Field to Market

The Keystone Alliance for Sustainable Agriculture

USDA Agricultural Outlook Forum 2010

February 18, 2010

Sarah Stokes Alexander
The Keystone Center

Field to Market

What is Field to Market?

- A **collaborative stakeholder group** of producers, agribusinesses, food and retail companies, and conservation organizations
- Working together to develop a supply-chain system for agricultural sustainability
- Developing outcomes-based metrics
- Measuring the environmental and socioeconomic impacts of agriculture first in the United States

Field to Market

Vision for Field to Market

Our Goal:

To meet the needs of future generations, promote an economically viable agricultural production system that measurably:

- Reduces pressure on habitat and other land use demands by increasing productivity of affordable, accessible, quality crops on available acres
- Increases the resource use efficiency of energy, water, fertilizer, soil, and other agricultural inputs
- Enhances water quality and other natural resources through thoughtful stewardship
- Contributes to the economic vitality of agricultural communities, and
- Protects the health and safety of our workers and consumers

Our Mission:

To meet the agricultural challenge of the 21st century by providing collaborative leadership that is:

- Transparent
- Grounded in science
- Focused on outcomes
- Open to the full range of technology choices, and
- Committed to creating opportunities across the agricultural supply chain for continuous improvements in productivity, environmental quality, and human well-being

Field to Market

Steering Committee 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
- 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
- Natural Resources Conservation Service (NRCS)
- National Potato Council
- Syngenta
- The Fertilizer Institute
- 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

Field to Market

Field to Market Objectives

- To provide useful measurement tools and resources for growers and the supply chain that track and achieve continuous improvement against key outcomes.
  - First Steps:
    - Environmental Indicators Report
    - Grower Fieldprint Calculator

Field to Market

Environmental Indicator 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**
  - Crop-specific focus on 4 commodities: corn, cotton, soybeans, and wheat
  - Land use, soil loss, water use, energy use, and climate impact (greenhouse gas emissions)
  - National scale indicators (US only)
  - Publicly available data (USDA ARMS, NRI, et al)
- **Peer Review Process**
  - Conducted in May 2008 with 17 reviewers

Field to Market

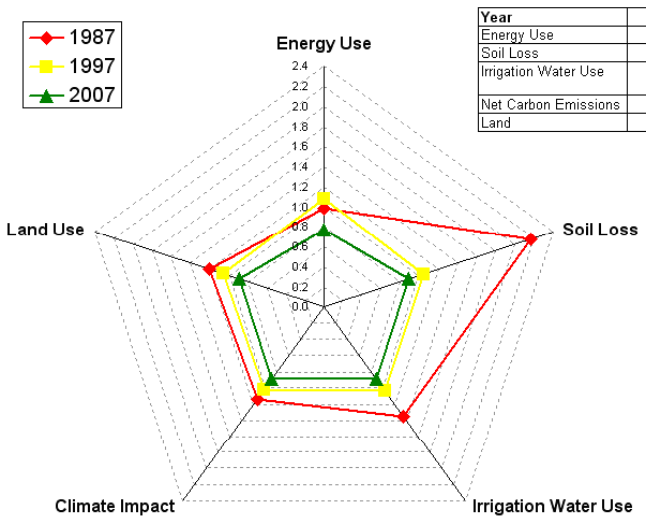
Corn: Summary of Results

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)



Year	2000	Unit
Energy Use	0.057	Million Btu/bushel
Soil Loss	28.7	Pounds soil/bushel
Irrigation Water Use	5.6	Thousand gallons/Incremental bushel due to irrigation
Net Carbon Emissions	3.0	Pounds Carbon/bushel
Land	0.013	Acres/bushel

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

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.

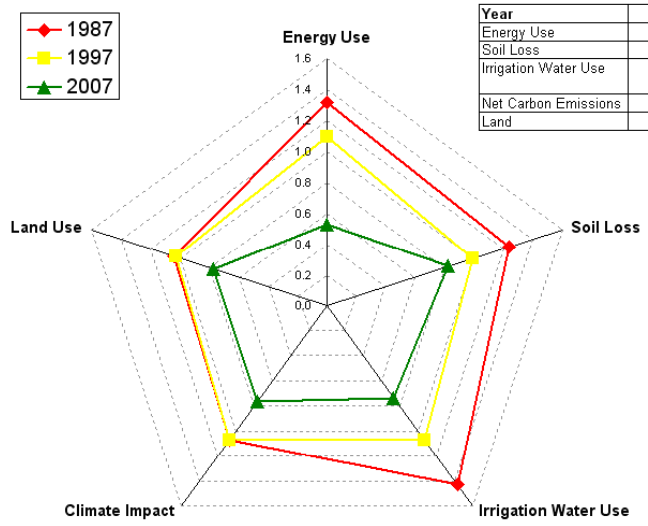
Field to Market

Cotton: Summary of Results

Over the study period (1987-2007),

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

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



Year	2000	Unit
Energy Use	0.012	Million Btu/pound
Soil Loss	33.2	Pounds soil/pound cotton
Irrigation Water Use	1.5	Thousand gallons/Incremental pound due to irrigation
Net Carbon Emissions	0.5	Pounds carbon/pound cotton
Land	0.002	Acres/pound

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

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.

