Aligning Aquaculture KPI Metrics with other livestock sectors to accelerate industry growth

Marty Matlock, PhD, PE, BCEE
Executive Director, Arkansas Resilience Center
Professor, Biological and Agricultural Engineering
233 Engineering Hall
University of Arkansas
Fayetteville, AR USA 72701

mmatlock@uark.edu

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Aligning Priorities in US Ag

- Provides focus for activities, programs
- Amplifies impacts across indicators
- Creates common language, methods, understanding across sectors
- Expands opportunities for engagement of stakeholders
- Enables sharing of improvement technologies and practices
Strategies for Sustainability Programs

1. Threshold compliance frameworks
   A. Compliance criteria established by an authority (regulatory, market access, etc)
   B. Participants subject to audits for compliance and either pass or fail the criteria

2. Incremental compliance frameworks
   A. Compliance criteria for tiers of performance established by an authority (NGO, market segment)
   B. Participants achieve a ranked certification based on audited performance – silver, gold, platinum or 1-3 stars, etc.

3. Continuous improvement frameworks
   This is the approach we use for most US ag programs
Sustainability System Frameworks

Compliance Certification Approach

KPI Metric

Minimum Acceptable Performance Level (MAPL)

Year


KPI Metric

0 10 20 30 40 50 60 70 80 90 100

Sustainability System Frameworks

Threshold Certification Approach

First Tier Performance Level
Second Tier Performance Level
Third Tier Performance Level
Sustainability System Frameworks

Continuous Improvement Approach

Benchmark Year

Assessment Years

KPI Metric

How to Move the Curve

- No-Till Erosion
- 2010 Soil Erosion

Moving the Curve through targeted BMP adoption

0.10 tons/bushel
No Till Average

0.131 tons/bushel
2010 National Average

Highest Erosion Fields
ANSI/ASABE 629: A Continuous Improvement Framework for Sustainable Agriculture

1. Define
   A. Define Sustainability for the Enterprise
   B. Identify Sustainability Performance Indicators
   C. Select Metrics for PIs

2. Plan
   A. Benchmark SPI Metrics
   B. Set Goals for Each SPI
   C. Develop Strategy to Meet Goals

3. Implement
   A. Implement the Strategy
   B. Measure, Assess and Report Results
   C. Adapt Strategy to Improve Outcomes
Framework of Goals for Continuous Improvement

Aspirational

Strategic

Tactical

Operational

Vision

Management

Planning Horizon

Long

Short

Breadth of Goal
Start at the Beginning

1. Define
   A. Define Sustainability for the Enterprise
   B. Define Key Performance Indicators
   C. Select Metrics for KPIs

2. Plan
   A. Benchmark KPI Metrics
   B. Set Goals for Each KPI
   C. Develop Strategy to Meet Goals

3. Implement
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Criteria for Key Performance Indicators

Key Performance Indicators (KPIs) are things we measure to inform decisions. KPIs should be:

1. Outcomes Based.
2. Science Driven.
3. Technology Neutral.
4. Transparent.
Indicator and Metric Selection

1. Identify the most important indicators
   – Important to producers
   – Important to their customers

2. Select indicators that have established metrics
   – Develop experience with assessment and reporting
   – Create a process that works for everyone

3. When the first phase of indicators are established identify the second phase
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System and Sector Metrics for Indicators in Supply Chains

Crop Production → Animal Production → Animal Processing → Food / Retail Services → Consumer

**Environmental Sustainability Indicators** – Environmental things we want to make better

Examples: Water resources, GHG emissions, Biodiversity, Soil health

**Social Sustainability Indicators** – Social things we want to make better

Examples: Worker health and safety, Community resilience, HS Enrollment

**Economic Sustainability Indicators** – Economic things we want to make better

Examples: Profitability, Access to finance, Access to markets, Available labor
System and Sector Metrics for Indicators in Supply Chains

Crop Production → Animal Production → Animal Processing → Food / Retail Services → Consumer

- Stream Habitat Quality
- Stream Water Quality
- Water Availability / Scarcity
- Water Use Efficiency

Environmental Sustainability Indicator – Water Resources
Next Step: Metric Development

• Identify the measurable elements within each indicator
  – Each sector will identify what is already being measured, what can be measured, and what should be measured

• Common measurements across sectors will be classified as System Metrics

• Metrics that are unique to a sector will be classified as Sector Metrics

• Prioritize System and Sector Metrics for benchmarking
## Top Priority Issues for Each Dimension of Sustainability

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US Ag Sustainability Programs
Adopting the Framework

US Poultry & Egg Association
National Corn Growers Association
National Institute for Animal Agriculture
USSEC
BEEF®
USA Rice Federation
United Soybean Board
American Peanut Council
Pork Checkoff
Cotton Incorporated
Field to Market®
The Alliance for Sustainable Agriculture
Field to Market: The Alliance for Sustainable Agriculture focuses on defining, measuring and advancing the sustainability of food, fiber and fuel production
US Row Crop Environmental KPIs

