Practical considerations in implementing metrics for Sustainable Agricultural Production

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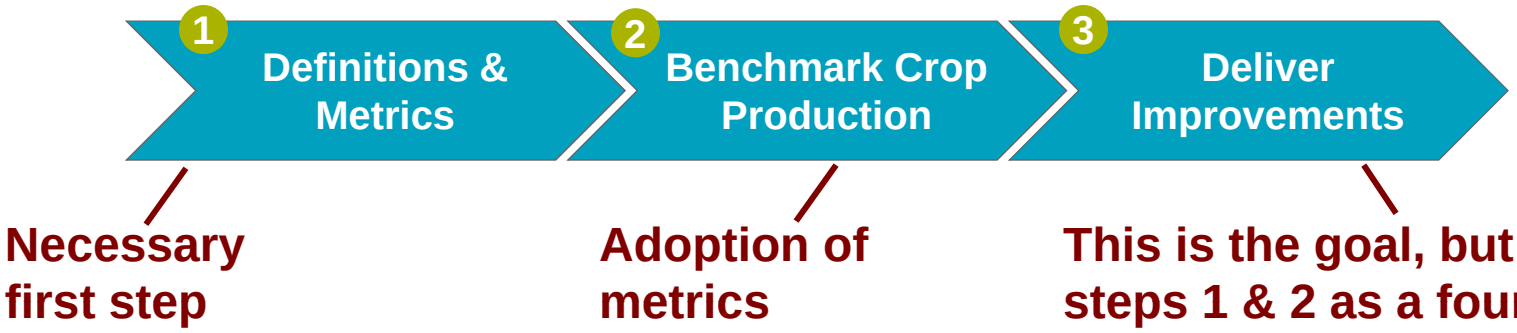
The National Academies, Workshop 1: Measuring Food Insecurity and Assessing the Sustainability of Global Food Systems
February 16-17, 2011

Food security depends on continuous improvement of our ag systems --- how do we get there?



- **Definitions & Metrics:** What do we mean by ag sustainability? What are the outcomes? How will they be defined & measured?
- **Benchmark:** How will metrics be adopted/improved? What do we know today? How much participation is necessary for broad adoption?
- **Improvements:** What can be improved at the grower level? How do we ensure a difference will be made? How do we incentivize change?

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For many of us this can be personal…

….it is important to get it right

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Discussion of principles linked to metrics going forward

- Science based & validated
- Transparent & open sourced
- Pragmatic & focused on what matters
- Value creating for the grower (must exceed the cost & disruption)
- Respectful of confidentiality
- Improvements verifiable
- Not disruptive to efficient product movement & relationships
- Focus on decisions in the control of the grower
- Recognize & address land tenure relationships in creating incentives
- Phased & realistic
  - Move with value creation, not in front of it
  - Improve over time

Agreement on metrics is an essential first step in making progress with sustainability

- Metrics adoption is in a state of flux
  - Competing, parallel efforts exist
  - Few commitments
- Difficult to evaluate options & make meaningful investment e.g.,
  - Downstream companies are waiting for producers
  - Producers are waiting for downstream commitments

