Field to Market: Measuring Agricultural Sustainability

Charles Shapiro, John Hay, Randy Pryor, Rick Koelsch, Tyler Williams & Gary Lesoing
Nebraska Extension

Supported by Nebraska Corn Board

Outcomes:

• Understanding of Field to Market approach to “Sustainability”
• Awareness of Fieldprint Calculator
• Does this have value to you?
Sustainable Agriculture

What is your first reaction to this term?

It isn’t to say that everyone isn’t always trying to do the best that they can, but to think we are doing everything perfect and there is nothing more to learn; well that’s just foolish. So we have to start somewhere……..
“I view sustainability as meeting the needs of the present without compromising the ability of future generations to meet their own needs.”
In this sense, sustainability is not a destination but a process of learning and action (i.e. continuous improvement).

Fred Luckey, former VP Bunge

Our CHALLENGE:
Ag must produce 70% more by 2050:

While Reducing Our Impact:

- 33% of the world’s GHG emissions
- 75% of US N₂O emissions
- 50% of global top soil loss
- 70% of the world’s water use
- 80% of deforestation worldwide
How to Make a Difference - Fertilizer optimization

Levels of Fertilizer Optimization Programs

Level 1: Benchmarking & Plan
Benchmarking performance against local or national level and development a nutrient management plan

Level 2: Plan Evaluation
Basic evaluation and adaptation of nutrient management plan

Level 3: Network
Participation in group/network led by trained agronomic advisor or employ highly specialized professional

Level 4: Network + Soil Health
Participation in group/network led by trained agronomic advisor or employ highly specialized professional – AND – Soil health enhancements
Field to Market Guiding Principles

www.fieldtomarket.org

• Define sustainability for commodity crop production as:
  ✓ Science based
  ✓ Technology neutral
  ✓ Emphasize continuous improvement
  ✓ Emphasize input use efficiency

• Develop measurable metrics
• Ask farmers to estimate individual field sustainability
• Share the farmer’s story with consumers
FIELD TO MARKET
Fieldprint Calculator
2012 SPIDERGRAM

- No-tillage
- Irrigated Corn
- NH3 fertilizer applied in Spring @ 180 lbs/acre
- 5 acre-inches irrigation applied
2014 SPIDERGRAM
-No-tillage
-Irrigated Corn
-130 lbs Actual N as 28% applied with herbicide preplant & 40 lbs actual N with chemigation
-5 acre-inches irrigation applied

2015 SPIDERGRAM
-No-tillage
-Irrigated Corn
-130 lbs Actual N as 28% applied with herbicide preplant & 40 lbs actual N with chemigation
-3 acre-inches irrigation applied
Energy Use in Agriculture

What are the top 3 energy use inputs per bushel raised in irrigated agriculture?

(include imbedded and applied energy)
Water Use Efficiency – More Crop Per Drop

Write down 3 numbers for a corn field:

- 2016 irrigated yield?
- Approximate yield if not irrigated?
- Inches of water applied?

\[
\text{Water Efficiency} = \frac{220 - 120 \text{ bu/ac}}{10 \text{ inches}} = 10 \text{ bu/inch of water}
\]
More Crop Per Drop

Goal for Corn – 12 to 14 bu per acre inch

1. Increasing irrigated crop yield vs dryland yield (do not over or under apply irrigation water).

2. Practices that lead to increasing water efficiency (decreasing amount of water applied without decreasing irrigated crop yield).
Definition of Metrics

- **Land Resource Efficiency** = Planted area per unit of production
- **Soil Erosion Efficiency** = Average soil erosion above T* per unit of production
- **Irrigation Water Use Efficiency** = Quantity of irrigation water applied per unit of production
- **Energy Efficiency** = Total energy used (direct and indirect) per unit of production
- **Climate/Greenhouse Gas Efficiency** = Sum of direct and indirect GHG emissions per unit of production
- **Soil Carbon Sequestration** = Annual average change in soil carbon
- **Water Quality Index** = Under revision
- **Nitrogen Use Efficiency** = lbs. Nitrogen per bushel (Nebraska report only)

---

**NE Extensions Role:**

Apply FTM Principles to Improve Efficiency & Sustainability

1. Engage Nebraska Farm Leadership in discussion of:
   - Is this important to the future of Nebraska’s corn and soybean producers?
   - How can the value to the farmer be enhanced?

2. Is there a role for trusted advisors in applying FTM principles with clientele?

3. Can we create new tools for adding value for farmer?
1. **Today:** Is input use efficiency important to farmers? (water, land, energy)

2. **10 years from now:** Will environmental sustainability define who is in business?
   - Market access?
   - Customer expectations?

3. **Farm management:** Will performance benchmarks be important to keeping farms in business?
Randy Pryor, Extension Educator
University of Nebraska-Lincoln Extension in Saline County  •  306 West 3rd Street, Wilber, NE  68465
Phone (402) 821-2151  •  Fax (402) 821-3398  •  e-mail: randy.pryor@unl.edu

Rick Koelsch
Professor, Department of Biological Systems Engineering & Animal Science
University of Nebraska-Lincoln
216 L. W. Chase Hall, P.O. Box 830726, Lincoln, NE 68583-0726  •  koelschl@unl.edu
402-472-3935  •  402/499 2183 (cell)  •  Zoom Call: https://nebraskaextension.zoom.us/u/15605133177

F. John Hay
Extension Educator - Energy
Department of Biological Systems Engineering
University of Nebraska-Lincoln
250 L. W. Chase Hall, P.O. Box 830726, Lincoln, NE 68583-0726
402-472 0408  •  402-473 0308 (FAX)  •  fhay20@unl.edu
http://bioenergy.unl.edu