CONSERVATION INNOVATION GRANTS
FINAL REPORT

Grantee Name: SureHarvest	
Project Title: The Stewardship Index for Specialty Crops (NRCS CIG 69-3A75-11-216)	
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Period Covered by FINAL Report: September 15, 2011 – December 31, 2013	

Summary of Project Activities:

The Stewardship Index for Specialty Crops (SISC) was formed in 2008 by a diverse group of 30 growers, trade association leaders, retail and food service companies, food processors, and NGO's who all shared a bold vision – to develop a system for measuring performance throughout the specialty crops supply chain – from farm to plate. Through a previous Conservation Innovation Grant (NRCS CIG 69-3A75-9-157) project, SISC was able to set the organizational foundation for providing metrics and conducting pilots in the crop production segment of the supply chain.

This CIG project continued the approach of piloting metrics with growers to get feedback on usefulness, ease of data collection and value of the measure-to-manage approach to sustainability performance. Honing in on a "doable" set of metrics that would interest growers from an economic and environmental perspective was key to driving participation and ultimate adoption. The dynamic of growers addressing internal operational efficiencies and local resource challenges (e.g., water quality and quantity) combined with increasing regulatory demands as well as buyer sustainability program surveys is making for a situation where growers feel overwhelmed by data requests. The Big Data era is gaining momentum in the food industry with many growers ill equipped to manage requests and questioning the immediate value of integrating business and sustainability strategies. An historical shift is occurring in an industry that is traditionally slow to change.

Within this context, the SISC Coordinating Council guided the metric development, outreach and strategy setting work of this still evolving initiative. They discussed pilot results, experiences shared by other metric initiatives such as Field to Market in the commodity crop sector, feedback from buyers on sustainable sourcing strategies and observed NGO activities with regional grower groups. These inputs shaped the activities of the project and the re-prioritization of which metrics were selected for further development and a revised piloting approach that resulted in five strong case studies to help clarify and support the value proposition of performance metrics.

Data is the foundation of metrics and with this comes the need for software tools to support SISC's vision of enabling growers to benchmark, compare, and communicate their own sustainability performance. The project succeeded in developing an Excel-based metric calculator for growers to use in pilots and to establish a prototype for the future development of software tools to support metric use. In addition, a longer term strategy for SISC's metric portfolio management and technology platform needs was developed to guide the next steps of the initiative.

This CIG project fit into the NRCS Water Resources focus area by developing metrics directly and indirectly related to water use, water quality, nutrient use, wildlife habitat, energy efficiency, greenhouse gas emissions and soil quality. Objectives were: 1) expand and complete metric pilot testing; 2) develop,

refine and manage the SISC metric portfolio; and 3) provide ongoing governance and outreach and develop tools to support metric calculations. The following details activities by objective during the course of the project, September 15, 2011 – December 31, 2013.

Objective 1: *Expand and complete metrics pilot testing*

As was seen in the previous SISC CIG project, pilot testing plays a critical role in road testing metrics in the real world of farming operations. SISC's iterative model of collaborative metric development, pilot testing and then refinement based upon participant feedback proved again to be a successful approach in this project.

Metrics piloting was done during the 2012 and 2103 crop seasons and, as will be described below, a different tactic was used for the 2013 pilot to help build the value proposition for metrics to drive broader adoption of the SISC metrics. The 2013 pilot also implemented Version 1.0 of the SISC metric suite. Grant partners, Sustainable Food Lab and Western Growers, played a key role in promoting the pilots, providing grower/shipper and food company contacts as well as sharing insights on the usage of metrics in commerce.

2012 Pilots – Broad Recruiting Effort

The 2012 pilot was fashioned after the same approach used during the previous CIG grant's piloting efforts (NRCS CIG 69-3A75-9-157) – cast a broad net across the specialty crop growing regions and get as many growers as possible to commit to using the SISC metrics on a field during the crop season. Packers/shippers and food processors as well as regional trade associations, retailers and foodservice companies were used as "recruiters" to sign up their grower suppliers and members. SISC Coordinating Council members were also assigned recruiting duties in their contact networks and spheres of influence. Several webinars were held to both introduce the pilot to prospective participants as well as show them how to use the Excel calculator. This recruiting was met with mixed results and despite commitments by growers to provide data, the anticipated number of submitted datasets did not reach project expectations.

As part of the pilot recruiting effort in large group presentation settings, we have been able to expose a large audience of growers to the performance metric concept and the data they should be collecting for their farming operations. This education and awareness exercise should help growers better understand the usefulness of readily available data for decision making and for supply chain requests.

Process

The SISC website was updated with a Pilot Materials page that allowed pilot participants to download pilot instructions, background documents, technical appendices, and a user guide for the Excel metric calculator that growers used to enter pilot data and see calculated metric results. Growers were asked to use the SISC Excel calculator to collect data for the nitrogen, phosphorus, water, energy and soil organic matter metrics. Growers entered data and then submitted Excel files to SureHarvest for analysis and aggregation where possible. For the most part, growers could easily navigate the calculator although some food company representatives collected the data and entered it for their growers.

Results

SureHarvest worked to gather pilot metric results from growers and the various food companies, retailers, foodservice companies and trade associations who were involved in the data collection process. **137 data sets** (91% of our target of 150 data sets for the 2012 pilot) were submitted by **109 different growers**. Growers were located in **four states**: California, Colorado, Washington and Wisconsin. The **13 crops** represented in the data sets include: almonds, apples, broccoli, green beans, peaches, pears, peas, potatoes, processing tomatoes, raisin grapes, sweet corn, walnuts and winegrapes. Approximately **270,000 acres**

are represented in the data (*note*: California processing tomato growers supplied average results across all of their acreage). **39 data sets were submitted via the Excel calculator** while others submitted nitrogen usage and irrigation applied metric data directly. The reasons for participation in the pilot fell into a number of broad categories: requested by a buyer (either a food company or a retailer); buyer compliance via a sustainability audit; on-farm research by universities; grower curiosity; and a value-add exercise where a Colorado potato packer/shipper was developing a new sustainable potato variety. SISC also received metric results from a number of winegrape growers who used the California Sustainable Winegrowing Alliance's metric calculator that used SISC metrics for nitrogen and irrigation applied.

Metric result submission by metric reflected the availability of and difficulty to obtain some on-farm data. Metric results in order of submission (see Figure 1) from high to low were: nitrogen applied, phosphorous applied, irrigation applied, soil organic matter potential, and energy use. Energy use (fuel, electricity) is not typically captured at the field level and proved to be difficult for most people even with the whole farm allocation functionality in the Excel calculator.

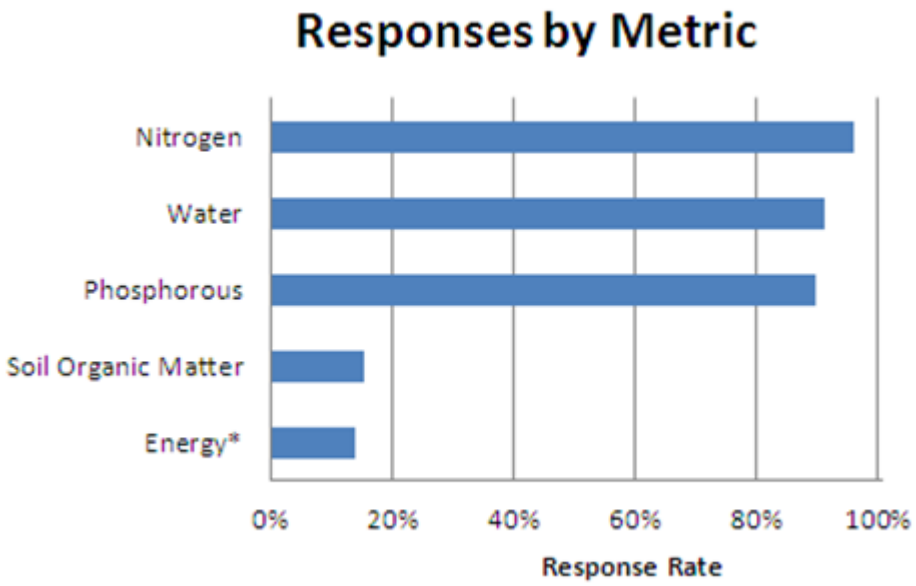


Figure 1. 2012 pilot responses by metric. (Response Rate = those data sets that provided data for the metric areas listed.)

In the case of California winegrape growers, the California Sustainable Winegrowing Alliance (CSWA) through a parallel CIG grant (NRCS CIG 69-3A75-9-146) had developed a metric calculator to augment their practice-based Sustainable Winegrowing Program. CSWA (a member of the SISC Coordinating Council) took the full list of SISC metrics and used it as a starting point to discuss and select the on-farm metrics that would be implemented first into the calculator. They settled on energy, water and nitrogen usage. (A greenhouse gas (GHG) metric utilizing the DNDC soil/plant GHG emission was also included in the calculator.)

Data was received from 50+ California processing tomato growers and was used to **anonymously aggregate data** to provide individual growers a report showing how their metric results compared to their fellow growers. Peer comparison is a key SISC value proposition and an assumption that has been a driving force behind getting large sets of data from regional groups of growers. (See 2013 California processing tomato case study for more information on this concept.)

One of the most successful 2012 pilots involved Farm Fresh Direct (FFD), a Colorado-based fresh market potato packer/shipper, who wanted to show that metric results can be useful for on-farm sustainability measurement and decision making. FFD used metrics in a potato trial for a more sustainable variety and they shared the story with Walmart, one of their key buyers. The pilot results proved to a win-win-win for the grower, packer/shipper and retailer. If we add the consumer to the equation (see Figure 2), it is a win-win-win-win - the results provide a market access "story" for a new sustainable product! (*Note:* FFD and Walmart have been SISC Coordinating Council members since its founding.)

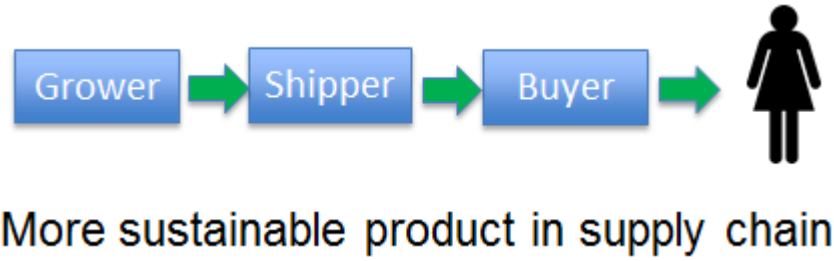


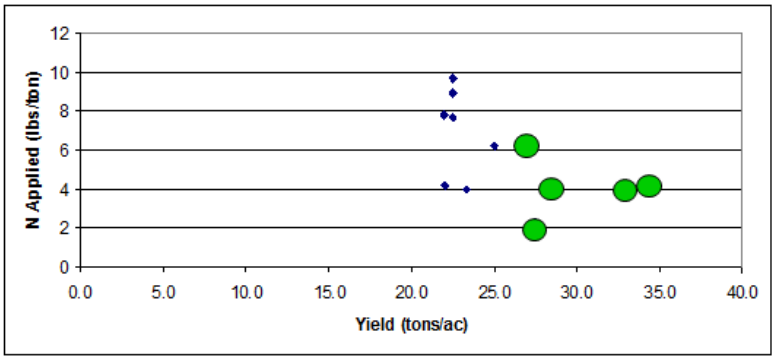
Figure 2. Metrics can be used to drive more sustainable consumer products in the chain of commerce.

The following is a snapshot of the pilot.

- Used SISC metrics to determine sustainability performance of a new variety in San Luis Valley in Colorado
- 5 growers participated in the pilot and grew 5 varieties in 10 fields
- Growers used the SISC calculator to input data for: fertilizer usage, pesticide usage, irrigation water applied, electricity usage and fuel usage
- SureHarvest compiled data submitted by grower participants

The metric results for the pilot are shown in Figures 3 and 4. The Tebina variety data is represented by the green dots. FFD used data collection and metric results to show that the new variety had higher yield, lower nitrogen usage and lower water usage compared with the other varieties. Reduced nitrogen and irrigation needs have both economic and environmental implications for the grower and the surrounding landscape – a key concern in Colorado's water-challenged San Luis Valley.

Nitrogen Applied



Phosphorous Applied

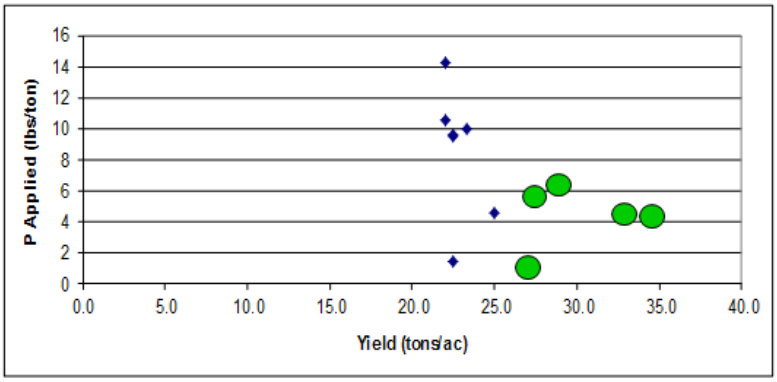
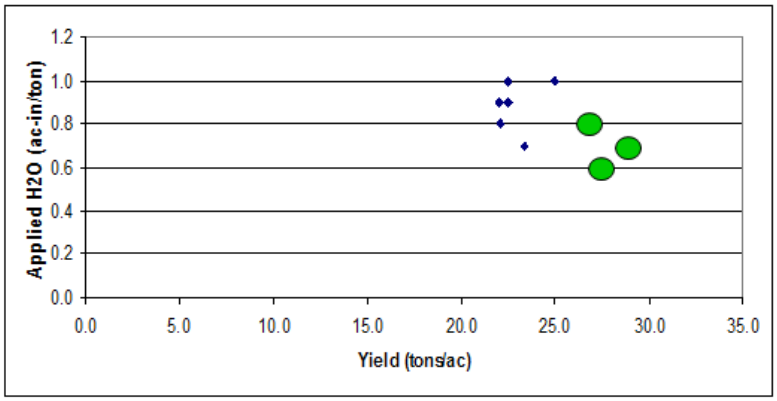


Figure 3. Nitrogen and phosphorous applied metric results for Colorado pilot fields. Green dots are Tebina variety and blue dots are other varieties.

Irrigation Applied



Energy Usage

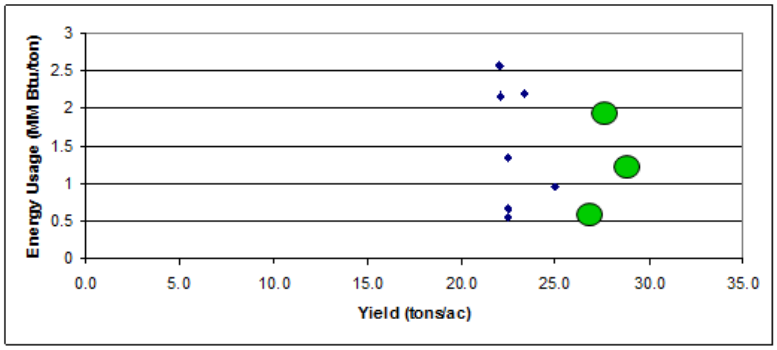


Figure 4. Irrigation applied and energy usage metric results for Colorado pilot fields. Green dots are Tebina variety and blue dots are other varieties.

Pilot Feedback
SISC conducted two webinars with growers who participated in the pilot. While turnout was relatively low, we received positive feedback on the Excel calculator as a good prototype of what a future metric calculator might look like. The feedback on the utility and relevance of the metrics reflected the metric result submission volume cited above: nutrient and water usage metrics are of high interest to growers.