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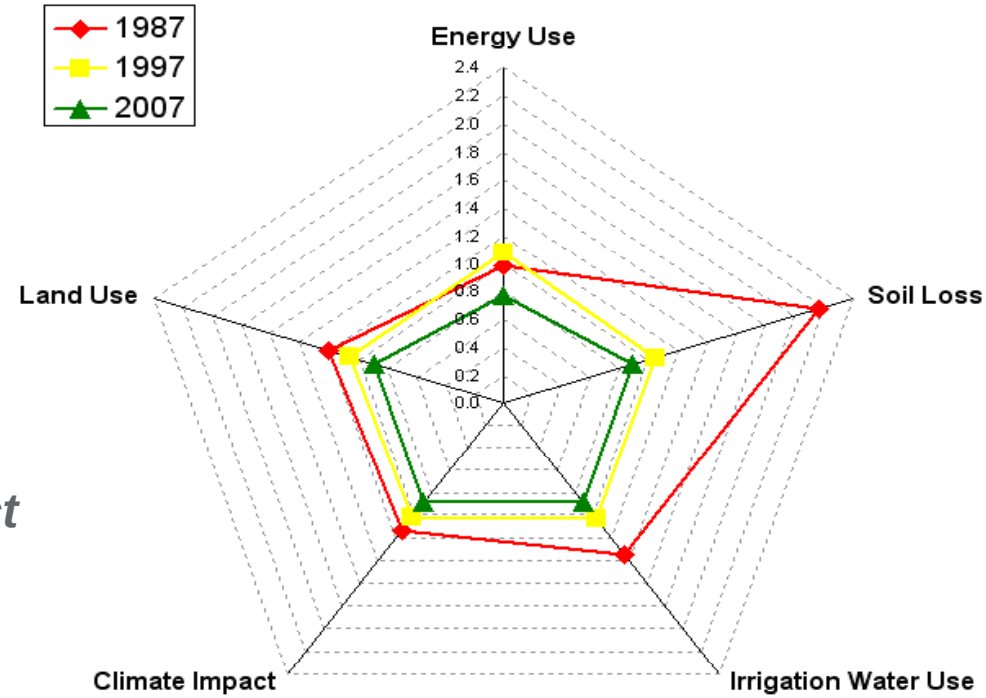
A leading, science-based effort in the US is the Keystone Field to Market (FTM) initiative

Field to Market

Corn Efficiency Indicators

(Per Unit of Output, Index 2000 = 1)



The smaller the spidergram the lower the impact

Indicates progress in recent decades. More is needed

(Values are expressed in 5-year averages)

A successful story going forward depends on the adoption of FTM metrics by growers……

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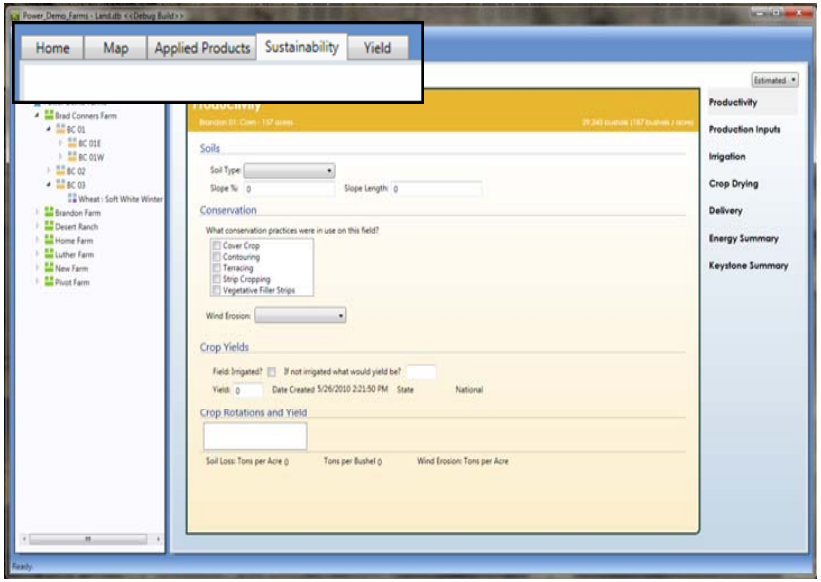
Syngenta adopted the FTM metrics for a range of pilots to gain practical experience with growers & collaborators

- **Incorporated into Syngenta's farm management tool (Land.db™)**
  - Existing grower relationships
  - Already capturing farm data
  - Confidentiality
- **Initiated several pilots**
  - Evaluate the metrics
  - Feedback from growers across multiple crops & geographies
  - Identify areas of improvement



