Science Based Metrics for Sustainable Outcomes In Agriculture

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Everything is Connected
Everything is changing
Sustainability 2050: The Challenge

UN Population Projections

Year

Population (Billions)

Sustainability 2050: The Challenge

UN Population Projections

Projected with current fertility rates

Year
Population (Billions)
0 2 4 6 8 10 12

Center for Agricultural and Rural Sustainability
University of Arkansas • Division of Agriculture
Office for Sustainability
Sustainability 2050: The Challenge

UN Population Projections

- Median Estimate

Year

Population (Billions)


0  2  4  6  8  10  12
Sustainability 2050: The Challenge

What we do in the next 10 years will shape Earth and Humanity for the next 100 years.

When technology and culture collide, technology prevails, culture changes.
We are all in this together

Elements of Sustainable Agriculture

PEOPLE

EQUITABLE

PROFIT

SUSTAINABLE

BEARABLE

VIABLE

PLANET
Human Activities Dominate Earth

Croplands and pastures are the largest terrestrial biome, occupying over 40% of Earth’s land surface.
Key Sustainability Challenges for Agriculture

1. In order to meet projected demands for food, feed, fiber and fuel from the land, we must increase production (output per year) by 50 to 100 percent in the next four decades.

2. If global production is not increased, US and European production must compensate by increasing even more.

3. If we want to preserve biodiversity and other land-based ecosystem services, we must freeze the footprint of agriculture.

4. Thus yield (output per area) must more than double in the next 40 years in the US and Europe.

5. Energy scarcity will drive innovation while limiting expansion of productivity.

6. Water scarcity will limit productivity globally.
Freezing the Footprint of Food
How to triple food production on the same amount of land by 2050

The role of research

- Genetics 50%
- Poor Management Practices 50%
- Technology 40%
- Underperforming Land 25%
- Property Rights 20%
- Waste 10%

Overconsumption 5%
The Food Supply Chain

Production → Processing

Distribution → Wholesale → Retail → Consumption

Direct Mktg

Safety, Security, Stability
The Issue is TRUST

1. Consumer attitudes
2. Social License – freedom to operate
3. Criteria for legitimacy
4. Market competitiveness
5. Reputational Risks!
Wal-Mart ratchets up sustainability expectations

01/13/2015 05:06:00 PM
Tom Karst

ORLANDO, Fla. — With both Wal-Mart and Whole Foods moving aggressively to measure sustainability of their suppliers, Jeff Dlott believes meeting expectations of buyers can be both a requirement for doing business and a market opportunity for produce marketers.

"Don't kill the messenger, but sustainability is becoming a requirement in major markets," said Dlott, president and CEO of SureHarvest, Soquel, Calif., at a workshop at the 2015 Potato Expo on Jan. 8.

He urged suppliers to be clear on their target markets and align their strategy accordingly.

The "Responsibly Grown" program of Austin, Texas-based Whole Foods — introduced last October — and the yet to be revealed Sustainability Index approach of Bentonville, Ark.-based Wal-Mart were the focus of Dlott's presentation.

Wal-Mart plans to roll out sustainability benchmarking with top suppliers in the first quarter of 2015, Dlott said. The Sustainability Consortium — a global group of retailer trade groups and
Sustainability Initiatives

Field to Market
Keystone Alliance for Sustainable Agriculture

Corn Efficiency Indicators (Per Unit of Output)

Sustainability Assessment for Specialty Crops (SAFA) Guidelines

A System for Measuring Sustainable Performance Throughout the Specialty Crop Supply Chain

United Nations Foundation
Sustainable Development: Solutions from the Land Dialogue
Draft 4.0 – compact version

Natural Resources Management and Environment Department
Food and Agriculture Organization of the United Nations
January 2012

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Office for Sustainability
University of Arkansas
Washington, DC (July 8, 2014) – Today, Field to Market®, the Alliance for Sustainable Agriculture announced the launch of a new agricultural supply chain program for U.S. commodity crops. The Field to Market metrics and benchmarks developed through a multi-stakeholder process over the past several years will now become an important platform for measuring, promoting and reporting on continuous improvement in corn, soybeans, wheat, cotton, rice, potatoes and other crops related to seven sustainability indicators: land use, soil conservation, soil carbon, irrigated water use, water quality, energy use and greenhouse gas emissions.
Field to Market: What We Are Doing

- **Grower Fieldprints:** Individual opportunities for continuous improvement
- **Supply chain projects:** Direct engagement in continuous improvement
- **National indicators report:** Documentation of overall trends

Public data and models
Collaboratively developed
Outcomes based
How We Define Sustainable Agriculture

- Increasing productivity to meet future food and fiber demands
- Improving the environment
- Improving the social and economic well-being of agricultural communities

Meeting the needs of the present while improving the ability of future generations to meet their own needs
Field to Market Membership
Over the study period (1980-2011), trends in U.S. rice production were as follows:

- **Yield:** Total rice production increased (+53%) and yield (cwt per planted acre) increased (+53%).

- **Resource efficiency (per cwt):** Rice improved on all measures of resource “efficiency,” with decreases in per cwt land use (-35%), soil erosion (-34%), irrigation water applied (-53%), energy use (-38%), and greenhouse gas emissions (-38%).

- **Resource use/impact per acre:** Rice improved (decreased) per acre irrigation water applied (-25%) and slightly improved per acre energy use (-3%) and greenhouse gas emissions (-4%); per acre soil erosion remained constant (0%).

- **Total resource use/impact:** Rice improved (decreased) total irrigation water applied (-18%); rice increased total land use (+9%), soil erosion (+9%), energy use (+6%), and greenhouse gas emissions (+5%).
Sustainability is Continuous Improvement

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

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

3. Implement
   A. Implement the Strategy
   B. Measure, Assess and Report Results
   C. Adapt Strategy to Improve Outcomes
Moving the Curve

The approach is to create incentives for the lowest performers to improve, thus improving the metrics for all producers in a sector.
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.
## Persistent vs Important Issues

<table>
<thead>
<tr>
<th>Persistent Issues</th>
<th>Important Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locally grown</td>
<td>Water use efficiency</td>
</tr>
<tr>
<td>GMO crops</td>
<td>Soil erosion</td>
</tr>
<tr>
<td>Organic crops</td>
<td>Soil organic carbon</td>
</tr>
<tr>
<td>Natural</td>
<td>Land use change – biodiversity loss</td>
</tr>
</tbody>
</table>

From Jason Clay, WWF
Environmental Key Performance Indicators for Agriculture

- Greenhouse Gas Emissions
- Energy Use
- Water Use
- Land Use
- Water Quality
- Nutrient Use Efficiency
- Habitat/Biodiversity
KPIs: Sentinels for Threats
KPIs: Sentinels for Threats
Framework of Goals

Aspirational

Strategic

Tactical

Operational

Vision

Management

Planning Horizon

Long

Short

Breadth of Goal
Sustainability Framework

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Thank you!