2012 & 2013 Pilots – Boots-on-the-Ground Approach
Face-to-face metric data collection was also attempted with growers so that can we could learn in person what the challenges are. This "boots-on-the-ground" program used grant funds to support regional crop consultants to recruit and work directly with growers to help collect data and complete the pilot. Growers in California, Florida, Wisconsin and Washington were part of this mini-project. Data was provided from the following crops: fresh market tomatoes, sweet corn, snap beans, potatoes, apples, pears, cherries, raisin grapes, almonds and peaches.

The key finding was that even with a specialist helping collect data, there were data items that were hard to find or the grower did not collect. In some cases production yields were rough estimates.
Another common experience was difficulty in recruiting growers to participate in the pilot due to lack of interest, uncertainty on data confidentiality or how the data would be used (particularly by retail buyers), and lack of time to "look for data" during their almost year-round harvest season. So even though we worked through growers' trusted advisors, the results were similar to the general SISC recruiting efforts. From a technical perspective, the pick lists in the Excel calculator were cumbersome and did not include all fertilizers or pesticides pointing to the need for a web-based tool that is constantly updated with crop input products.

This effort did serve the purpose of educating the crop advisors on sustainability issues being addressed by SISC. One advisor said "After decades of focus on the biological components of pest/predator/pesticide/host plant, gathering data that was focused almost exclusively on macro inputs such as fertilizer, water and fuel consumption was a bit of a turn-around." Expanding one's horizons on the broader definition of sustainability is an outreach and education element of SISC going forward.

2013 Pilots – Building Case Studies to Drive Adoption
An important lesson from the 2012 pilot as it impacted the 2013 pilot, was that "casting a wide net" in hopes of getting food companies, buyers and trade associations to recruit growers for the pilot did not work well. Based upon the continued challenges with getting a broad scattering of pilot participants during the 2012 pilot, the strategy changed to pursue targeted pilots for the 2103 crop season – motivated groups of regional growers with a challenge or opportunity. (*Note:* This change in strategy was discussed with and approved by our NRCS grant technical advisor.)

In the focused pilot strategy, sponsors were identified who realized the positive benefits of using SISC metrics with their grower constituents/suppliers. The sponsors also provided resources to help them overcome the challenges we have seen in the previous pilots to ensure that pilot data and results objectives can be achieved.

The desired outcome was to have 4-5 regional pilots and work closely with the sponsor to assist growers in providing data for the metric calculator. By documenting these "case studies" as examples of how grower groups can successfully use the metrics to address an opportunity and/or respond to a challenge facing the group, we will hopefully increase the likelihood of metric adoption by other growers.

Process
In preparation for recruiting, the multi-pronged "value" of using the metrics was described as follows:

	Nitrogen Applied	Water Applied	Energy
Economic impact	X	X	X
Water quality impact	X	X	
Of concern to regulators	X	X	X
Buyers interested in topic	X	X	X (GHGs)

Other issues that growers in a specific geography may be concerned about where metrics could help analyze and document included:

- Water quality (regulatory influence)
- Water availability (potential regulatory influence)
- Market access (the "local" food driver)

SureHarvest worked directly with the groups that were identified to describe the pilot, provide guidance on data collection, conduct calls or webinars with pilot partners, aggregate the pilot data and provide a case study report back to the participants. The following are brief summaries of the studies showing the diverse settings and application of metrics. The common theme is that metrics results will drive much more discussion on "why?" and "what next?" rather than being able to draw strong actionable conclusions or comparisons.

<u>California Processing Tomatoes</u>

- Five processors were able to get fertilizer and irrigation data from 55+ growers for 325+ fields representing 10% of the acreage of the 2013 crop that provided a large and rich data set for analysis.
- Metrics results for nitrogen and water usage showed wide variability for operations in terms of inputs and yield. (See Figure 5.) "Fascinating, exciting to see, but concerning…"
- Processors agreed that data quality verification and the context of the data would be needed to draw meaningful conclusions from the results.
- Processors would love to have this kind of data that shows their grower supplier compared to their peer growers to drive the improvement opportunity discussion. (See Figure 6.) "Growers could quickly see how they compare to other growers. We could explore the practices that top performers are using."

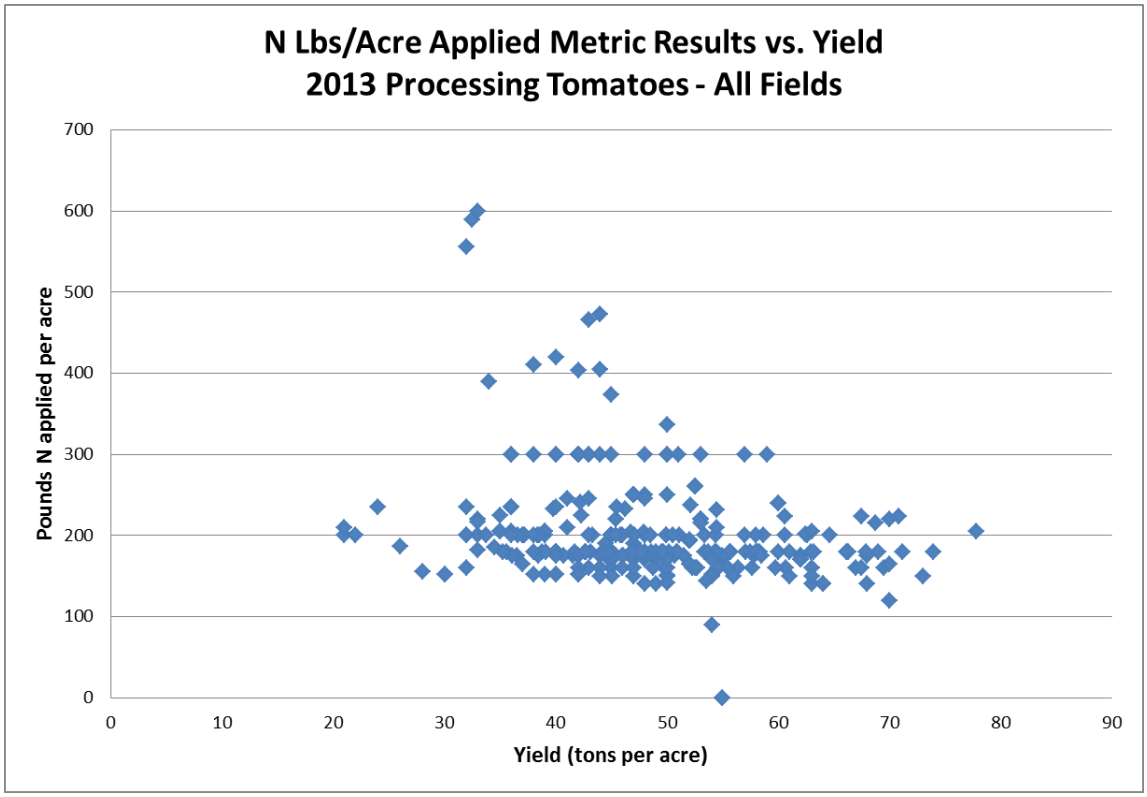


Figure 5: Nitrogen applied per acre vs. yield for all fields (CA processing tomatoes – 2013).

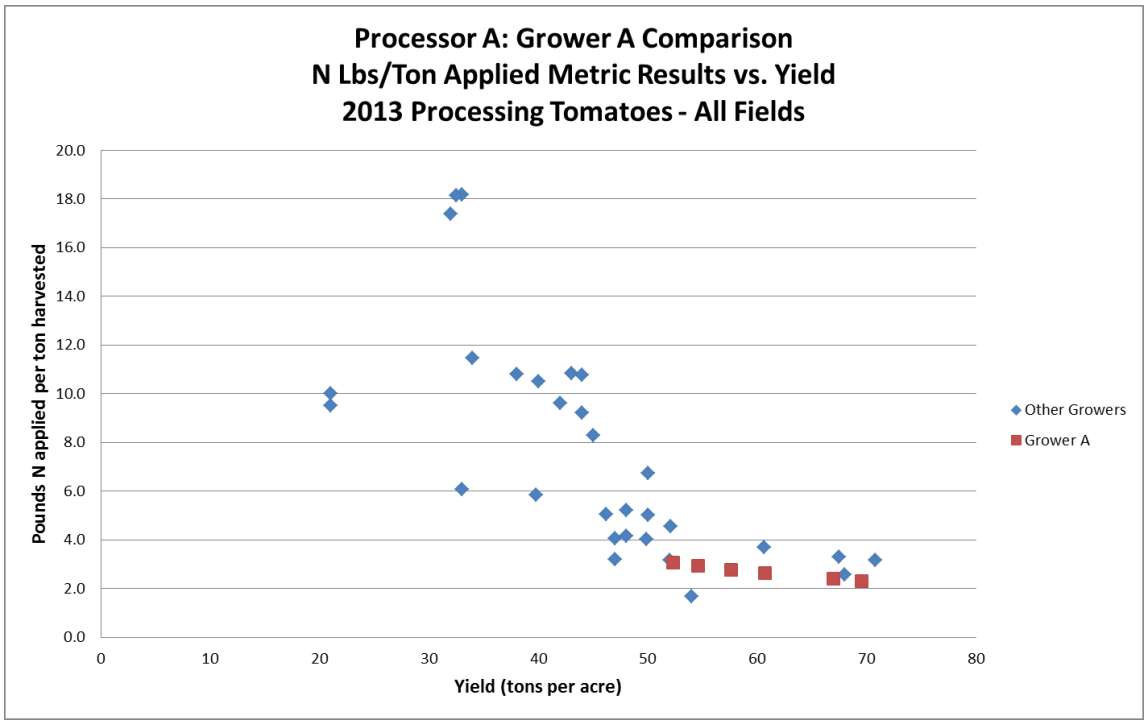


Figure 6: Nitrogen applied per ton harvested vs. yield for Processor A's growers only and breaking out Grower A (CA processing tomatoes – 2013).

Attachment A is the actual tomato processor and grower case study and is a good representation of the case studies.

California UC Davis Processing Tomatoes

- Data collected from one-acre research plots (7 plots per year) on the university farm over an 11 year period.
- Used SISC Excel calculator for nitrogen, phosphorous, water, soil and energy metrics.
- Nitrogen and water metric results showed variability within season depending on the rotational system (conventional, organic, mixed, conservation tillage) and across years for the same plots. (See Figures 7 & 8.)
- Even though the crop of interest for the metric calculations was tomatoes, the context that they were grown in (i.e., the rotational system) produced different metric results show that "a tomato is not a tomato" from a metric comparison perspective. (See Figure 9.)
- Soil metric showed a lower than expected performance level given the focus of the research farm objectives.
- Even within a research farm environment, some data (primarily energy related) was either difficult to obtain or did not exist pointing to the need for very clear data collection procedures to support metrics analysis.

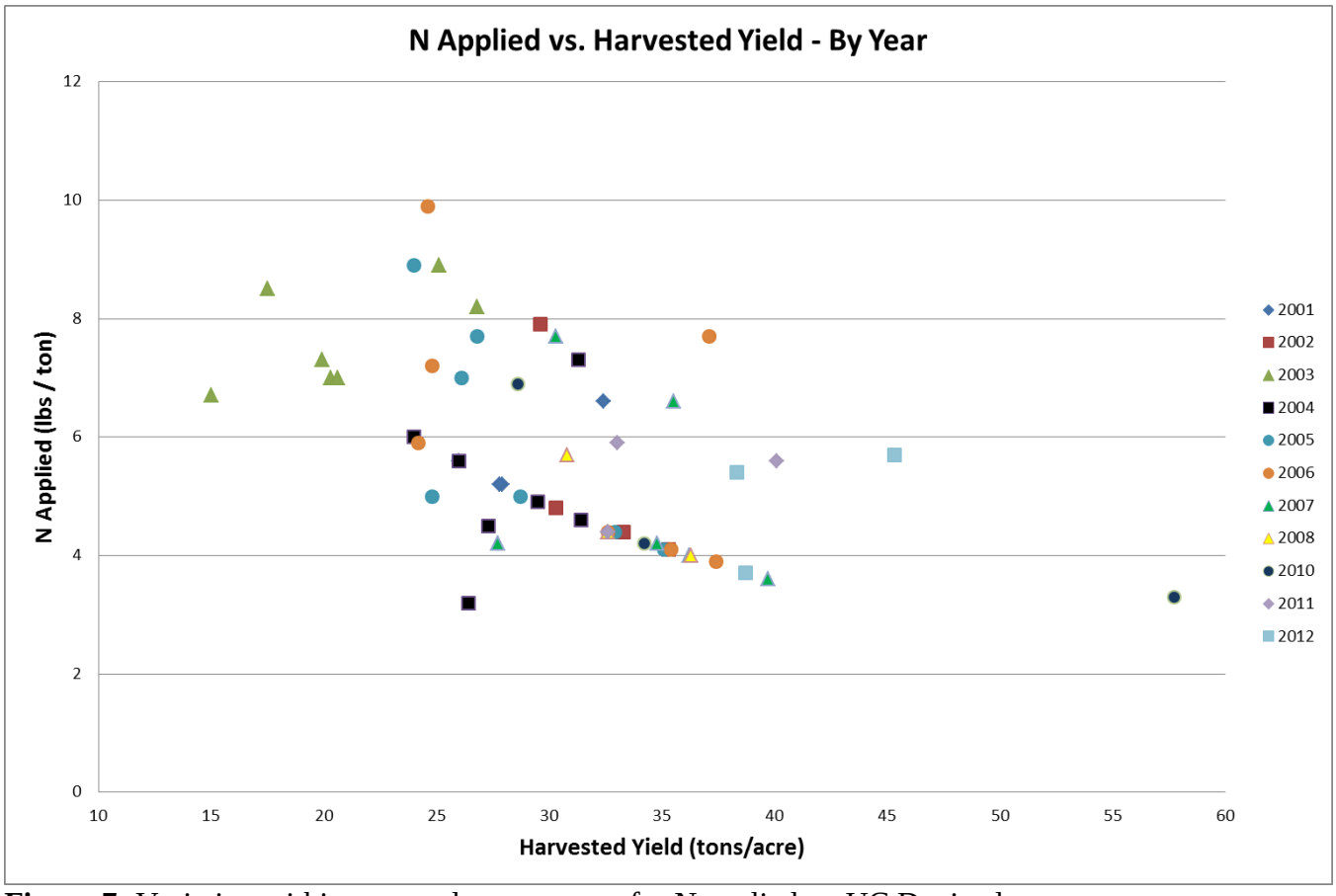
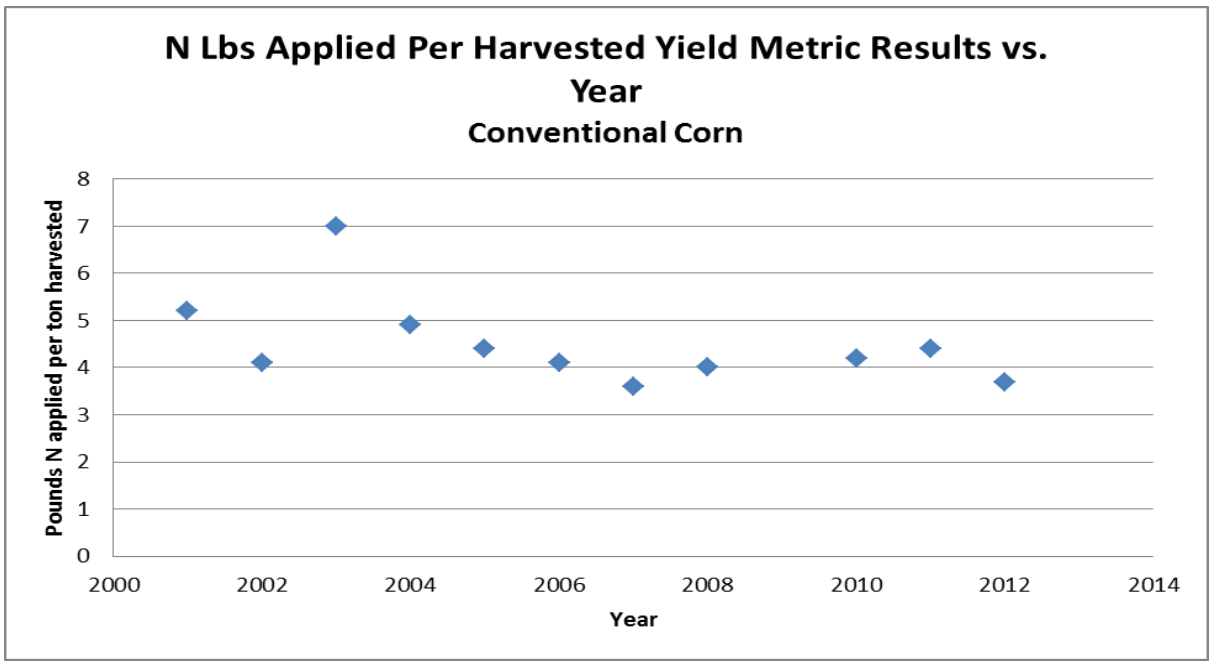


Figure 7: Variation within year and across years for N applied on UC Davis plots.