Land.db™ is broadly deployed by Syngenta

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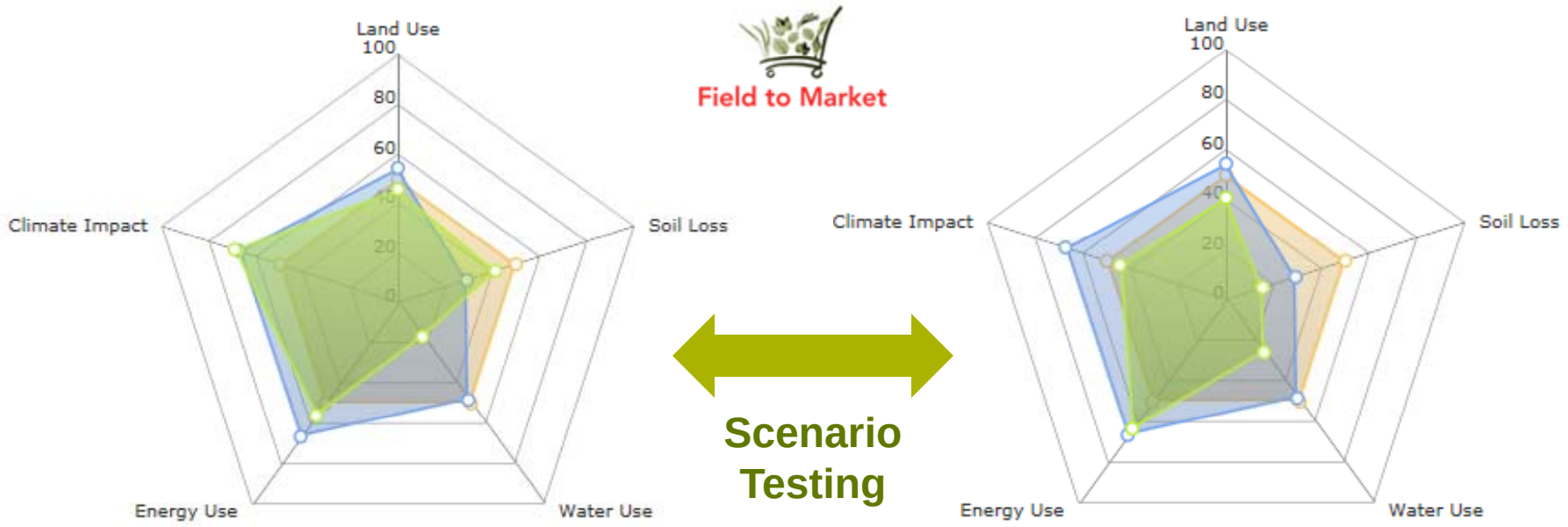
Syngenta growers evaluated the effects of potential management decisions on a real time basis



