Soybeans
From the 2016 Environmental and Socioeconomic Indicators for Measuring Outcomes of On-Farm Agricultural Production in the United States

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 productivity, environmental quality, and human well-being. 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 performance at the field, local, state, and national levels. The group provides collaborative leadership that is engaged in industry-wide dialogue, grounded in science and open to the full range of technology choices.

Field to Market is developing and piloting science and outcomes-based sustainability metrics, and tools at a variety of scales, to help measure and advance continuous improvement. The Field to Market 2016 Environmental and Socioeconomic Indicators Report analyzes sustainability trends over time at the national scale for six crops previously assessed: U.S. corn for grain, cotton, potatoes, rice, soybeans, and wheat, as well as four new crops: barley, corn for silage, peanuts, and sugar beets. Using publicly available data, the report evaluates performance over three decades.

Environmental Results
Over the study period (1980-2015), both total production and planted area of soybeans have increased. Yield improvement, illustrated in the Land Use indicator, has driven improvements in Irrigation Water Use, Energy Use, and Greenhouse Gas Emissions on a per-bushel basis, and these indicators have increased slightly on a per-acre basis. For these indicators as well as Soil Conservation, the improvement trends have plateaued in recent years.

The total change in 2015 when compared to 1980 for U.S. soybeans production were as follows:

- **Production Trends**: Total soybeans production (+120%) and total planted acres (+31%) both increased while crop yields increased (29%).
- **Resource Efficiency**: Soybeans improved (decreased) resource efficiency with decreases in per bushel land use (-40%), irrigation water use (-32%), energy use (-35%), and greenhouse gas emissions (-38%) and declines (improvements) in per acre soil conservation (-47%).
- **Per Acre and Total Resource Impact**: On a per acre basis, land use (+62%), irrigation water use (+5%), energy use (+8%), and greenhouse gas emissions (+4%) all increased for soybeans. Total resource use also increased for irrigation water use (+438%), energy use (+42%), and greenhouse gas emissions (+37%) but total soil conservation improved with a 32% decrease in total soil loss.

Learn more at www.fieldtomarket.org/report
Figure 1. Index of resource use to produce soybeans over time. Data are presented in index form, where the year 2000 = 1 and a 0.1-point change is equal to a 10 percent difference. Index values allow for comparison of change across multiple dimensions with differing units of measure. Year 2000 values are provided in the table.

Figure 2: Percentage change for soybeans in each of the five primary indicators across four equal eight-year periods representing the full time series of this study. Percentage changes are calculated based on the difference between the two end-point years (e.g. percentage change in 2015 as compared to the value in 2007). See the full report for more details on the trends over time.