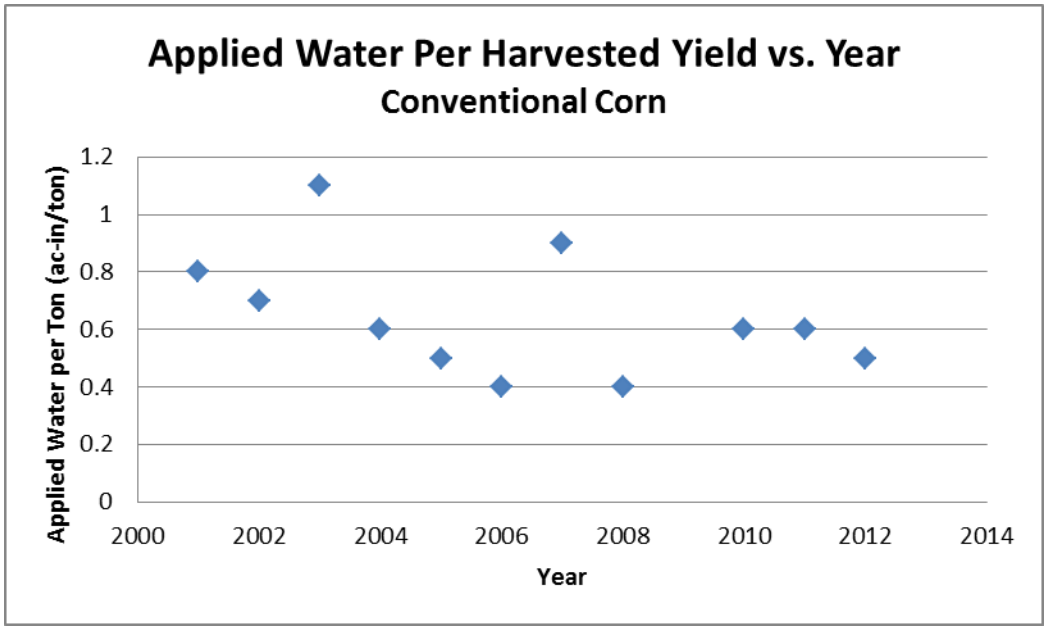


Figure 8: Two metrics showing variation between years and over time on UC Davis plots.

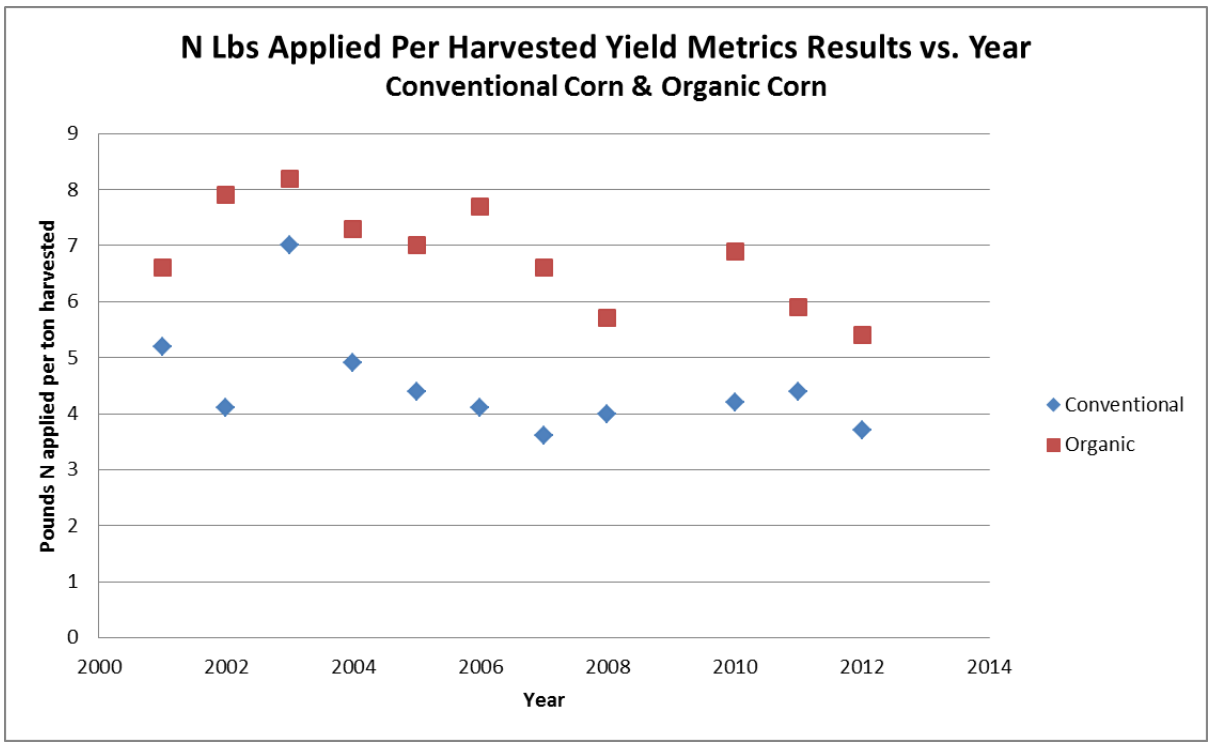


Figure 9: Processing tomato data for two different systems (crop rotations) showing differences within a year and over time.

<u>New Jersey Vegetable Growers & Supply Chain Partners</u>

- Crop input supplier/consultant GROWMARK FS facilitated the study with 4 growers over 4 fields to bring attention to the region in terms of a local, sustainable sourcing option. Grower/shippers were also interested in how they "measured up" to their West Coast peers.
- Findings were presented via webinar with PRO*ACT foodservice buyers to understand what progressive NJ growers are doing and to educate buyers on SISC and how metrics can be used in crop production. (See Figure 10.)
- From the buyer's perspective: "The info personalized production… buyers deal with cases of product and sometimes this creates a disconnect with the field and production. To hear details on soil, amendments, fuel forces them to think about things a little differently."
- From the input supplier's perspective: "We view sustainability as part of our clients' success and our success."
- From the growers' perspective: "Let's keep measuring how we are doing." (See Figure 11.)

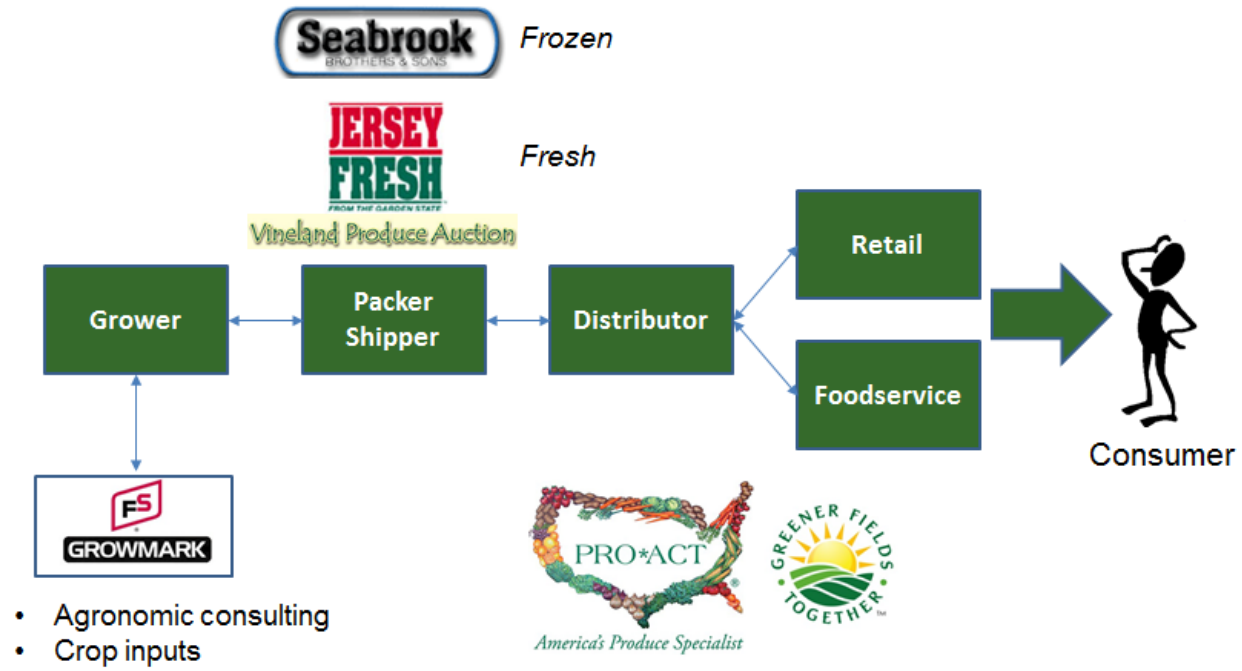


Figure 10: New Jersey case study partners from a supply chain perspective and sustainability ripple effect of production practices and education opportunities.

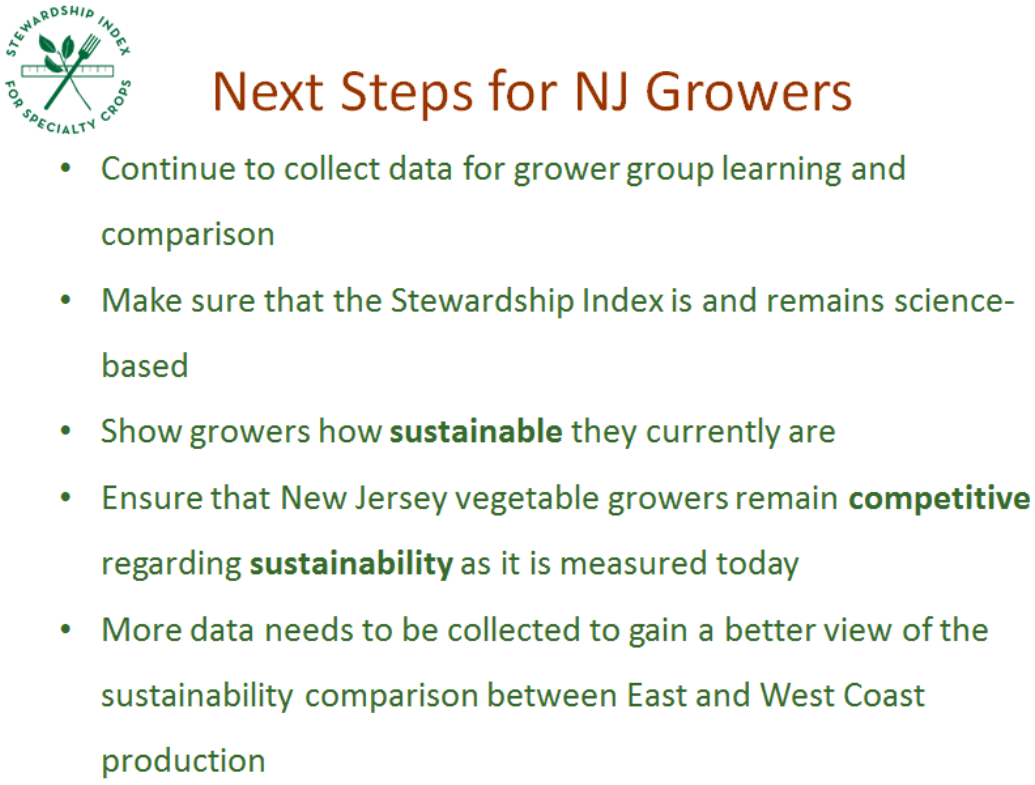


Figure 11: New Jersey grower impact based upon participation in pilot – continue on the sustainability journey. (Slide from partner webinar at end of pilot.)

Wisconsin Potato Metrics Comparison Study

- Study was part of a graduate student thesis on current metrics tools (SISC, Field to Market, Cool Farm Tool, McDonald's IPM Survey, etc.). *(Publication in May, 2014 timeframe will discuss overall study.)*
- Four growers provided data from 16 fields over two crop seasons into various calculators including the SISC Excel calculator.
- Metrics results showed noticeable variability between growers. Processing and fresh market crop metric results overlapped but overall differences were discernible. (See Figure 12.)
- Not surprisingly, significant weather difference between the two seasons impacted the water use metrics. Dry versus wet years also impacted nitrogen metrics.

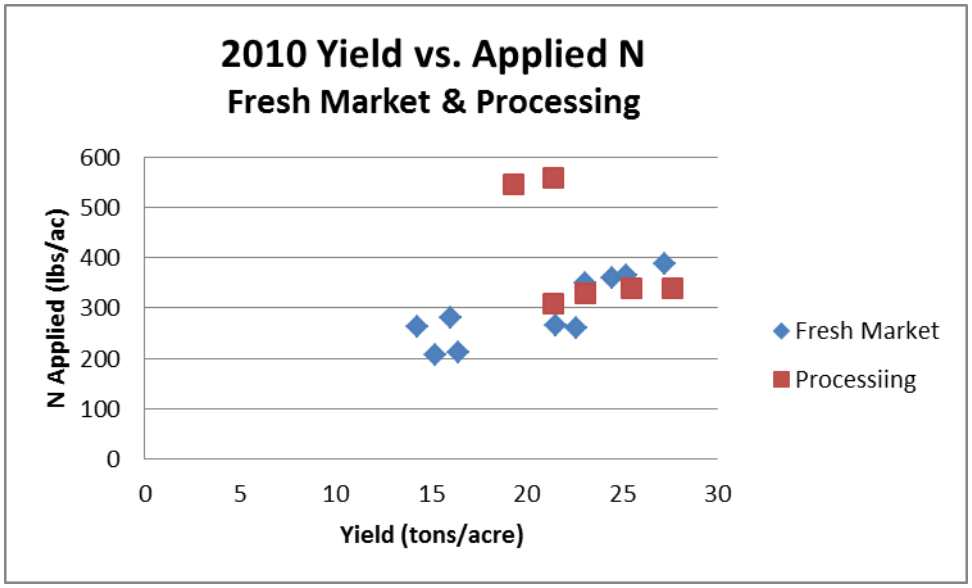


Figure 12: Difference between processing and fresh market potato nitrogen metric results.

California Almond Board Sustainability Program Metrics

- Four years of nitrogen and water usage data was extracted from the California Almond Sustainability Program (CASP) self-assessment data system. Metrics were calculated using acreage and yield information from 325+ orchards throughout Central Valley.
- Metrics results for nitrogen and water usage showed wide variability for operations in terms of inputs and yield in both inner-season and cross-season graphs.
- Preliminary results will be used by Almond Board to drive discussions with growers, buyers and regulators. Further studies to look at regional variation could help fine tune the analysis.

Note: Sample results diagrams are not presented because the Almond Board is reviewing internally to determine how to discuss the results with growers and other stakeholders. This is an example of the data confidentiality aspect of even aggregate metric results and the possibility of misinterpretation by an unsophisticated audience.