Original Fieldprint

Field State National

Change Production Variables

Field State National

Represents Field to Market Indicators generated in Land.db™

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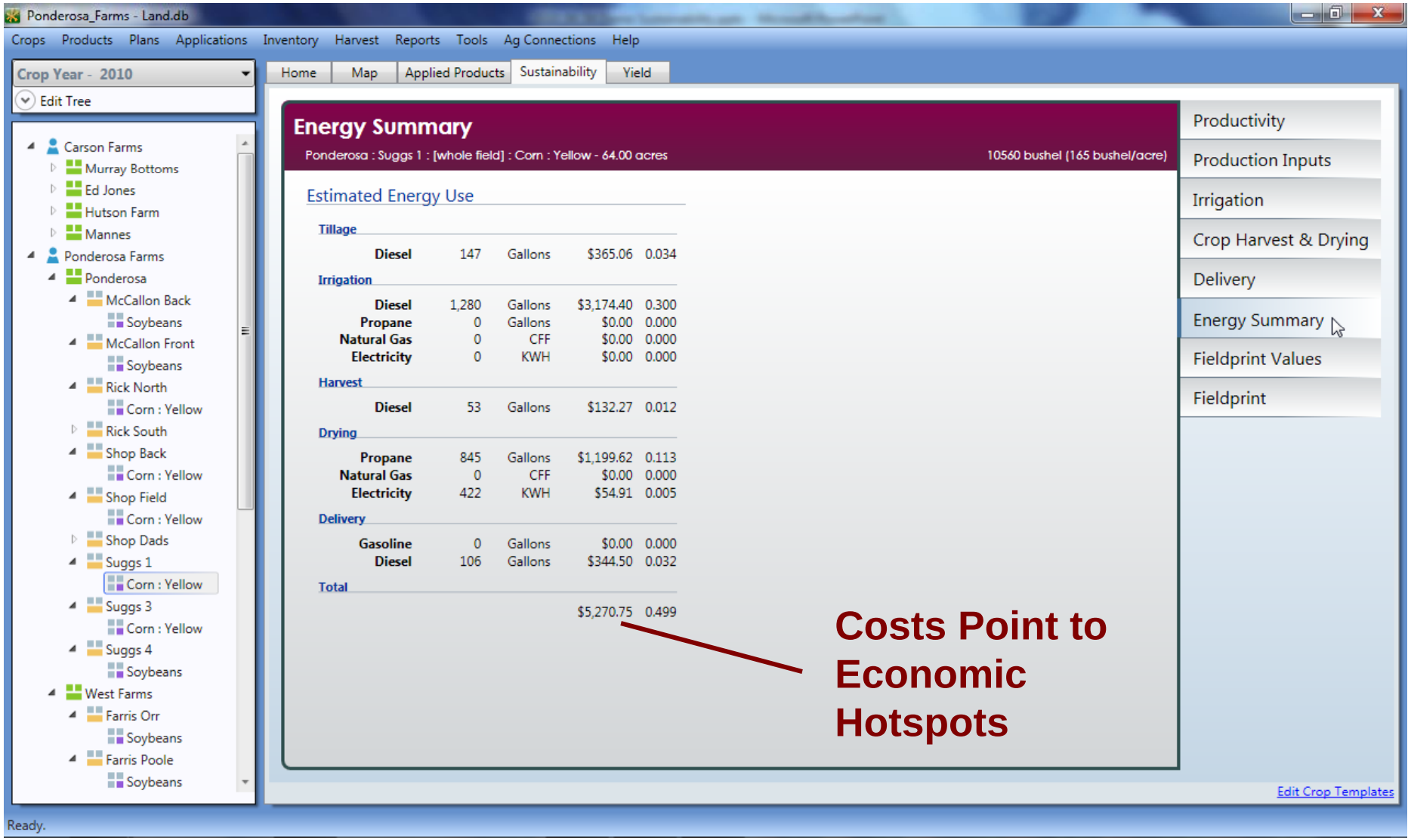
Opportunities for improvement were highlighted e.g., energy use



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What did we learn from our growers? (positive feedback)

- **Grower interest in comparisons to:**
  - Neighbors
  - State & national averages

- **Operational improvements were made visible. These may be adopted as they represent cost savings & efficiency** (example: fuel usage)

- **Efficiency in data entry greatly appreciated** (critical success factor)

