



Field to Market

Field to Market, The Keystone Alliance for
Sustainable Agriculture





Field to Market Members

- American Farm Bureau Federation
- American Farmland Trust
- American Soybean Association
- Bayer CropScience
- Bunge
- Cargill
- Conservation International
- Conservation Technology Information Center
- Cotton Incorporated
- CropLife America
- CropLife International
- Dairy Management Inc.
- Darden Restaurants
- DuPont
- Environmental Defense Fund
- Fleishman-Hillard
- General Mills
- Grocery Manufacturers of America
- John Deere
- Kellogg Company
- Land O'Lakes
- Manomet Center for Conservation Science
- Mars, Incorporated
- Monsanto Company
- National Association of Conservation Districts
- National Association of Wheat Growers
- National Corn Growers Association
- National Cotton Council of America
- National Potato Council
- Syngenta
- The Fertilizer Institute
- The Irrigation Association
- The Nature Conservancy
- United Soybean Board
- University of Arkansas Division of Agriculture
- University of Wisconsin-Madison College of Agricultural and Life Sciences
- USA Rice Federation
- World Resources Institute
- World Wildlife Fund



Premise

- Agricultural productivity will need to at least double in the next 40 years
- Less land and water will be available for farming
- We will need to meet this goal in a manner that works for farmers, our food and fiber supply, our communities and our environment



Background: Field to Market

- **We are developing outcomes-based metrics**
 - We will measure the environmental, health, and socioeconomic impacts of agriculture first in the United States
 - We are beginning with national scale environmental indicators for corn, soy, wheat, and cotton production in the U.S.
 - The group was convened and is facilitated by **The Keystone Center**, a neutral, non-profit organization founded in 1975 to ensure that present and future generations approach environmental and scientific dilemmas and disagreements creatively and proactively.



Report Overview

- **Criteria for Development**
 - Outcomes based
 - Practice/ technology neutral
 - Transparent and credible science
 - Measures on-farm production outcomes within a grower's control
- **Data and Methods**
 - National scale indicators (US only)
 - Publicly available data (USDA ARMS, NRI, et al)
- **Peer Review Process**
 - Conducted in May 2008 with 17 reviewers
 - Feedback was incorporated into revisions of the current report (a summary of the review is included as an appendix)

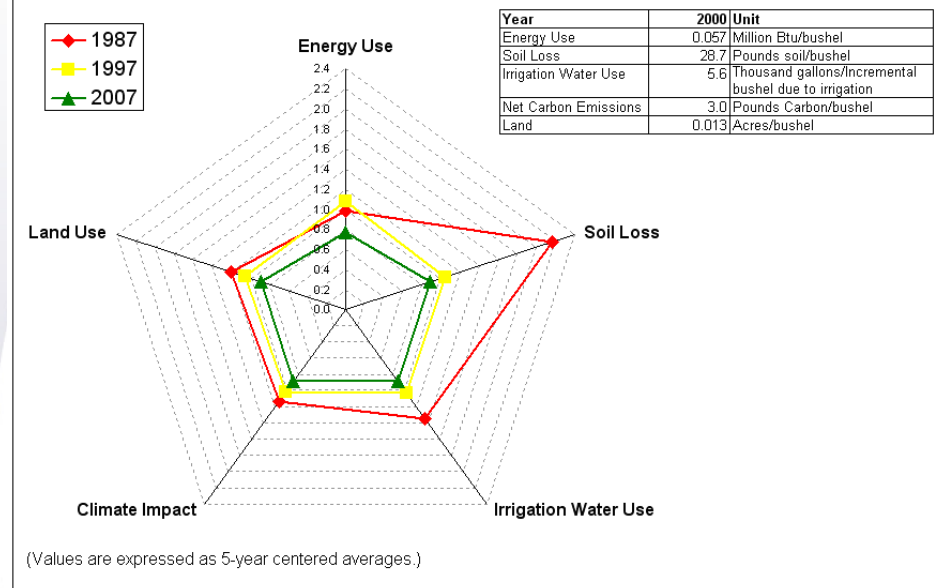


Corn: Summary of Results

Over the study period (1987-2007),

- **Productivity** (yield per acre) has increased 41 percent.
- **Land use** increased 21 percent. Land use per bushel decreased 37 percent.
- **Soil loss** above T has decreased 43 percent per acre and 69 percent per bushel.
- **Irrigation water use** per acre decreased four percent. Water use per bushel has been variable, with an average 27 percent decrease over the study period.
- **Energy use** per acre increased three percent. Energy use per bushel decreased 37 percent.
- **Greenhouse gas emissions** per acre increased eight percent. Emissions per bushel decreased 30 percent.