- Greenhouse Gas Emissions
- Energy Use
- Water Use
- Land Use
- Water Quality
- Nutrient Use Efficiency
- Habitat/Biodiversity
Benchmarking US Soybean KPIs

Index of Per Bushel Resource Impacts to Produce Soybeans
(United States, Year 2000 = 1)

<table>
<thead>
<tr>
<th>Year</th>
<th>2000</th>
<th>Unit - per Bushel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>0.027</td>
<td>Planted Acres</td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>0.131</td>
<td>Tons</td>
</tr>
<tr>
<td>Irrigation Water</td>
<td>0.766</td>
<td>Acre Inches</td>
</tr>
<tr>
<td>Energy</td>
<td>44,840</td>
<td>Btus</td>
</tr>
<tr>
<td>Greenhouse Gases</td>
<td>8.2</td>
<td>Pounds CO₂e</td>
</tr>
</tbody>
</table>

* Five-year average 1996 - 2000

Note: Data are presented in index form, where the year 2000 = 1 and a 0.1 point change is equal to a 10% difference. Index values allow for comparison of change across multiple dimensions with differing units of measure.
U.S. SOYBEAN SUSTAINABILITY ASSURANCE PROTOCOL
A CONTINUOUS IMPROVEMENT PROCESS

Prepared by Marty Matlock, PhD, PE, BCEE
Executive Director, UA Office for Sustainability
Professor of Ecological Engineering
Biological and Agricultural Engineering Department,
University of Arkansas, Fayetteville, AR
mamatlock@uark.edu
## SSAP KPIS BENCHMARKED TO 2000 DATA

<table>
<thead>
<tr>
<th>Key Performance Indicator</th>
<th>Unit of Measure</th>
<th>Value</th>
<th>Metric Type</th>
<th>2010 Data</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Planted acres per bushel</td>
<td>0.027</td>
<td>Efficiency</td>
<td>0.025</td>
<td>7.4</td>
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<tr>
<td>Soil Erosion</td>
<td>Tons per bushel</td>
<td>0.131</td>
<td>Efficiency</td>
<td>0.118</td>
<td>9.9</td>
</tr>
<tr>
<td>Total Soil Erosion</td>
<td>Million tons per year</td>
<td>364.6</td>
<td>Impact</td>
<td>360.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Irrigation Water Use</td>
<td>Acre inches per bushel</td>
<td>0.77</td>
<td>Efficiency</td>
<td>0.60</td>
<td>22.1</td>
</tr>
<tr>
<td>Total Irrigation Water Use</td>
<td>Million acre inches per year</td>
<td>42.2</td>
<td>Impact</td>
<td>58.6</td>
<td>-38.9</td>
</tr>
<tr>
<td>Energy Use</td>
<td>BTUs per bushel</td>
<td>44,840</td>
<td>Efficiency</td>
<td>36,800</td>
<td>17.9</td>
</tr>
<tr>
<td>Total Energy Use</td>
<td>Trillion BTUs per year</td>
<td>116</td>
<td>Impact</td>
<td>113</td>
<td>2.6</td>
</tr>
<tr>
<td>GHG Emissions</td>
<td>Pounds CO$_2$e per bushel</td>
<td>8.2</td>
<td>Efficiency</td>
<td>6.5</td>
<td>20.7</td>
</tr>
<tr>
<td>Total GHG Emissions</td>
<td>Billion Pounds CO$_2$e per year</td>
<td>22.0</td>
<td>Impact</td>
<td>20.0</td>
<td>9.1</td>
</tr>
</tbody>
</table>
U.S. SOY PRODUCERS SUSTAINABILITY GOALS FOR U.S. SOYBEANS BY 2025

<table>
<thead>
<tr>
<th>Key Performance Indicators</th>
<th>Unit of Measure</th>
<th>Total Potential Reduction(^1) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Planted acres per bushel</td>
<td>10</td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>Tons per bushel</td>
<td>25</td>
</tr>
<tr>
<td>Energy Use</td>
<td>BTUs per year</td>
<td>10</td>
</tr>
<tr>
<td>GHG Emissions</td>
<td>Pounds CO2e per year</td>
<td>10</td>
</tr>
</tbody>
</table>

1. Reductions measured against the Year 2000 Benchmark

[www.ussec.org/ssap](http://www.ussec.org/ssap)
Other Animal Protein Strategies

Beef – US Roundtable on Sustainable Beef
Pork – National Pork Board
Poultry – US Poultry and Egg Federation
USRSB approach to indicators development