Challenges Encountered

The following challenges were encountered during the 2012 and 2013 pilots:

- We continue to seek the value proposition for growers to utilize metrics in a measure-to-manage and continuous improvement element of operating their business. Selling the value proposition of

using metrics to growers, especially for growers who have not been involved was a barrier to pilot recruiting. For the most part, metrics are still not seen as a value-add business concept.
    - There is low voluntary adoption of sustainability metrics. "Nobody is telling us we have to do this…"
- Many growers see the metric data gathering process as too difficult and cumbersome *(data not available; data all over the place; time consuming and resource intensive)*
    - Getting busy growers to prioritize metric work in their busy schedules
    - "Would not be able to do this for all my fields…too much work"
    - Hard to find data – recordkeeping systems, not centralized, not at field level
- Growers view crop recordkeeping data as sensitive, proprietary, and confidential data and are unwilling to share it outside their operations.
    - Involvement of environmental NGO's seen as a threat by many
    - Fear of where the data will end up and how it will be used "against them"
- On-farm food safety audits and other sustainability audit programs are competing for growers' time in taking on another pilot. Some are practice-based and some also have a metric component. One of the core principles of the SISC initiative is to help reduce duplicative sustainability audits. We will need to work with these existing programs to harmonize the metric element of the data requested from grower suppliers.
- We have made progress in aligning SISC metrics with some of the buyer audit programs.
- "One-off" pilots (a single grower in a region) don't facilitate SISC's group learning proposition on group benchmarking and comparative analysis. The case studies where grower data could be aggregated were the most informative.
- Buyer-seller dynamics and "price" focused relationship makes sustainability discussion and pilot involvement more complicated.
    - Growers are often three steps or more removed from the buyer making supply chain discussion less clear and value of buyer surveys questionable.
    - There is push back on buyers looking to adopt metrics in sustainability surveys and ranking of suppliers – viewed as an "extra demand."

Lessons Learned

The following lessons were learned during the metric pilot activity:

- Pilots that addressed an opportunity or challenge for regional groups of growers were more successful in garnering interest than
- The context of crop production will be very important in analyzing metric results. The overlap of plant genetics (varieties), the environment (weather, soils) and management practices within a growing season and across seasons will have an impact. (See Figure 13.) What other factors could impact the metric results that without that information could skew the interpretation of the results?

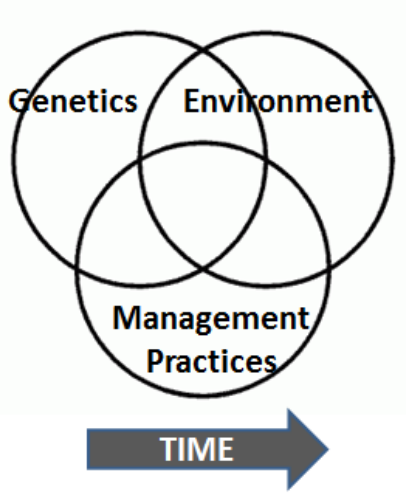


Figure 13: Impact of the "context" of metric results will be important for comparisons.

- Temporal comparison of metric results will be challenging given climatic impact on some metrics. Multi-year trend analysis will require sufficient long-term data sets to determine appropriate intervals for metric averages.
- A sponsor who provides a clear understanding of the value of the metrics can motivate a group of growers to participate in pilots
    - Farm Fresh Direct – metrics across growers' fields as part of a "more sustainable" variety trial providing benefits to grower, shipper and buyer (and consumer)
- Groups of growers involved in an existing industry sustainability program are more willing to augment practice assessments with metrics to better understand the relationship between practices and performance.
    - Examples: California's Sustainable Winegrowing Program and Almond Sustainability Program
- There is a small group of early adopter, motivated growers who are curious about how metrics can help them better manage their operations.
- A number of retailers and foodservice operators see the need for a set of standard metrics and are willing to implement them in their sustainable sourcing programs…when the time is right.
- Metrics are seen by the research community as a way to:
    - convey sustainability performance findings to growers
    - evaluate differences between sustainability programs
- Value was more evident after a grower went through the pilot experience. There were learning and "aha!" moments.
- Based upon mixed results for pilot recruiting, buyers in general do not have as much "control" over grower suppliers as was anticipated in terms of requesting data above and beyond their contractual obligations.
    - With a number of buyers introducing sustainability surveys with a metric component, growers are being pulled into providing quantitative data about their farming activities.
    - "Standardizing" a set of performance metrics will hopefully alleviate buyers creating their own to the detriment of suppliers interacting with multiple buyers.

- Data quality issues will have an impact on metrics results as was seen with obvious outlier data appearing in aggregated data analysis.

Objective 2: *Develop, refine and manage metric portfolio*

Metric Portfolio Management-
Grant partner Natural Resources Defense Council played a crucial and leading role in organizing the metric development effort, coordinating many of the Metric Review Committee (MRC) metric efforts, and managing the metric peer review process.

The previous SISC CIG grant (NRCS CIG 69-3A75-9-157) resulted in a portfolio of metrics that were the result of extensive MRC activity during the foundation building stage of SISC. Managing the portfolio consists of: publishing final working versions (designated "working" because they will be continually refined based on evolving knowledge) of metrics for use by the public; refining working metrics as new science or technology dictates; shepherding metrics through the MRC development process; and developing new metrics as the opportunity and need arises.

The Coordinating Council continued to play a vital role in directing metric portfolio activities. SISC staff used their input on prioritization to develop work plans for a core set of metrics identified to be most pressing for the industry and of highest economic interest to growers. Creating the highest likelihood for adoption was a key concern of the Council and a priority to try to build momentum for measure-to-manage approaches to specialty crop production.

During the final stages of the MRC process, the Council approved the formation of a Metrics Technical Advisory Committee (MTAC) to provide guidance for the following:

- Define a process to move draft metrics to working versions;
- Technical peer review - coordination of a written scientific review and actions taken on peer feedback; and,
- Public comment period oversight and actions taken on public input.

As part of the grant funding, SISC contracted with UC Davis' Ag Sustainability Institute (ASI) in the summer of 2012 to enlist researchers to provide a technical peer review of the candidate working metrics. The SISC Steering Committee and ASI developed a review design and implementation plan and seven faculty members with different areas of expertise provided written feedback on the metric itself, the protocol for data collection, weaknesses, strengths and key recommendations. The review was summarized for the Coordinating Council who then filtered the recommendations based upon metric development filters (e.g., data availability, cost of data collection, applicability to growers' operations). The metrics were then updated under oversight of the Metric Technical Advisory Committee. Overall, the reviews were favorable in terms of a good start to help growers focus on the right sustainability elements of their operations. Based upon feedback, the phosphorous metric was changed to include a soil phosphorous lab test component and nitrogen in irrigation water was added to the nitrogen metric. In some cases, however, reviewer's comments were about more complex aspects of the metrics (e.g., measuring water runoff, soil moisture monitoring data, a complete nitrogen cycle model) and will need to be addressed in future metric revisions.

After the technical review process was completed and the metrics modified as needed, a press release was issued in June, 2013, announcing a one-month long public comment period. The MTAC addressed over a dozen comments that were submitted via the SISC website. Most involved no change to the metrics

themselves but rather clarification of the explanation of the underlying science or usage guidance. Other suggested changes were added to a list of potential future enhancements of the metrics.

In September, 2013, SISC announced the release of its first suite of working metrics. The following succinctly described this significant milestone: "*Developed through unprecedented collaboration among growers, buyers and public interest groups, the new suite of metrics is intended to provide a science-based yardstick for assessing on-farm performance across key areas impacted by the production of fruits, vegetables and nuts.*" The transparent, repeatable, multi-stakeholder metric development process that forms the cornerstone of the SISC initiative had finally gone through an entire cycle!

SISC's Version 1.0 of "official" metrics include: Applied Water Use Efficiency, Energy Use, Nitrogen Use, Phosphorus Use and Soil Organic Matter. See Figure 14 for a high-level view of the metrics. The metrics are shown as per unit of production values but also are defined on a per acre basis.

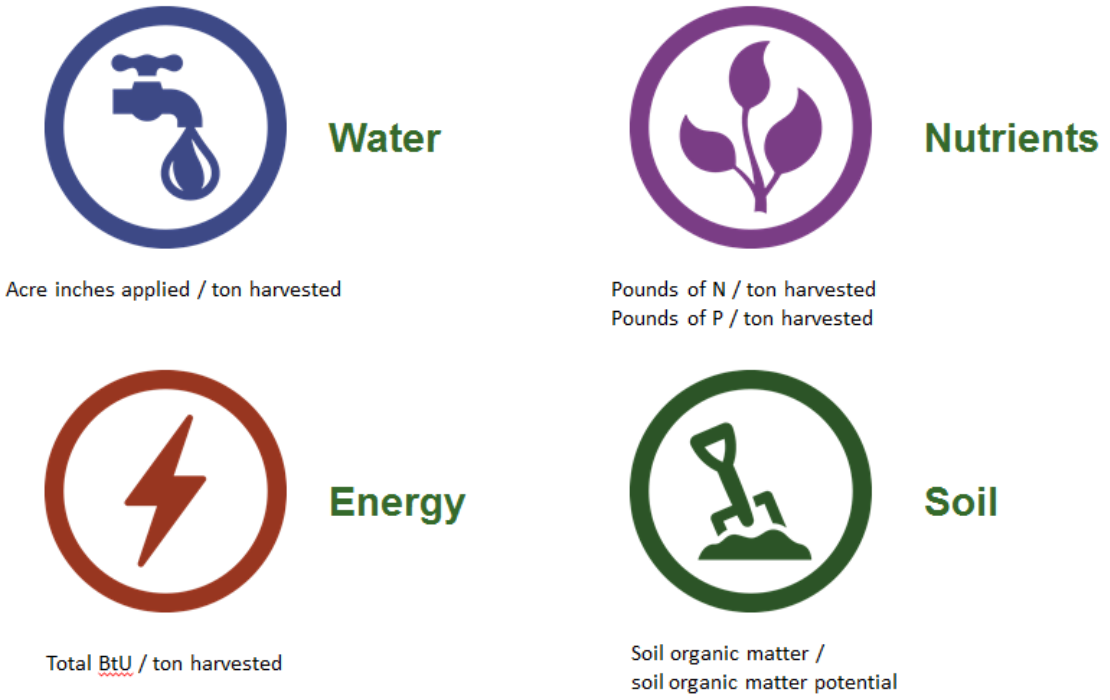


Figure 14: SISC working metrics V1.0. (See the following link for more detailed description of each metric: http://www.stewardshipindex.org/working_metrics.php)

The energy metric includes an allocation algorithm based upon usage of irrigation pumps, farm machinery for various activities, and contracted operations using machinery. The grower can use whole-farm data on fuel and electricity purchases to allocate to individual fields and crops. This was helpful to growers who do not currently track energy usage at the field level.

Ongoing Metric Development

Based upon the SISC experience and the changing dynamics of operationalizing sustainability within farming operations and across supply chains, the Council agreed that all future metric proposals must meet the following criteria:

- Practical and feasible
- Useful for improving management
- Currently being adopted by other initiatives

- Key variables are already captured in other metrics
- Additional data burden is low
- Scientific basis for the metric ensures a reasonable level of accuracy
- Enables the establishment of a baseline
- Market demand for the data already exists
- High confidence in the link to change desired exists

Combining these objectives with the work that had already been done on a number of other metrics, the Council prioritized metrics for further development into two groups: active development and on-hold.

Active Development

Greenhouse Gas Emissions Projection (formerly GHG Metric):
The greenhouse gas (GHG) metric working group renamed this metric the "Greenhouse Gas Emissions Projection" in order to emphasize the indicative nature of the estimate, an acknowledged level of uncertainty, and that it is not actually measured.

The MRC decided to recommend the use of the Cool Farm Tool (CFT - http://www.coolfarmtool.org/) as a tool to analyze farm level scenarios of GHG production. It was clear that it will take considerable work to come to an agreement on the models to use for accurate and precise estimates of on-farm GHG production. Until that time, growers will be able to use the CFT as a "directionally correct" method to examine the carbon footprint of some aspects of their farming and look for ways to reduce their carbon intensity of production.

To be consistent with the approach taken with the other initial metrics, a peer review of the CFT was done by two scientists with expertise in estimating GHG production on the farm and also in GHG production modeling. Their overall recommendation was to proceed with the approach and hope that the CFT adds more specialty crops and that a simple soil-derived GHG emissions model evolves as research progresses.

Key Feedback
- The CFT is user-friendly and a good starting point for estimating GHG emissions at the farm scale. Growers can use the tool to explore how they might reduce the carbon footprint of their farm.
- The primary focus on fertilizer, pesticides, and energy use characterizing upstream emissions is appropriate.
- For some regions, CFT needs to include embodied upstream energy of irrigation water.
- Calculating emissions per acre has obvious benefits for growers but it needs to be made clear that changes in practices that affect yield might change emissions per unit production.
- CFT would benefit from modifications for calculating soil-derived N_2O emissions and carbon sequestration in specialty crop systems. (*Note:* The DNDC model is a good candidate to address this issue.)
- There was a lack of clarity over whether all users will be able to include fuel use information for contracted operations.

Biodiversity & Ecosystems Metric:
Based on the results of pilot testing and continued feedback from metric workgroup members, the coordinators of this metric identified a need to further reduce the number of indicators, to revise or remove a number of indicators that are difficult to quantify, and to improve the definitions of terms included in the metric. There is also a clear need to develop an improved scoring method that is more

transparent and meaningful. Proposed ideas include framing the output of the metric as a weighted acre of habitat, which would better quantify biodiversity outcomes than the current scoring system.

Proposed changes to the metric will simplify and clarify the metric to make it more meaningful from a biodiversity perspective and to increase its utility for use by growers. The current proposal is to build a spatial tool to pre-populate percentages of different habitat types of non-crop vegetation for growers to validate. The habitat types would link to specific best management practices. Spatial data would be gathered from existing, freely available Landsat and Vegetation data and would enhance the metric in the following ways:

- Comparability across farms, regions, beyond
- Linkage of metrics more directly to habitat values
- Linkage of BMP's to existing habitat values
- Reduce/streamline response requirements
- Give new information to farmers

Next steps are to investigate the feasibility of developing the spatial tool, including identifying an implementation partner; and refining the metric language to reflect proposed, streamlined changes. (*Note:* The Field to Market initiative has recently developed a biodiversity tool that may be usable by SISC.)

Simple Irrigation Efficiency:
The Simple Irrigation Efficiency (SIE) metric measures how efficiently irrigation water is used to meet a crop's water demand. A grower can improve the SIE metric score by reducing losses of water to pathways that don't contribute to crop growth, including soil evaporation, percolation and run-off. As such, the SIE metric is an indicator of how productively the water resource is being used. The next steps for the SIE metric will include investigating a tool to help growers gather and track ETc for their fields.

On-Hold
Some metrics were put on hold because the MRC process had reached an impasse or there are pending parallel development efforts by other groups or the metrics were deemed to be of lower priority given current resources.

Air Quality:
The air quality metric has been put on a future development list due to the complexity of capturing data needed for the PM2.5 metric (i.e., fuel combustion particulates) and the geographically limited focus of air quality issues around PM10 (i.e., dust generation).

Pesticide Metric:
Developing a pesticide metric continues to be a challenge for SISC as well as other metric development initiatives. There is still strong sentiment that SISC leadership is needed in this space, and that bringing in outside expertise might prove fruitful in working towards a draft metric to be reviewed by the full Coordinating Council. The need for a pesticide metric is not going away - at least three initiatives where growers are being asked for pesticide usage data from their supply chains: Sysco Sustainable Program[1], Whole Foods Market's sustainable sourcing program, and the Equitable Food Initiative[2].