Corn Efficiency Indicators (Per Unit of Output, Index 2000 = 1)



- **Total annual trends** over this time period indicate increases in total annual energy use (28 percent), water use (17 percent), and greenhouse gas emissions (34 percent). Total annual soil loss has decreased 33 percent

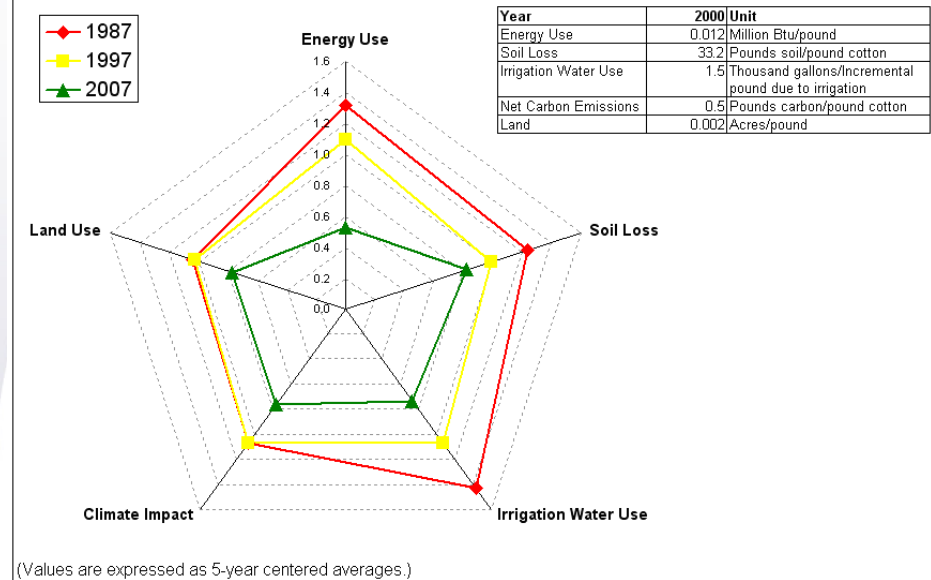


Cotton: Summary of Results

Over the study period (1987-2007),

- **Productivity** (yield per acre) increased 31%, with most improvement occurring in the second half of the study period.
- **Land use** has fluctuated over time, with an overall increase of 19%. Land use per pound produced has decreased 25%.
- **Soil loss** per acre decreased 11% while soil loss per pound decreased 34%.
- **Irrigation water use** per acre decreased 32%, while water use per incremental pound of cotton produced (above that expected without irrigation) decreased by 49%.
- **Energy use** per acre decreased 47% while energy use per pound decreased 66 percent.
- **Greenhouse gas emissions** per acre decreased nine percent while emissions per pound fluctuated, with more recent improvements resulting in a 33% average decrease over the study period.

Cotton Efficiency Indicators (Per Unit of Output, Index 2000 = 1)



- **Total annual trends** over the time period indicate soil loss and climate impact in 2007 are similar to the impact in 1987, with average trends over the study period remaining relatively flat. Total energy use decreased 45 percent and total water use decreased 26 percent.