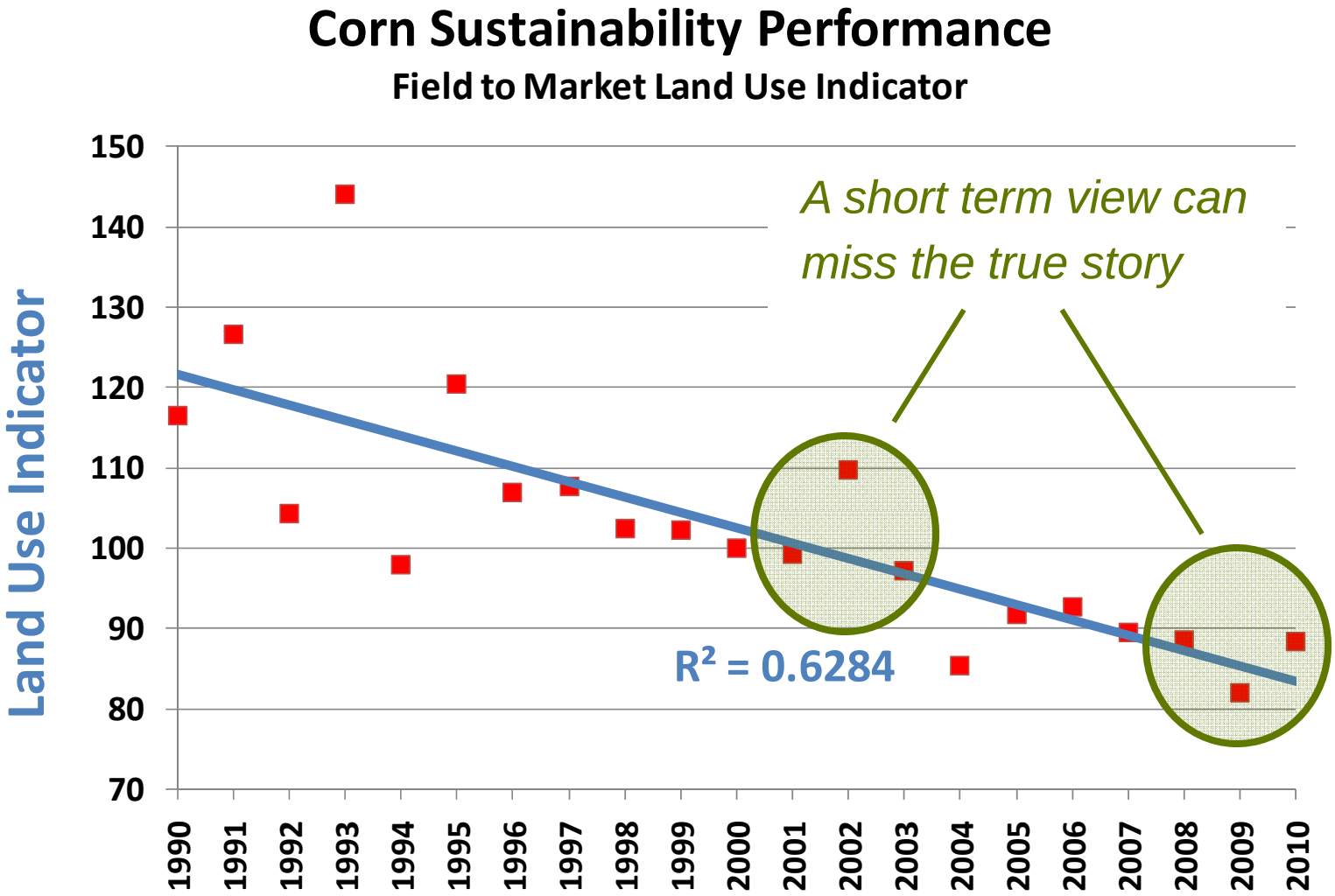
What did we learn from our growers? (areas for improvement)

- **Time required to enter quality data was significant**
  - 3-4 hours per farm
  - Building on an existing farm management tool
  - Opportunities to improve the grower experience

- **Value perception varied**
  - Growers varied in their perception of sustainability
  - Significant suspicion about the future impact

- **Data privacy was a prevalent and significant concern**

A full understanding of performance will take time…



Based on USDA NASS Crop Production Data

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The challenge is that we cannot get ahead of value

Value > Cost ?

- Recognize grower costs & potential disruption
- Ensure adequate incentive if changes are needed
- Stepwise and flexible approach
- Move at the pace of created value & available resources, not ahead of it