Agreeing upon a pesticide metric continues to be a challenge due to no agreement on several suggestions of how one would be developed that effectively addresses risk. A small working group of Coordinating Council members are considering three options:

[1] http://sustainability.sysco.com/sustainability-at-sysco/sysco-sustainability/
[2] http://www.equitablefood.net/

1. Measurement of the direction and degree of change of the use of high-risk pesticides as compared to the use of reduced-risk pesticides. This could be accomplished through initial benchmarking by a producer and then tracking use of both categories of pesticides overtime.
2. Tracking pest management expenditures for pesticide use compared to expenditures for IPM practices such as monitoring, biological and cultural controls, and other preventative measures.
3. Assessment of IPM practices used by a producer to avoid the use of high risk pesticides.

SISC has reached out to a national trade group to help frame the metric to provide an alternative approach but has not been successful in setting up a meeting. The primary sticking point appears developing a metric that includes an assessment of risk beyond EPA labeling.

One way to work through this hurdle is to create a metric that combines practice-based considerations with industry-accepted information about compounds. The grower community wants more information about their pesticide choices while also avoiding scenarios that would limit their options. In Protected Harvest's[3] Healthy Grown and Lodi Rules programs, there is an important lesson: a pest management metric could provide support in a crisis, distinguish a region or crop in the market, and garner credibility with regulatory agencies.

Packaging Metrics:
The packaging metric is not directly related to on-farm activities and there are other sustainable packaging initiatives that are working on packaging metrics. Given available resources, SISC will watch parallel efforts.

The MRC coordinator is involved in several other packaging initiatives and suggested metrics be used for decision making and not product comparisons. Suggested metrics are:

- Product/Packaging Relationship w/Product Loss
- Cube Efficiency
- Material Sourcing

Human Resources Metrics:
Agreement upon and completion of the labor metric has proven to be a challenge for SISC. Some of the elements are somewhat contentious in the ag community. The Coordinating Council decided to cease further development efforts and watch how parallel efforts to define agricultural labor metrics proceed in anticipation of broader adoption. One such ag-oriented coalition that has the backing of numerous farm labor organizations is the Equitable Food Initiative.

Fair Value/Fair Price:
This metric is on hold awaiting broader agrifood supply chain discussions on this complex concept.

Green Purchasing:
This metric is on hold due to its lower priority.

Community:
This metric is on hold due to its lower priority.

SISC Website Updated – Working Metrics Available

[3] http://www.protectedharvest.org/

The SISC website was updated to reflect metric portfolio management activity, most significantly the publishing of working metrics version 1.0. The metrics section of the website (see http://www.stewardshipindex.org/metrics.php) provides stakeholders information on the following:

Page	Purpose
Published Working Metrics 1.0	Information on working metrics including technical and data collection guidance
Metrics in Development	Information and status of metrics under development
Updates on pilot testing	Information on pilot activities
Our process	Description of the MRC process from development through publication
Metric calculator	Excel calculator download and user guide

The main page also includes video of an overview webinar of the current working metrics. The webinar was an outreach activity by the National Potato Council to potato growers across the US.

See Attachment B for screenshots and further description of the SISC website's metric section pages.

Challenges Encountered

- There are a number of factors that have set a slow but determined pace for metric development in some of the more complicated issue areas like pesticides and labor; the most important are limits to political will and sound science. This next phase of metrics represent inputs that are simply harder to quantify.
- Not all metrics may be quantitative in nature and some may need scoring associated with the use of best management practices.
- While extremely important to the overall process, the technical peer review needed to be grounded in the practical aspects of adoption by growers. As was seen in the university research farm case study, even in the most controlled environments, not all data is available and usable.

Lessons Learned

The following lessons were learned during the sustainability metric development activity:

- The fully built out MRC process that includes technical peer review and public comment is a robust and transparent metric development approach and a key asset and contribution of the SISC grant project.
- The MRC process can be streamlined by utilizing "experts" to help draft an early metric that can then be used as a strawman by the larger community of MRC participants.
- Publishing "official" working metrics brought a level of credibility to SISC signaling that the metric development effort was sound and metrics are ready to be used beyond just pilots.
- SISC should strive to collaborate with other metric development initiatives to either co-develop metrics or adopt metrics that fill the gaps in the SISC portfolio. The Cool Farm Tool is an example for the GHG metric.
- Establishing a criterion list for the "ideal" metric allows decisions to be made in the metric development process that will lead to greater levels of adoption.
- Metrics that have a direct link to the economics of farming are the best candidates for early adoption.

Objective 3: *Governance, outreach and tool development*

The SISC initiative process continued according to its founding concepts of transparency and consensus building. Staff members have maintained a rigorous outreach agenda and regular points of contact with all Coordinating Council members and Metric Review Committees. Certain subgroup meetings have been convened to address core categories of business, including stakeholder groups, regional groups, crop-specific groups, and supply-chain-specific groups. The number of individuals engaged in the SISC process continues to grow.

Governance
Ag Innovations Network was funded by the grant to manage the governance, outreach and facilitation activities for the project. Bi-weekly Steering Committee meetings and bi-monthly Coordinating Council meetings were held to provide leadership for the project. Meeting notes were provided to participants to provide transparency and document our progress and decision making. SISC governance was spearheaded by the six-member Steering Committee comprised of two members from each of the three constituent groups – growers, buyers and NGOs. The Steering Committee provided guidance and oversight to the project activities. In-person CC meetings were held in: February, 2012 in San Francisco, CA; October, 2012 in Anaheim, CA; and July, 2013 in San Francisco, CA. The October, 2012 meeting was held in conjunction with the Produce Marketing Association's (PMA) annual conference where as part of the conference proceedings, a session on metrics was held with a vegetable grower/shipper (Ocean Mist Farms) and a retailer (Walmart) discussing two perspectives on SISC performance metrics.

The tripartite Coordinating Council has been a hallmark of the success of the SISC initiative. As members leave, maintaining the high-quality composition of the group is of utmost importance to the continued collaborative spirit of the group. During the course of the project, new members were added from Campbell Soup, Safeway, Unilever, and The Nature Conservancy.

Another important role that the Council provides is to help set the parameters of a strategic plan for SISC. CIG grant funding provided a foundation to get through its infancy as the sustainability movement has evolved. SISC staff worked to develop a longer-term institutional structure and funding plan. Various scenarios for SISC going forward were discussed and deliberated and the associated financial needs and hurdles were estimated. The Council believes that the core competency of the group revolves around developing, maintaining and refining the SISC suite of metrics. The development of information technology platforms to collect, aggregate, report on and share metric results is a bigger and substantially more costly element of SISC's initial aspirations. It was agreed that other initiatives or companies will be working on these sorts of platforms and SISC should keep its eyes on potential service providers and/or partners. Fund raising activities were being planned at the end of the grant period.

As the SISC initiative matured and evolved, three technical advisory committees were established that consist of Coordinating Council members that will address more specialized objectives:

- Metric Evolution: Develop process for transitioning from "pilot" to "working" metrics
- Metric Terms of Use: Develop protocols for the use of SISC metrics by industry
- Future Funding: Develop plan for financial sustainability of SISC after the period of our CIG ends.

Outreach – Communication Materials
Keeping participants, stakeholders and the broader industry abreast of SISC activities and accomplishments has been critical in showing momentum and progress for the initiative. A communications plan was developed that guided tactical outreach activities and included the following elements:

- Key messaging
- Audience-specific brochures
- Talking points and FAQs for SISC champions
- Media strategy
- Revisions to the pilot landing pages of the website
- Case studies

A key electronic outreach mechanism has been the SISC website. Ongoing management of the website included adding new content and sending out email blasts to registered participants as new activities, documents or announcements were added to the site. To coincide with the release of the working metrics, the site was given a major reorganization and update based upon recent SISC activities and included a revised metrics section with full supporting documentation of the working metrics.

As a key element of the SISC outreach and communications plan, SISC staff and Coordinating Council members met with numerous grower organizations, buyers, other sustainability initiatives and non-profits. Presentations and talking points were created that provided consistent and simple messaging on the SISC initiative and value to the specialty crop industry. Presentations and discussions encouraged participation in the SISC process and sought feedback on metrics, tools and protocols developed to date. Groups and venues included: Monterey County Sustainability Working Group, California Department of Food and Agriculture, Ag Water Stewardship Initiative, Sustainable Ag Expo, CA Resource Conservation Districts annual meeting, United Food Show, Grower Shipper Association, CropLife America, California League of Food Processors' Ag Production Committee, National Initiative for Sustainable Agriculture, Agriculture Retailers Associations, Georgia Fruit and Vegetable Growers Association, FMI/GMA Food Sustainability Summit, and The Sustainability Consortium's Member Summit.

Three new versions of the SISC brochure were developed to target the grower, buyer and general audiences to provide an update on the SISC project and specific messaging to promote adoption of metrics. The brochures were distributed at events that SISC project collaborators and coordinating council members attended. (See images of the brochures in Attachment C.)

The brochures represented the "collective wisdom" of the SISC participants to date and a means to primarily convey the benefits to specialty crop supply chain members and a broader group of stakeholders. It was a key strategy of the project to share progress and reinforce the vision of the usage of performance metrics. A benefits summary by supply chain member from the program update brochure is shown in Figure 15.

SUPPLY-CHAIN BENEFITS

	GROWER/ PRODUCER	SHIPPER/ PROCESSOR	RETAIL/FOOD SERVICE BUYER
Provides growers with free tools enabling "measure-to-manage" within their operations	■		
Provides a common foundation for industry to use in benchmarking and communicating sustainability performance	■	■	■
Minimizes the proliferation of "proprietary" reporting requirements in the supply chain	■	■	■
Is pre-competitive – does not impact any company's ability to differentiate itself from its primary competitors	■	■	■
Encourages continuous improvement and increased awareness	■	■	■
Complements, rather than competes with, programs addressing other aspects of operational sustainability		■	■
Unites all supply chain participants in answering the question: "How is our industry contributing to business, ecosystem and human wellbeing?"	■	■	■

Figure 15: Benefits by supply chain member chart from the Program Update brochure conveys value propositions of SISC initiative.

Broader trade and media outreach was done through press releases on project updates and announcements Press coverage included articles specifically on SISC and broader sustainability and metric development initiatives. Media outreach and speaking engagements are listed below under **References**.

Outreach – SISC Metric Adoption/Implementation
While the adoption of SISC metrics has been slower than anticipated, there are encouraging signs that businesses and organizations see the benefits of using a suite of metrics that was developed using SISC's multi-stakeholder approach. Buyers have commented that they value the approach because it provides credibility that they would not have if they had developed them internally. The collaborative MRC process provides a wide set of perspectives in the design and development of the metrics.

The following are examples of SISC metric adoption by buyer and association sustainability programs:

- Walmart used SISC metrics in their Produce Sustainability Assessment with fruit and vegetable suppliers. After piloting the assessment, it was deemed to be a data management challenge for the purchasing group to collect year-over-year detail quantitative data at the grower level and the effort was put on hold. Walmart is now using an approach made available by The Sustainability Consortium (TSC) to collect qualitative key performance indicator (KPI) information for consumer products. A number of products in their Food, Beverage and Ag Sector have numerous KPIs for the crop production section of the supply chain. SISC has been an invited participant in the TSC sector to share learnings on developing on-farm quantitative metrics and the challenges of adoption by producers.
- Whole Foods Market has incorporated some SISC metrics into their supplier assessment that will be launched later in 2014. The details of the assessment have not been published so it is not clear which specific metrics were included.
- The California-Arizona focused Western Growers Association has been a strong SISC partner and has always seen the value of providing a mechanism for their members to use metrics to benchmark their performance and compare themselves to their peers to drive operational improvement. Western Growers is in the process of implementing a web-based software tool that

utilizes the SISC metrics and underlying calculation algorithms to provide a metric calculator and aggregation/reporting service to its members.
- The Sustainable Winegrowing Program chose to use SISC metrics as a foundation for their metrics calculator that complements their practice self-assessment program started in 2002.
- The Almond Board of California collects quantitative data on nutrient use, water use and energy use as part of their California Almond Sustainability Program. Data was used in a SISC case study to calculate SISC metrics across four years for nitrogen and water use.

SISC also continued to collaborate with other agriculture metric initiatives to both stay abreast of progress as well as look for areas of overlap and sharing of metric insights, adoption mechanisms, and challenges. SISC staff interacted with the following metric initiatives: Field to Market, the EU-based Sustainable Agriculture Initiative, Cool Farm Institute, The Sustainability Consortium, Dairy Management Inc., and the National Initiative for Sustainable Agriculture. Discussions were held around harmonization of metrics to improve existing metrics, avoid duplication of efforts and potential leveraging of existing software. While the discussions have been enlightening and keep SISC "at the table" in terms of being a credible initiative, each effort has a different set of stakeholders with slightly different goals and objectives. Unfortunately, unless there is a compelling reason to create a "master" metric suite, future harmonization remains uncertain.

A key take away from the discussions with other metric developers has been that we are all in the same situation – struggling to get growers to adopt metrics as a management tool due to a lack of a clear and compelling value proposition. Even the initiatives with sophisticated web-based metric calculators are challenged to get growers to use their software. It was encouraging, however, to hear about pilots where supply chain partners are using the metrics in regional sourcing areas to document sustainability success stories and opportunities.

Tool Development – Current Needs
One of the important learnings from the previous CIG grant pilot efforts was that an electronic calculator was needed for growers to input data needed for metrics calculations and to display the metrics results. The tool would be much more efficient than the previous method of growers sending data into a central location and metrics calculated and sent back to the growers.

As a stepping stone to a more sophisticated web-based tool that may be developed in the future with appropriate funding, grant partner NRDC developed an Excel workbook that streamlined data collection, metric calculations and metric result creation. From the outset, the calculator was viewed as a prototype that would help guide the development of a more sophisticated tool. Limitations of using Excel included different versions of Excel being used by growers, pick list updates and bug fixes required a new download of the Excel file, and limited user interface design features. Despite the limitations, the calculator was a success based upon feedback from SISC pilot participants and proved that a specialty crop calculator could be developed and deployed.

The calculator Excel workbook has different sheets used for user guidance, data entry, calculations, report creation, and user feedback. Underlying metric calculation algorithms and reference data were built into the workbook. A sophisticated energy allocation algorithm was embedded for the energy use metric. Metric results can be displayed on either a yield (per unit of production) or area (per acre) basis. Screenshots of the calculator are presented in Attachment D.

For the 2012 pilot and several of the 2013 pilots, growers downloaded the calculator from the SISC website and used it to complete their pilot data collection and metric calculations. They then emailed the

Excel file to SureHarvest who then compiled the results for overall pilot reporting and, in some cases, aggregated the individual grower/field data for further analysis and reporting of anonymized results.

Tool Needs Assessment & SISC Strategy
An on-going discussion by the SISC Coordinating Council has been around the need for a metric calculator and data management platform to support the ultimate vision of metric results reporting and sharing amongst growers and their peers, supply chain partners and other stakeholders. This is a complex undertaking that requires a needs assessment and strategy planning step to understand the scope of such an effort and to create a blueprint for the future to guide organizational and budgetary planning.

A draft tool development needs assessment and strategy was developed so that the Steering Committee and Coordinating Council could visualize the various dependencies and phased implementation steps. The strategy is comprised of three phases: A) Phase 1 – SISC is a metric portfolio management body that develops, approves, and publishes metrics and guidelines for calculations that could be used by software developers in their farm management or sustainability products; B) Phase 2 – SISC works with third-party software providers within some form of a business licensing arrangement for the use and implementation of the SISC metrics; and C) Phase 3 – SISC promotes a data aggregation platform for software providers to interact with to promote broad aggregation reporting and data sharing between supply chain partners. The phases represent an evolutionary path as seen in Figure 16.