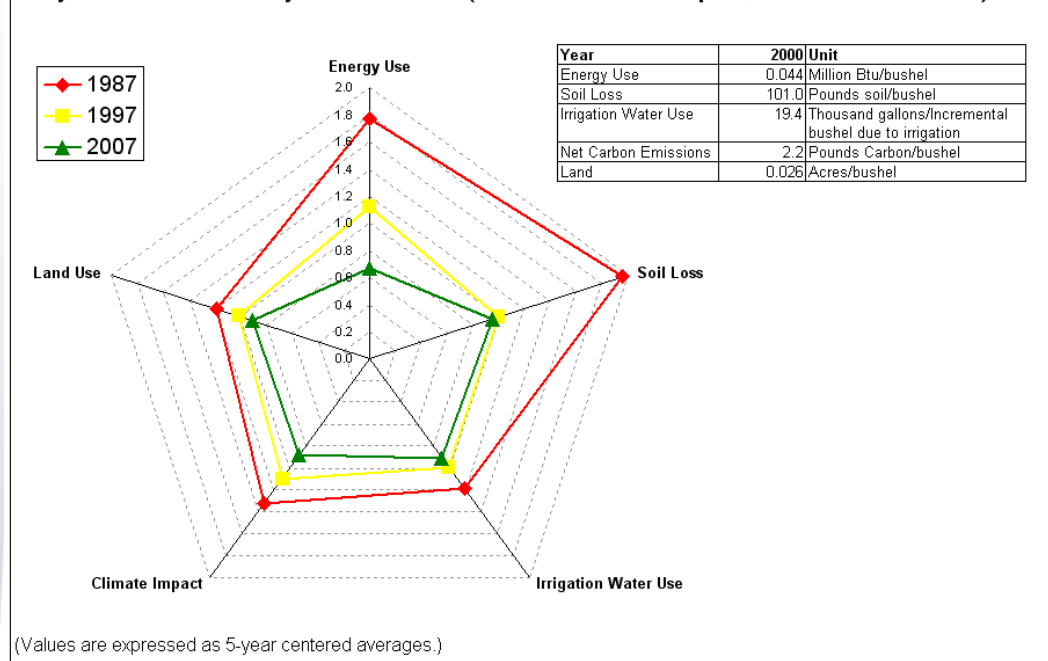


Soybeans: Summary of Results

Over the study period (1987-2007),

- **Productivity** (yield per acre) increased steadily by 29%.
- **Land use** increased in absolute terms and by 31% while land use efficiency per bushel improved by 26%.
- **Soil loss** per acre decreased roughly 31% while soil loss per bushel decreased 49%. These trends coincide with significant changes in farming practices in states that grow the bulk of all soybeans.
- **Irrigation water use** per acre has changed little over time and water use per bushel improved 20%. However, only four to seven percent of the crop utilizes supplemental water.
- **Energy use** per acre has decreased 48% while per bushel energy use decreased 65%.
- **Greenhouse gas emissions** per acre declined 14% and emissions per bushel decreased 38%.

Soybean Efficiency Indicators (Per Unit of Output, Index 2000 = 1)



- **Total annual trends** over this time period indicate soybean production's total energy use decreased 29 percent, total soil loss decreased 11 percent, total irrigation water use increased 39 percent, and climate impact increased 15 percent.

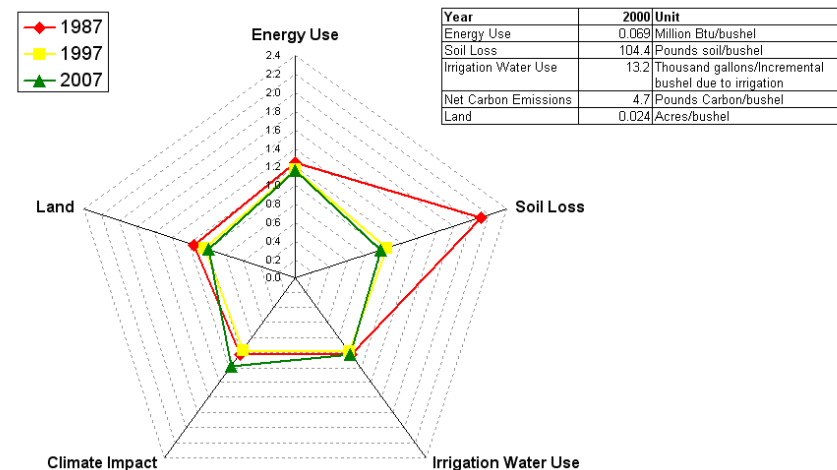


Wheat: Summary of Results

Over the study period (1987-2007),

- **Productivity** (yield per acre) increased by 19%.
- **Land use** decreased 24%. Land use per bushel was variable, with an average overall decrease of 17%.
- **Soil loss** per acre and per bushel improved 39% and 50%, respectively, with most improvements over the first half of the study period.
- **Irrigation water use** per acre increased 17% while water use per bushel produced due to irrigation showed an average flat trend.
- **Energy use** per acre increased 8%. Energy use per bushel decreased 9%.
- **Greenhouse gas emissions** per acre increased 34% and emissions per bushel increased 15%, with a larger increase in the latter half of the study

Wheat Efficiency Indicators (Per Unit of Output, Index 2000 = 1)



(Values are expressed as 5-year centered averages.)

- **Total annual trends** over this time period indicate wheat's total energy use and total irrigation water use were similar in 1987 and 2007, with average trends over the twenty year study period showing an 18 percent decrease in total energy use and an 11 percent decrease in total water use. Total soil loss has decreased 54 percent. Total climate impact has increased an average of five percent over the study period, with a more significant increase over the past decade.



Environmental Indicator Report

Discussion and Conclusions

- **Resource Indicators DO:**

- Describe progress or lack of progress for resource efficiency per unit of output, resource use or impact per acre, and total annual resource use or impact
- Provide context for focusing on specific challenges and regions
- Provide starting points for developing outcomes metrics at other scales, for a variety of technology choices, and a variety of crops

Resource Indicators DO NOT:

- Define a benchmark level for sustainability
- Represent all dimensions of sustainability. We will continue to develop other environmental (including water quality and biodiversity), social, and economic indicators



Fieldprint Calculator

A tool for growers to:

- Calculate individual results on sustainability indicators
- Compare individual results to national, state, and local averages
- Share information on natural resource management practices



Next Steps

- Grower engagement in calculator and resources tool
- Continue work on water quality, biodiversity, and socio-economic indicators
- Explore supply chain mechanisms to support sustainability
- Outreach and partnering with other groups



Questions/Contact Information

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- *Field to Market* Website (includes Fieldprint Calculator and background information)
 - <http://www.fieldtomarket.org>