soybeans improved substantially between 1980 and 2000 and have since followed a flat trend similar to Energy Use. Due to the slight increase in use of fertilizers containing nitrogen, there has been an increase in nitrous oxide emissions since around 2005.
- Soil erosion for soybeans substantially improved from 1980-2000, with additional slight reduction in the early 2000s. Since 2010, soil erosion has largely held steady for soybeans.

While substantial progress has been made since 1980 in the Land Use and Irrigation Water Use efficiency of soybean production, the National Indicators Report highlights some areas to focus on to encourage and incentivize adoption of conservation practices that will lead to continuous improvement in the Energy Use, Greenhouse Gas Emissions and Soil Erosion associated with soybean production.

Field to Market: The Alliance for Sustainable Agriculture brings together a diverse group of grower organizations; agribusinesses; food, beverage, restaurant, and retail companies; conservation groups; universities; and public sector partners to create opportunities across the agricultural supply chain for continuous improvement in sustainable agriculture. Field to Market offers America's food and agriculture industries an essential tool for unlocking shared value for all stakeholders—a common framework for sustainability measurement that farmers and the supply chain can use to better understand and assess environmental performance. Together, Field to Market and its members work to collectively meet the challenge of producing enough food, feed, fiber and fuel for a rapidly growing population while conserving natural resources and improving the ability of future generations to meet their own needs.

EXPLORE THE FULL REPORT AT
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