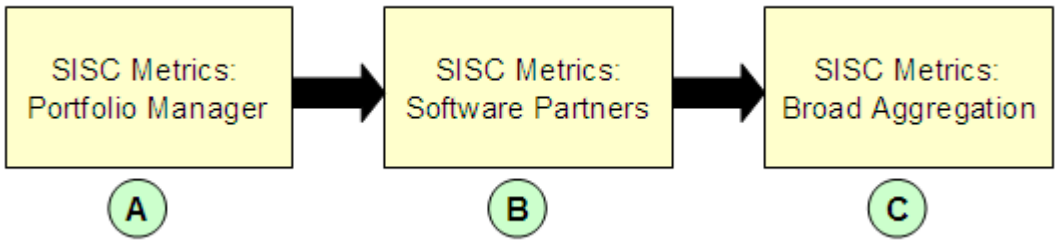


Figure 16: Evolutionary phases of the SISC initiative from metrics development through data aggregation and sharing platform provider.

To date, SISC has been focused on Stage A and would like to move to Stage B to promote adoption of SISC metrics and provide a means for growers to have access to SISC metric calculations. Based upon success in Stage B, SISC could then determine in Stage C how a data aggregation hub could be used to provide broader aggregation of metric results for growers and supply chain members. There is agreement that the role of SISC as a metric portfolio management body is critical to its original goals of providing a "standard" set of performance metrics for the specialty crop sector.

The key strategy for tool development will be to use the current Excel-based calculator as an example of a metric calculation implementation so that third-party software providers have a feel for what a web-based tool might look like. SISC staff had discussions with several software providers about the logistics of a SISC component in their software. It will be critical for SISC to establish protocols for the use of SISC metrics by the industry, in order to protect the credibility of our multi-stakeholder process and to leverage the value of that process in ways that provide ongoing support.

A number of on-farm crop recordkeeping software products already exist in the market and ideally SISC metric calculations could be added to them. SISC will need to work with the software companies on "terms of use" of the metrics (e.g., licensing fees as appropriate, how will they be used by growers and buyers), how they might aggregate data in reports, and how they would maintain the metric calculations

as revisions are released by SISC. Other software products are also being introduced to support buyer sustainability programs (e.g., Whole Foods Markets' program) and association sustainability programs (e.g., Western Growers' Toolbox) and will require their developers to have ongoing interaction with SISC.

The final stage of the SISC vision is represented in Figure 17 which depicts the many technology pieces that will need to be coordinated and integrated to enable a SISC aggregation platform. Existing software tools are shown as examples of the types of systems that could be used to collect, calculate and share metric data. The architecture would support and build upon databases of crop/region-specific data that could be developed for peer learning & continuous improvement, ideally driven by commodity associations such as existing efforts by California's winegrape and almond industries. The region/crop-specific databases could then be rolled up into a national/international database for peer comparison on a crop-by-crop basis. The university research community, extension system and USDA would also benefit from this robust data pool.

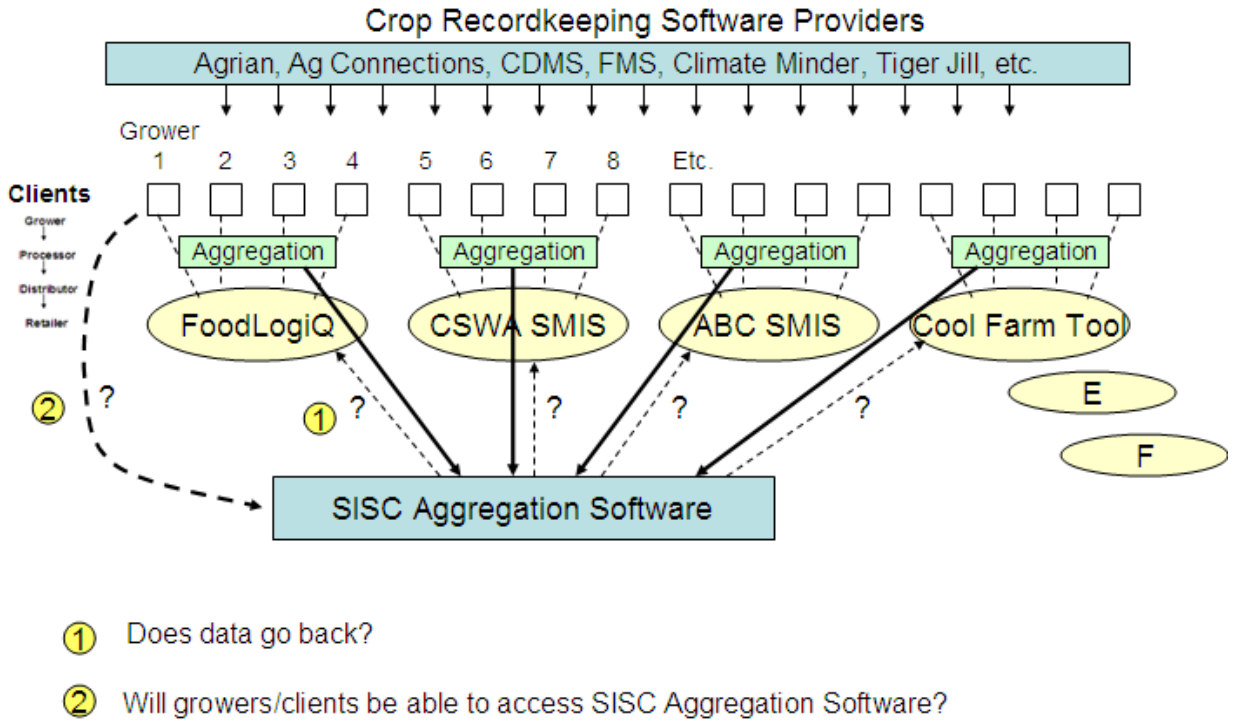


Figure 17: Complexity of many software products and platforms that lead to a technically complex development and implementation process for a SISC aggregation software tool.

A critical element of any data aggregation scheme is data security and confidentiality. As we have learned in the SISC pilots, growers are quite concerned about who would be able to see their data and how it might be used – both from a negative and positive perspective. We have also seen that the context of metrics results is important for anyone who is interpreting and drawing conclusions from the data. Figure 18 is taken from the work done during the first SISC CIG grant (NRCS CIG 69-3A75-9-157) and represents the complex rules and agreements that must be developed to protect data and enable data sharing between grower peer groups, supply chain partners and other stakeholders. Combined with Figure 17, it is clear that there is much ground for SISC to cover before reaching this ambitious goal.

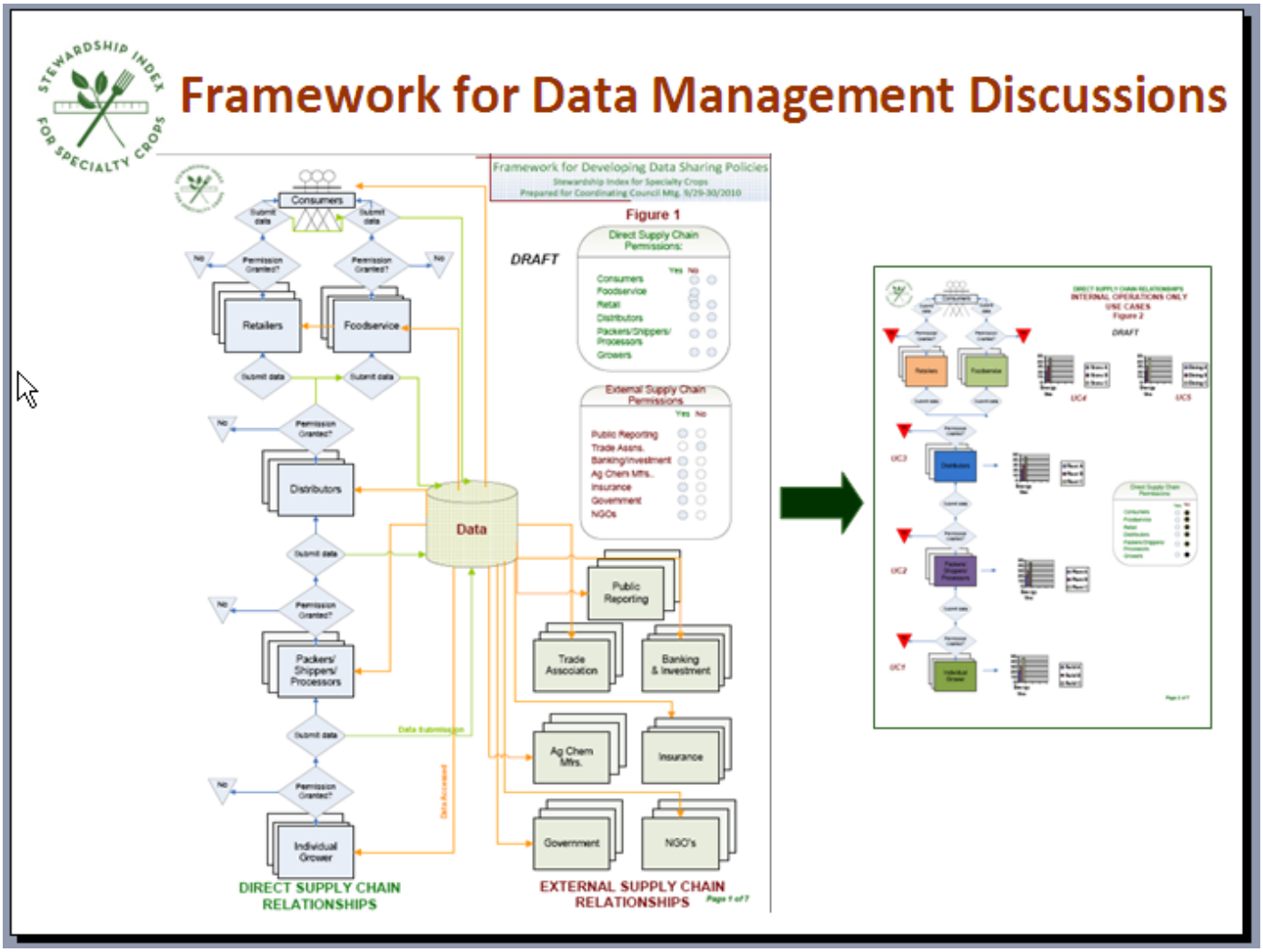


Figure 18: Data management and sharing framework for supply chain partners developed in the previous SISC CIG grant.

Challenges Encountered

The following were challenges encountered during the governance, outreach and tool development objective:

- Based upon discussions with other metric initiatives, the challenge ahead is grower adoption and providing tangible case studies on the short-term business value of year-over-year metric comparisons.
- Other metric development initiatives are not ready to undertake a serious harmonization effort due to different objectives of each. SISC will continue down its prudent path.
- Excel-based grower tools are not ideal and have much overhead in terms of updates, bug fixes, different software versions used by growers and support.
- Software development takes more resources than anticipated and will require significant investment to realize SISC's ultimate vision.

Lessons Learned

The following lessons were learned during the outreach, governance and tool development activity:

- Active governance and the tripartite Coordinating Council has been a hallmark of the success of the SISC initiative. Leadership and an ongoing commitment to the original vision are keeping the effort moving forward despite challenges and slower metric adoption than hoped for.
- SISC continues to be recognized as an important multi-stakeholder initiative that is providing value to the industry. SISC's metric development process is a key "selling" point to buyers based upon overall credibility and transparency of the process.
- Keeping participants, stakeholders and the broader industry abreast of SISC activities and accomplishments has been critical in showing momentum and progress for the initiative.
- The benchmarking and long-term performance tracking elements of the metrics fit with continuous improvement philosophies that are part of buyer and association programs that are being launched.
- Adding metrics to existing practice-based sustainability programs is a natural step forward and has a participant group more willing to try metrics.
- Buyers are trying to motivate the industry - need to take a first step or it won't happen on its own
- The Excel-based calculator was a relatively low cost and valuable prototype for growers to experience how a metric calculator would work.
- It will be critical for SISC to establish protocols for the use of SISC metrics by the industry to ensure appropriate use and comparable results from different software products that choose to embed the metric calculations.

Significant Project Results:

Objective 1

- Created 5 case studies showing both the value and limitations of collecting and aggregating metrics data.
- Identified some of the important challenges agriculture faces in terms of using performance metrics on the farm – metric result variability, data quality, temporal impacts, etc.
- Got an excellent read on the readiness (or not) for many specialty crop growers to use performance metrics in their farming operations.

Objective 2

- Completed a full cycle of the MRC process and published Working Metrics Version 1.0
- Five metrics scientifically peer reviewed, offered for public comment and then released for general use, along with (1) suggestions for further refinement, and (2) detailed background information and supporting technical guidance.
- A prioritization process was defined to determine which metrics should be developed going forward and which are candidates for collaboration with other metric initiatives.

Objective 3

- Created a strategic plan that defines three evolutionary phases for SISC to move from managing the metric portfolio to embedding SISC in existing grower-oriented software products to developing a broad metric data aggregation and sharing platform.Developed and used an Excel-based metrics calculator in pilots to serve as a prototype for future metric calculator tools.
- Positioned the SISC Steering Committee and Coordinating Council to become a self-funded initiative.
- Presented on the topics of sustainability in general and measure-to-manage in particular at numerous specialty crop industry events thereby gaining significant exposure for the SISC initiative.
- Represented SISC at like-minded industry alliances including Field to Market, The Sustainability Consortium, and The Sustainable Food Lab.
- Conducted email and public relations campaigns to promote the launch of Working Metrics Version 1.0 and related free calculator tool available on the SISC website.

- Developed and used an Excel-based metrics calculator in pilots to serve as a prototype for future metric calculator tools.

Conclusion and the Transferability of Results:

Through this CIG project, NRCS was able to build on the previous CIG grant's funding (NRCS CIG 69-3A75-9-157) of the successful establishment of the SISC initiative to further advance the adoption of measure-to-manage tools for specialty crop growers and supply chain partners. The formalized multi-stakeholder metric development and governance structure has been well received by those organizations looking for a suite of vetted performance metrics that are ready for implementation.

As shown in this project, we are making progress in raising the awareness of the applicability of measure-to-manage but still need to find those "triggers' that will resonate with growers to incentivize adoption of performance metrics. As participants in other metric initiatives are finding, the intersection between economics and environmental conservation is the sweet spot for US specialty crops growers. Figure 19 represents the challenges of technology adoption and the diffusion of innovation as described in *Crossing the Chasm*[4] which documents the phenomenon of adoption of new technologies or ideas and the reality of the "chasm" that exists between early adopters and the rest of the population. If value is not established, the main "target" group will never be reached. We think this is the current state of performance metrics – we need the strong business case to drive adoption.

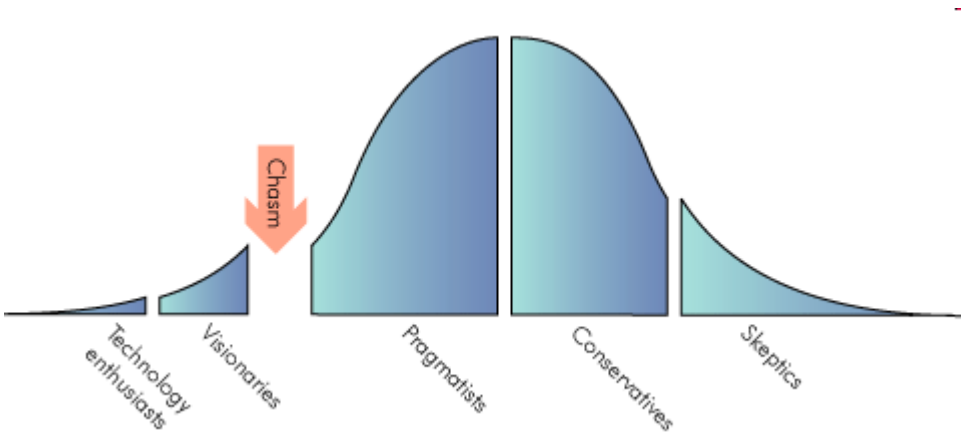


Figure 19: Technology adoption model with chasm that must be crossed to reach the larger target market. Value and need create the bridge across the chasm.