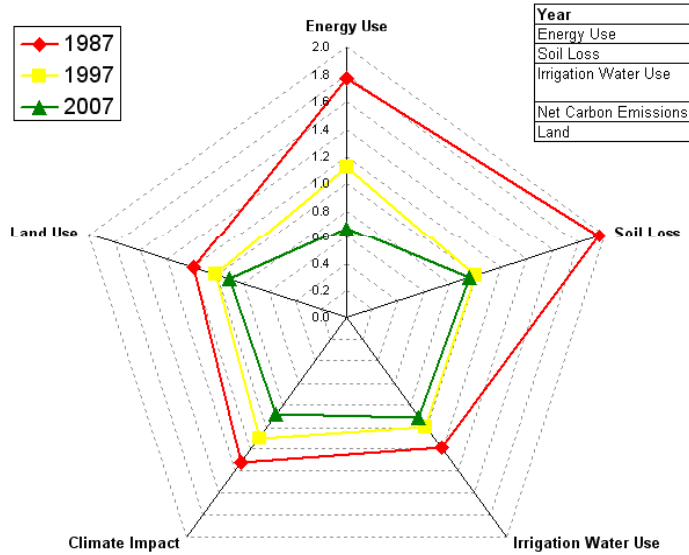
Field to Market

Soybeans: Summary of Results

Over the study period (1987-2007)

- **Productivity** (yield per acre) increased steadily by 29 percent.
- **Land use** increased in absolute terms and by 31 percent while land use efficiency per bushel improved by 26 percent.
- **Soil loss** per acre decreased roughly 31 percent while soil loss per bushel decreased 49 percent. 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 percent. However, only four to seven percent of the crop utilizes supplemental water.
- **Energy use** per acre has decreased 48 percent while per bushel energy use decreased 65 percent. Soybeans have seen the most dramatic shift in inputs used, particularly herbicides and fuel for tillage, enabling per-unit energy requirements to decline substantially over time.
- **Greenhouse gas emissions** per acre declined 14 percent and emissions per bushel decreased 38 percent.

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



Year	2000	Unit
Energy Use	0.044	Million Btu/bushel
Soil Loss	101.0	Pounds soil/bushel
Irrigation Water Use	19.4	Thousand gallons/Incremental bushel due to irrigation
Net Carbon Emissions	2.2	Pounds Carbon/bushel
Land	0.026	Acres/bushel

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

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.

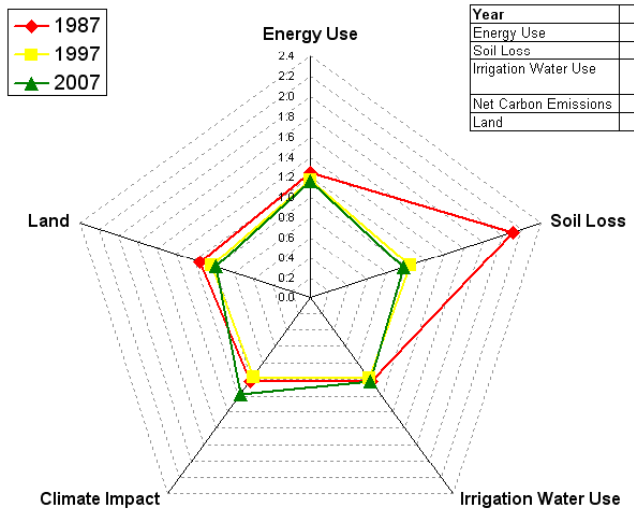
Field to Market

Wheat: Summary of Results

Over the study period (1987-2007)

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

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



Year	2000	Unit
Energy Use	0.069	Million Btu/bushel
Soil Loss	104.4	Pounds soil/bushel
Irrigation Water Use	13.2	Thousand gallons/Incremental bushel due to irrigation
Net Carbon Emissions	4.7	Pounds Carbon/bushel
Land	0.024	Acres/bushel

(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.

Field to Market

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

Field to Market

Fieldprint Calculator

- A free, easy-to-use, educational tool for growers to calculate individual results on natural resource management indicators
  - Allows growers to analyze how some of their choices impact natural resources, production levels, and operational efficiency
  - Helps growers identify areas where they can continue to improve
  - All grower information is confidential
- Pilot stage: currently seeking grower feedback for Version 2.0

Field to Market

Next Steps

- Improved versions of Calculator and increased grower use through pilots
- Continue work on water quality, biodiversity, and socio-economic indicators
- Explore partnerships with existing programs within USDA starting with NRCS
- Explore additional supply chain mechanisms to support sustainability
- Outreach and partnering with other groups

Field to Market

Questions/Contact Information

- Sarah Stokes Alexander, Director, Sustainability and Leadership Programs
  - 970-513-5846; salexander@keystone.org
- Julie Shapiro, Associate
  - 970-513-5830; jshapiro@keystone.org
- *Field to Market* Website (includes Fieldprint Calculator and background information)
  - http://www.fieldtomarket.org

Field to Market