Incentives will be essential moving forward

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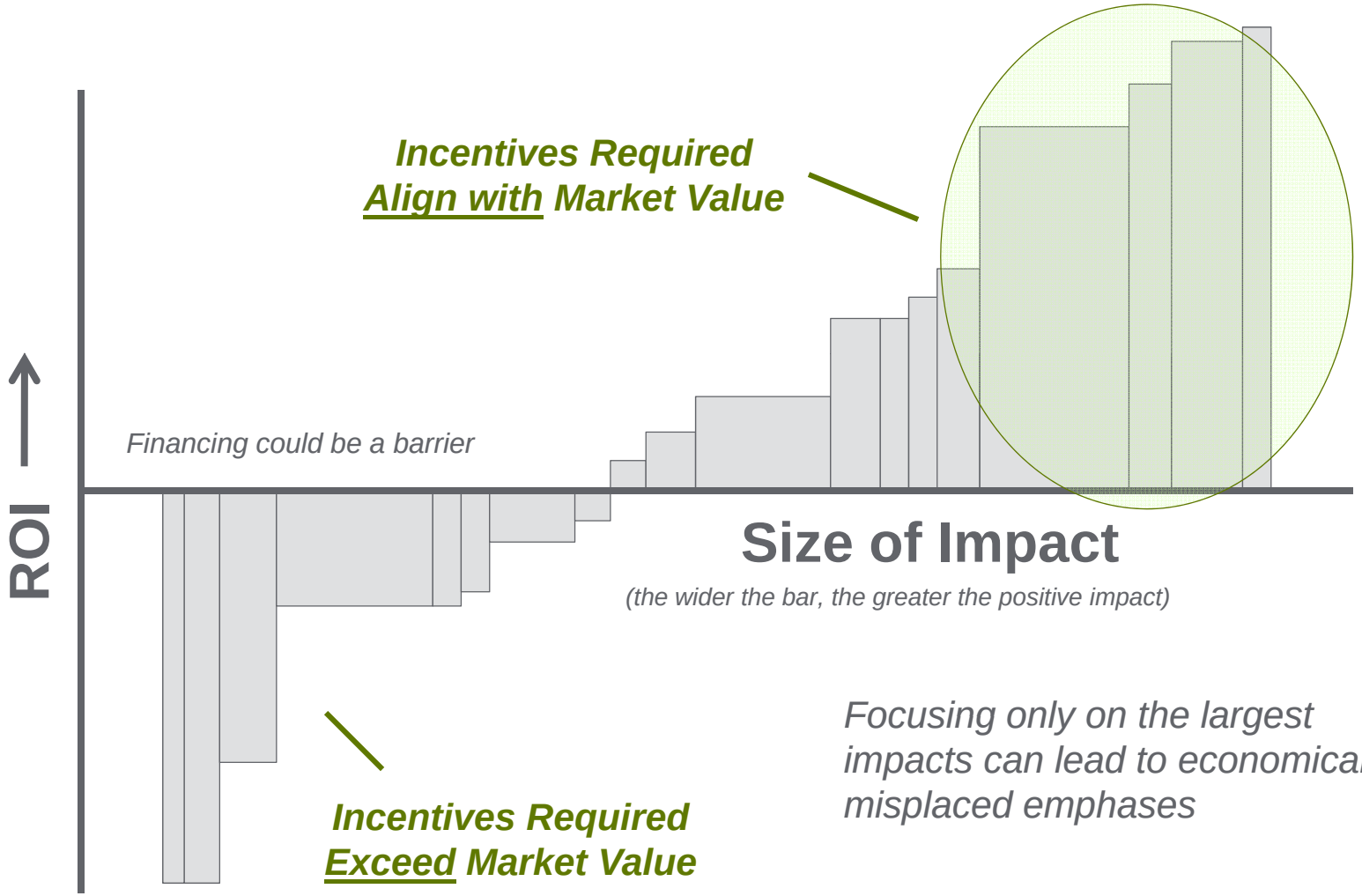
An ROI perspective of potential grower improvements informs decision-making & increases the likelihood of driving change



Analysis approach adapted from McKinsey

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Conclusions

- “Certainty” around metrics is critical to get things moving
- Leverage existing systems & relationships as possible
- Significant effort is required to gather data (esp. at field level)
- If readily usable, the FTM efficiency indicators would inform operational decisions on a routine basis (field by field)
- Aggregated data will inform the environmental benefit of certain production practices over time
- Going forward, data can be used to support life-cycle inventories for crop production on a regional and local basis
- Grower time & costs are significant - adequate incentives are essential
- Many of the basic insights likely applicable to other regions

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