The transferability and impact of this project has been seen already through the usage of SISC metrics in programs developed by groups such as the California Sustainable Winegrowing Alliance, the Almond Board of California, Whole Foods Market, Western Growers, and Walmart. The Sustainability Consortium is also learning and incorporating findings from the SISC experience which will have an influence on retailers and foodservice operators and their food suppliers. A number of growers and food companies are using the SISC metrics to better understand their crop production activities. The concept of ecosystem services continues to evolve with the USDA's Office of Environmental Markets playing an important role in linking conservation efforts to market-based incentive mechanisms that will drive the need for quantitative performance metrics such as SISC's. Additionally, SISC staff has had discussions with NRCS staff on strategies to embed metrics in grower programs such as EQIP and CSP where metrics may help quantify impacts resulting from conservation practice improvements.

[4] Geoffrey A. Moore, *Crossing the Chasm.* Harper Business Essentials, 1991.

These efforts represent a good starting point and significant progress has been made, but there is much to be learned still. SISC is a complex undertaking with differing levels of expectations of the impact and timing of widespread adoption. Over the next five to ten years, we will see a more collaborative food system proactively addressing resource constraints and a growing population, one in which we will be asking "how are we doing from a financial, environmental and social perspective?" SISC has positioned itself with the help of CIG grant funding to be a participant in answering this question.

References:

The following is a list of articles and presentations featuring SISC during the CIG grant period:

McCormick, R., York, T. (26 October 2013). Capitalize on Your Sustainability Efforts: Reach a Consumer Base That Cares and Buys. *Produce Marketing Association Fresh Summit Convention & Expo*. Panel discussion in Anaheim, CA.

Karst, T. (24 September 2013). Stewardship Index for Specialty Crops Releases Version 1.0. *The Packer*. Retrieved from http://www.thepacker.com

Karst, T. (12 September 2013). United Fresh Sustainability Tool Draws Attention. *The Packer*. Retrieved from http://www.thepacker.com/fruit-vegetable-news/United-Fresh-sustainability-tool-draws-attention-223515171.html

O'Connoll, J. (2 September 2013). Farmers, Buyers Partner on Sustainable Production. *Capital Press*. Retrieved from http://www.capitalpress.com/article/20130902/ARTICLE/130909998

Arnold, A., (10 April 2013). Quantitative tools and performance indicators for the farm and in a sustainable sourcing program. *Sustainable Food Lab 2013 Summit*. Panel discussion in Annapolis, MD.

Karst, T. (27 June 2012). Stewardship Index Ramps Up Pilot Projects. *The Packer*. Retrieved from http://www.thepacker.com

Nassif, T., Wegner, P. (25 January 2012). Agriculture Must Engage in Conversations About Change. *Ag Alert*. Retrieved from http://www.agalert.com/story/?id=3761

Cable, S. (19 January 2012). Stewardship Index Makes Impact in Fresh Produce Industry. *The Packer*. Retrieved from http://www.thepacker.com

Karst, T.. (5 January 2012). Stewardship Index Focuses on Four Core Metrics. *The Packer*. Retrieved from http://www.thepacker.com/fruit-vegetable-enewsletter/packer-daily/Stewardship-Index-focuses-on-four-core-metrics-136692558.html

Ohmart, C. (29 September 2011). Measuring Sustainability. *Wines & Vines*. Retrieved from http://www.winesandvines.com/template.cfm?section=columns_article&content=91451&columns_id=41#

Other interaction and discussions with:

- USDA NRCS staff
- The Sustainability Consortium's Food, Beverage & Ag sector group

- Innovation Center for U.S. Dairy
- Field to Market sustainability initiative for commodity program crops
- Food retailers such as Safeway, Walmart, Whole Foods, Target, Sysco, etc.

In the space below, provide the following in accordance with the Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:

a. A listing of EQIP-eligible producers involved in the project, identified by name and social security number or taxpayer identification number;

To preserve grower anonymity essential for achieving our grant objectives, we are unable to provide the above information for growers participating in the pilot testing portion of the project.

b. The dollar amount of any direct or indirect payment made to each individual producer or entity for any structural, vegetative, or management practices. Both biennial and cumulative payment amounts must be submitted.

No direct or indirect payments were made to growers during the reporting period.

c. A self-certification statement indicating that each individual or entity receiving a direct or indirect payment for any structural, vegetative, or management practice through this grant is in compliance with the adjusted gross income (AGI) and highly-erodible lands and wetlands conservation (HEL/WC) compliance provisions of the Farm Bill.

No direct or indirect payment from this grant has been made to individual producers or entities for any structural, vegetative, or management practices.

Project Funding Received and Expended – Expenditures Summary Across Objectives
NRCS 69-3A75-11-216

	NRCS CIG	In-Kind Match	Cash Match	Total
Personnel	$330,306.93		$98,389.96	$428,696.89
Benefits	$58,289.33		$17,362.72	$76,652.05
Travel	$21,136.88		$5,952.22	$27,089.10
Equipment				
Supplies				
Contractual	$352,059.86		$315,257.10	$667,316.96
Other		$357,992.00		$357,992.00
Total	$761,793.00	$357,992.00	$436,962.00	$1,556,747.00

Attachment A. Case Study Example – CA Processing Tomatoes

The following case study provides an example of how food processors and their grower suppliers can use metric results for nitrogen use and water use to determine how to collectively address water quantity and quality issues in California's Central Valley.

California Processing Tomato Industry

The California processing tomato industry is an important sector of the state's agricultural and food processing industry. The industry produces over 90 percent of U.S. production and roughly 35 percent of global production.[5] The ideal environment for growing tomatoes is confined to the San Joaquin and Sacramento Valleys. There are roughly 15 tomato processors in the state that rely on tomato production from over 250,000 acres.

Challenges

As with other crops in California, water availability and water quality issues are causing growers to evaluate their farming practices to ensure optimal efficiencies from both an economic and environmental perspective. The lens of sustainability provides an ideal framework to better define best management practices (BMPs) and performance outcomes to help the industry address these challenges.

Another dimension of better understanding the sustainability of farming and processing activities is the supply chain transparency that buyers are beginning to expect from their suppliers. Processors are being asked to complete sustainability surveys that include questions about their grower suppliers' water usage, nutrient usage, pest management, energy management, etc. The surveys have a mix of questions about BMPs and performance (i.e., quantitative data that may include metrics) that are aimed at identifying improvement opportunities for suppliers.

Stewardship Index for Specialty Crops (SISC) Value

The Stewardship Index for Specialty Crops (SISC) is one answer to the complex question of what sustainability means for producers and consumers of specialty crops (fruits, vegetables and nuts).

SISC aims to advance both optimal production and strong environmental protection by offering a suite of science-driven metrics empowering producers to measure outcomes of on-farm practices (i.e. water use, nitrogen use, etc.) accurately and consistently. Metric data give producers, food buyers and consumers a common language for discussing the impact of farming practices – and the meaningful stewardship activities of U.S. farmers.

SISC is a coalition of producers, buyers, and public interest groups who are collaborating to develop and share metrics that all parties agree are the most important indicators of stewardship.
By developing, refining and promoting farmer-tested tools that anyone can use to measure performance, SISC is aligned with many other initiatives globally in advocating for measuring specific outcomes rather than endorsing the use of less accountable 'checklists of practices' that many businesses have been asked to use.

[5] http://anrcatalog.ucdavis.edu/pdf/7228.pdf

This case study provided SISC an opportunity to work with and learn from a geographically confined industry about the process of collecting field data for a single crop season, calculating metrics results, aggregating the results and providing graphics that growers and processors can use to further the discussion on water stewardship and nutrient management.

Participants

The following processors participated in the case study:

- Campbell Soup Company
- Del Monte Foods
- Los Gatos Tomato Products
- The Morning Star Packing Company
- Olam Spice & Vegetable Ingredients

Some of the processors are branded food companies while other processors provide private label products. Some may also provide processed tomato ingredients to other food companies. The companies also vary in terms of having established internal sustainability programs. It is typical for growers to deliver tomatoes to multiple processors.

Case Study Results

Data Collection & Analysis

The five participating processors recruited growers to provide data using an Excel spreadsheet to collect data. Data was submitted to SureHarvest for aggregation and analysis. All data analysis anonymized both processor and grower names to ensure a high degree of data confidentiality. The scope of this case study was to provide processors and growers with a high-level view of the aggregated data but not a detailed report for each grower.

Data was submitted by 57 growers for a total of 328 fields representing over 26,000 acres of processing tomato production. This acreage represents approximately 10% of the harvested acreage for the 2013 season.[6]

The following data was submitted for each field:

- Processor name
- Grower name
- Field name
- County
- Field acres
- Harvest yield (tons/acre)
- Applied irrigation water (acre-inches)
- Method to determine irrigation volume (estimate or meter)
- Irrigation system type
- Total nitrogen applied (lbs/acre)
- Source of nitrogen (commercial or compost, manure or cover crop)

[6] http://www.nass.usda.gov/Statistics_by_State/California/Publications/Vegetables/201308ptom.pdf

Fields were located in Colusa, Contra Costa, Fresno, Kern, Kings, Merced, San Joaquin, Solano, Stanislaus, Sutter and Yolo counties.

The average yield for the 328 fields was 47.8 tons per acre.

Nitrogen Applications
Average pounds N applied per acre = 205.8[7]
Minimum = 90, Maximum = 600

Only 3% of the fields applied compost, manure or used cover crops as a source of nitrogen.
Growers were not asked to supply N content of irrigation water as a potential source of additional N applied.

Irrigation Water Applications
Average acre-inches irrigation applied = 32.3
Minimum = 14, Maximum = 104

For those growers who provided responses to "method of measuring applied irrigation," 52% of the fields estimated volumes compared to using meters.
60% of the fields were irrigated using drip technology and 33% used furrow.

Note: Some processing tomato growers experienced yield losses during the 2013 season due to a curly top virus outbreak in certain Central Valley geographies. This would impact the per ton harvested metric results.

Metric Results

This case study focused on the SISC nitrogen use and applied water use efficiency metrics.

Nitrogen Use
Nitrogen is a key nutrient for crop production. However, when transported off the farm, it poses an economic loss to the grower and can have detrimental impacts to surface and groundwater quality. Nitrogen lost to the atmosphere as nitrous oxide (N_2O) is a potent greenhouse gas, with ~300 times the global warming potential of carbon dioxide (CO_2).

The Nitrogen Use metric aims to capture the most significant sources of nitrogen being added to the farm system. It includes nitrogen from synthetic and organic fertilizers, nitrates dissolved in irrigation water, and nitrogen fixed from the air by leguminous crops. By accounting for all of these significant sources of nitrogen, a grower should be able to increase the efficiency of nutrient use in crop production.

Note: It was agreed by the processors for the purposes of this case study that to maximize the amount of data collected, growers would not report on nitrogen in irrigation water or nitrogen associated with leguminous cover crops or crops in a previous rotation. This speaks to the challenge of getting some elements of metric calculations.

[7] Results from a 2013 UC Davis study showed that the average N usage for processing tomatoes in 2005 was 182 pounds per acre. http://californiaagriculture.ucanr.edu/landingpage.cfm?article=ca.E.v067n01p68&fulltext=yes

The graphic below describes the SISC nitrogen use metrics.

Nitrogen Use = **Pounds N added to system** / **Ton of product harvested**

Notes:

- *N inputs include:*

$$N\ applied_{synthetic} + N\ applied_{organic} + N\ applied_{irrigation\ water} + N\ fixed_{leguminous\ crops}$$

- *Includes all fertilization events from the end of the previous harvest to the current harvest (non-cash cover crops applied to subsequent cash crop).*
- *For educational purposes, metric can also be presented on a per-acre basis as:* **Pounds N added to system /acre planted**

Note: N content of irrigation water was not requested from growers.

Figures 1 and 2 display the metric results for the submitted nitrogen use data for all fields. (Note the probable outlier data in the 550+ pound per acre and 17+ pounds per ton ranges. Filtering these values is an important activity in any metric study.)