1. Identified the six most important indicators
   - Important to producers
   - Important to the supply chain and their customers

2. Selected indicators that have established metrics
   - Intention is to develop experience with assessment and reporting with EXISTING metrics, even if they are imperfect
   - Desired outcome is a PROCESS that works for everyone

3. When we have experience and a process for benchmarking what existing metrics, we will prioritize collection of NEXT metrics.
The USRSB Process

1. Define
   A. Define Sustainability for the Enterprise
   B. Define Key Performance Indicators
   C. Select Metrics for KPIs

2. Plan
   A. Benchmark KPI Metrics
   B. Set Goals for Each KPI
   C. Develop Strategy to Meet Goals

3. Implement
   A. Implement the Strategy
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HIGH PRIORITY INDICATORS

- Animal Health and Well-being
- Efficiency and Yield
- Water Resources
- Land Resources
- Air and Greenhouse Gas Emissions
- Worker Safety and Well-being

Indicator Definitions


Efficiency and Yield: Efficiency is the unit of input required to produce a unit of output and yield is the total product generated per unit of time or space. Both concepts address waste as a negative characteristic and drive toward improved profitability.

Water Resources: The volume of water consumed by a sector for each process and any impacts on water quality by a sector for each process.

Land Resources: The stewardship of terrestrial and aquatic habitat in relation to water, soil and biodiversity in an area. Impacts of land use and land use conversion, both caused by and prevented by ranching and farming activities.

Air and Greenhouse Gas Emissions: The cumulative emissions of pollutants, including particulate matter, greenhouse gases and other gaseous emissions from a sector for each process.

Worker Safety and Well-being: The implementation of safety programs and training to provide a safe workplace and help to prevent workplace accidents and injuries associated with production, processing, and distribution of beef and the relative prosperity of workers employed in those activities.
USRSB Approach to Metric Development

- Identify the measurable elements within each indicator
  - Each sector will identify:
    - what is already being measured,
    - what can be measured, and
    - what should be measured

- Common measurements across sectors are System Metrics
- Metrics that are unique to a sector are Sector Metrics
- Prioritize System and Sector Metrics for benchmarking
USRSB Sustainability Assurance Framework

Indicators for Beef Value Chain: Six High Priority Indicators*

Segment Specific Metrics developed for segments along the beef value chain**

Metric Tool-kit Resources, Education & Training Programs

Self-Assessment Tools

USRSB to Develop, Own & Promote Use

Implemented by Business-to-Business Supply Chains

2nd Party Certification

3rd Party Verification

*provides guidance & assists business to business verification efforts, including leveraging of existing programs


**Producers, Packers & Processors, and Retail & Food Service with Civil Society input at every segment
<table>
<thead>
<tr>
<th>Human Health and Safety</th>
<th>Animal Care and Welfare</th>
<th>Environmental Stewardship</th>
<th>Economic Integrity</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Community/Neighbor Relations</td>
<td>• PQA+</td>
<td>• Air Quality</td>
<td>• Community</td>
</tr>
<tr>
<td>• Employee Safety and Health</td>
<td>• We Care Ethical Principles</td>
<td>• Energy Use</td>
<td>Economic Benefit</td>
</tr>
<tr>
<td>• Employee Retention</td>
<td></td>
<td>• GHG Emissions</td>
<td>• Consumer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Land Use</td>
<td>Confidence</td>
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<tr>
<td>• Employee Relations</td>
<td></td>
<td>• Nutrient Management</td>
<td>• Food Security</td>
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<td>• Food Safety/Biosecurity</td>
<td></td>
<td>• Water Use</td>
<td>• Product Quality</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Profitability</td>
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GHG emissions associated with consumption of pork in the US.
Benchmark KPIs for GHG

Percentage Contribution to GHG Emissions

Life Cycle Total

Farm Gate Total

- Packaging
- Consumption
- Retail
- Processing
- Live animal production
- Fuel
- Manure
- Feed
- Piglets

Electricity
Benchmark KPIs for Water

- A Life Cycle Analysis of Water Use in U.S. Pork Production
  - 19 gal water per pound boneless pork
  - 75% from feed irrigation
  - 20% for drinking water
Benchmark KPIs for Water

The diagram illustrates the water consumption (m3) per kg at the farm gate for different categories. The categories include:

- Anesthesia
- Raclodamine
- Immuno-castration
- Growth Promoting
- Preventative
- Lammers Pens
- McGlone Pens
- Entire Males

The box plots show the distribution of water consumption across these categories, with the central line indicating the median values.
US Poultry and Egg Federation

- Adopted a process similar to USRSB
- Engaged a 3rd Party Facilitator in 2016
- Starting stakeholder deliberations
- Initiated Retrospective LCA:

## Top Priority Issues for Each Dimension of Sustainability

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Sustainability is Continuous Improvement

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