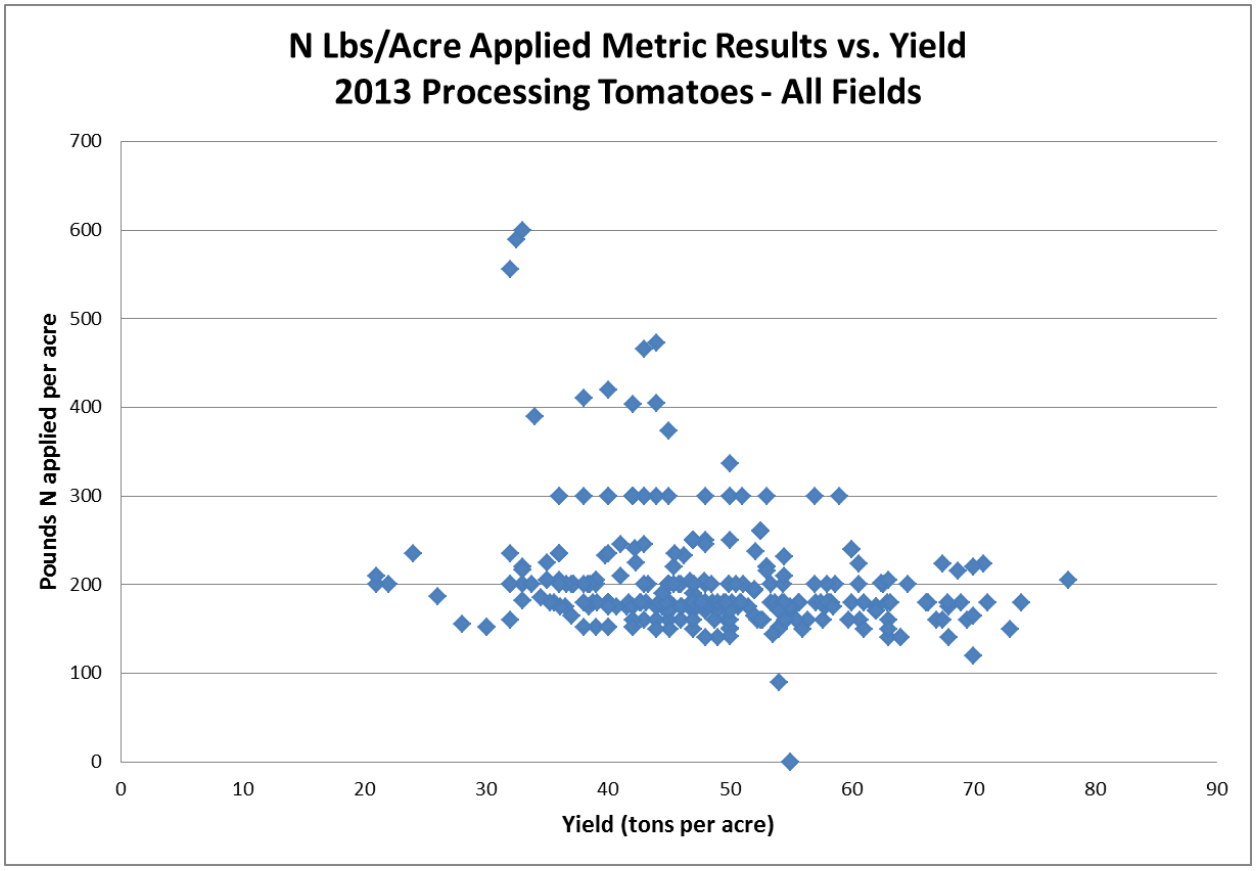


Figure 1: Nitrogen applied per acre vs. yield for all fields

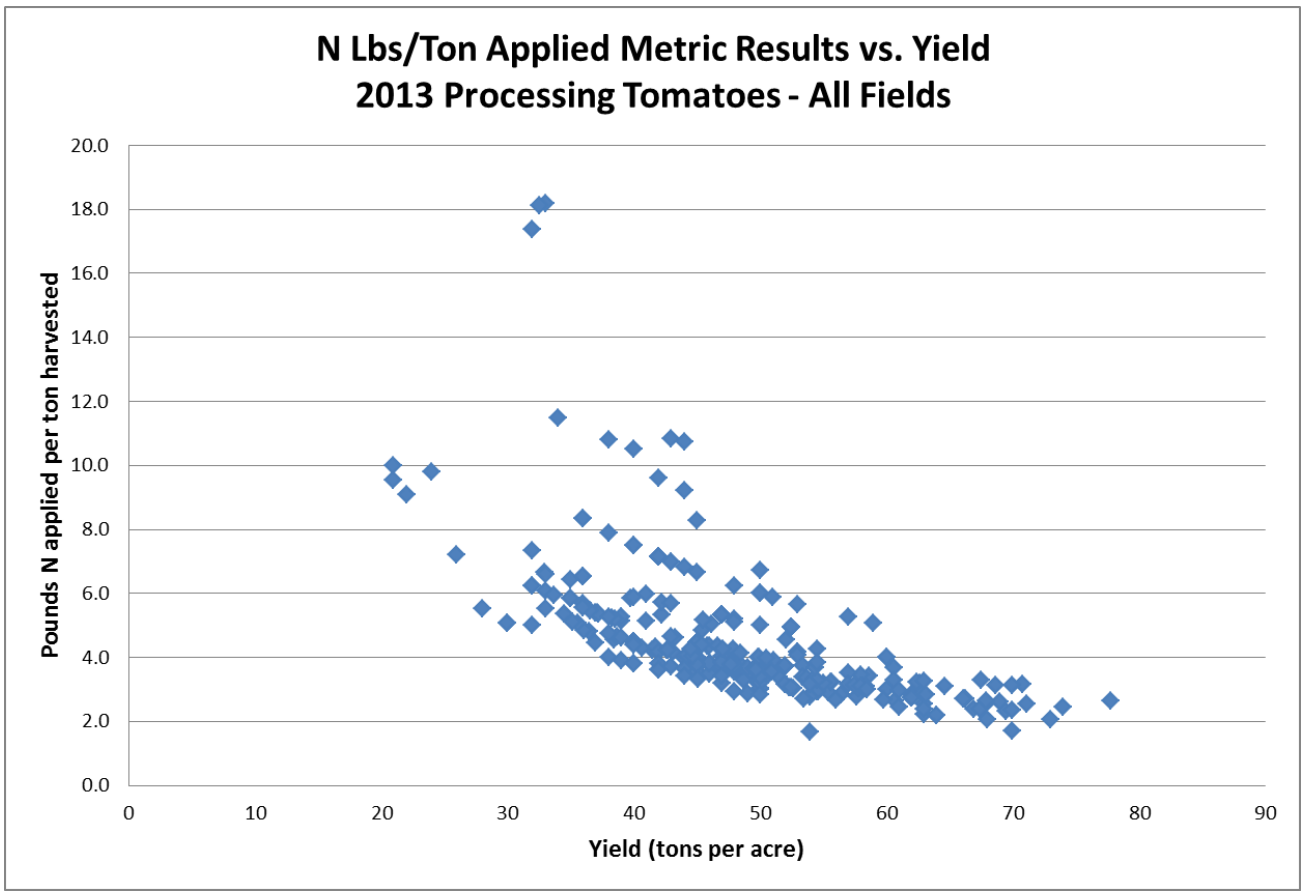


Figure 2: Nitrogen applied per ton harvested vs. yield for all fields

Applied Water Use Efficiency

Water is already in short supply in parts of the world and will become increasingly scarce as populations increase and climate change continues to alter weather patterns. In many places, water is also getting more expensive. California is currently in a drought cycle and water efficiency is of particular concern to both the rural agricultural community as well as in urban settings. Efficient irrigation is a critical component of sustainable crop production.

The Applied Water Use Efficiency metric measures the total amount of applied water used to produce the crop.

Note: A second metric, in development but not yet finalized, is Simple Irrigation Efficiency, which measures the amount of water applied to the crop relative to the crop's water need resulting from transpiration and soil evaporation (ETc).

The graphic below describes the SISC Applied Water Use Efficiency metrics.

Applied Water Use Efficiency	$\frac{\text{Acre-inches applied water}}{\text{Tons of product harvested}}$
	Notes: - *Applied water: Total ground and surface water applied.* - *The same land area (an acre, a field of known size) should be used to quantify both acre-inches applied and tons of product harvested.* - *Includes all irrigation events from the end of the previous harvest to the current harvest.* - *For educational purposes, metric can also be presented on a per acre basis as:* **Acre-inches applied water/acre planted**

Figures 3 and 4 display the metric results for the submitted applied irrigation data for all fields.

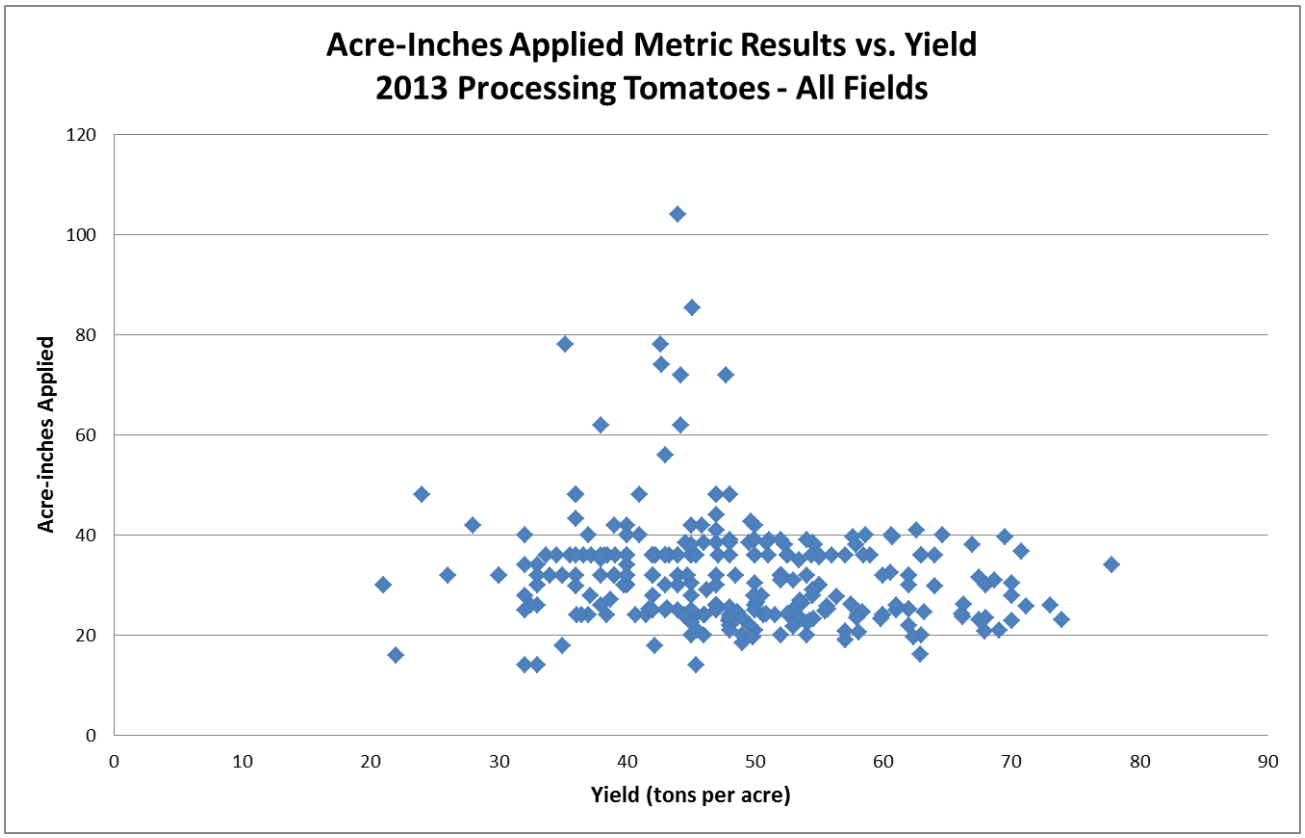


Figure 3: Acre-inches applied vs. yield for all fields

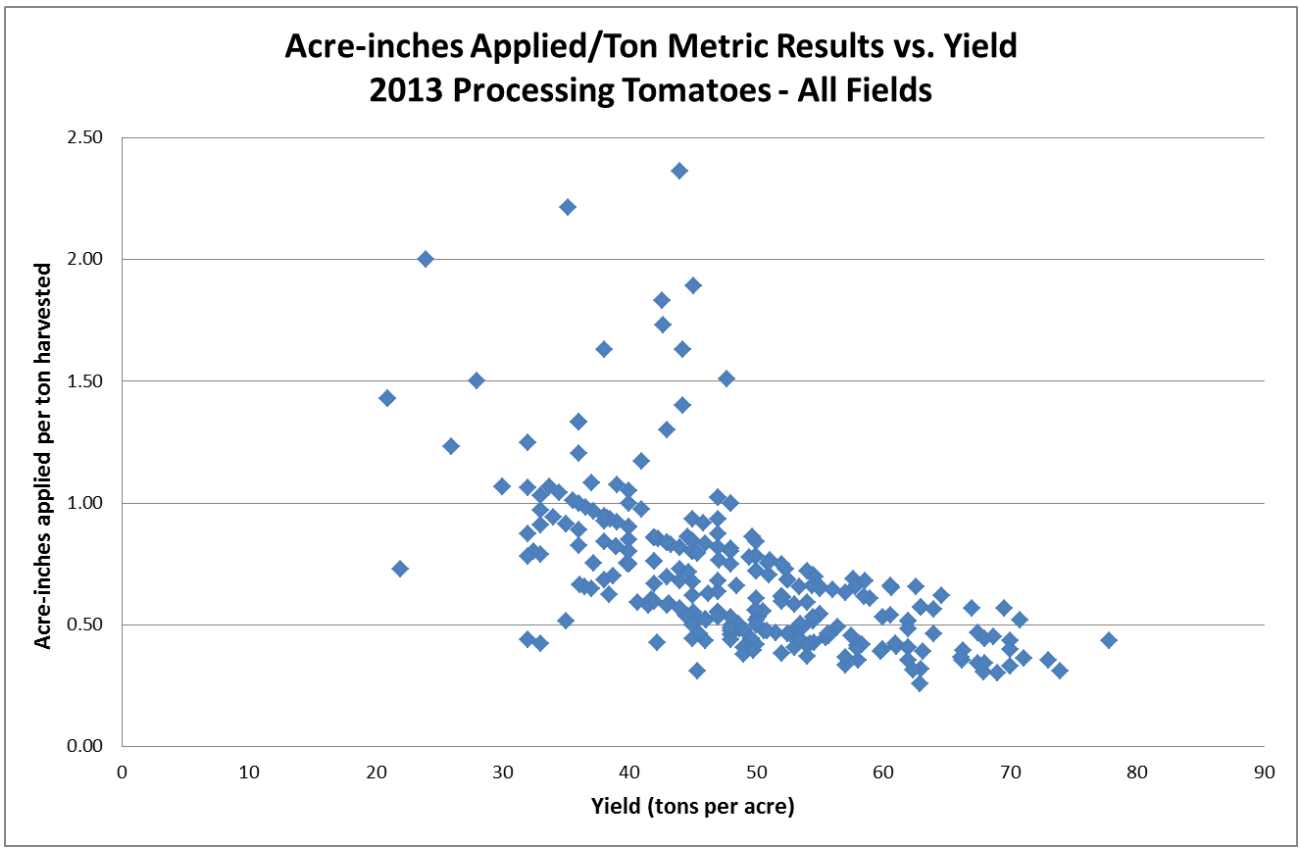


Figure 4: Acre-inches applied per ton harvested vs. yield for all fields

Processor Specific Results

The following charts were created to provide an example of what the metric results would look like for an individual processor and for one of their grower suppliers. Processor A is an anonymous processor in the case study.

Figures 5 and 7 display applied nitrogen and applied irrigation water metric results, respectively, for Processor A's growers' compared to all the fields for other processors.

Figures 6 and 8 display Grower A's metric results data compared to other Processor A grower suppliers.

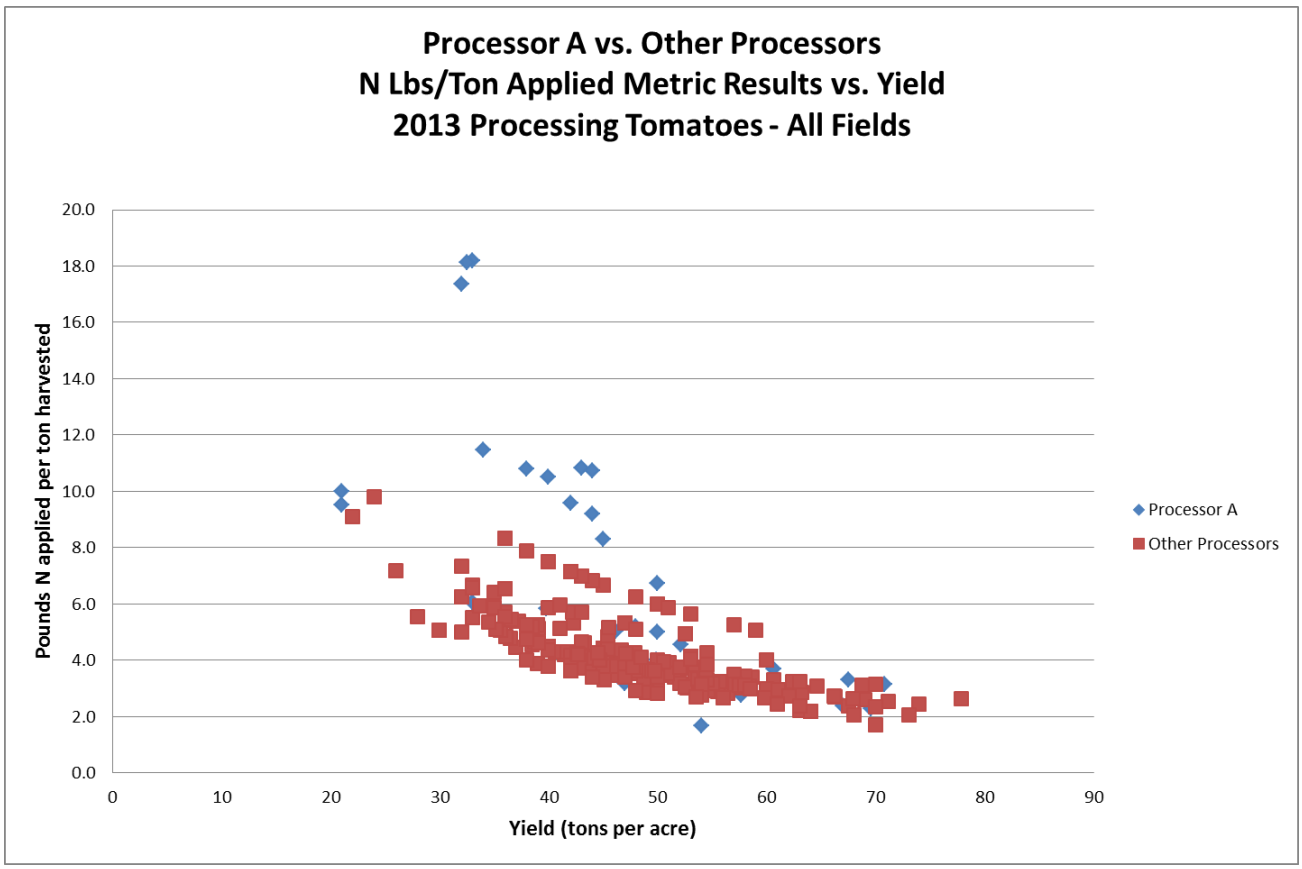


Figure 5: Nitrogen applied per ton harvested vs. yield for Processor A compared to all processors

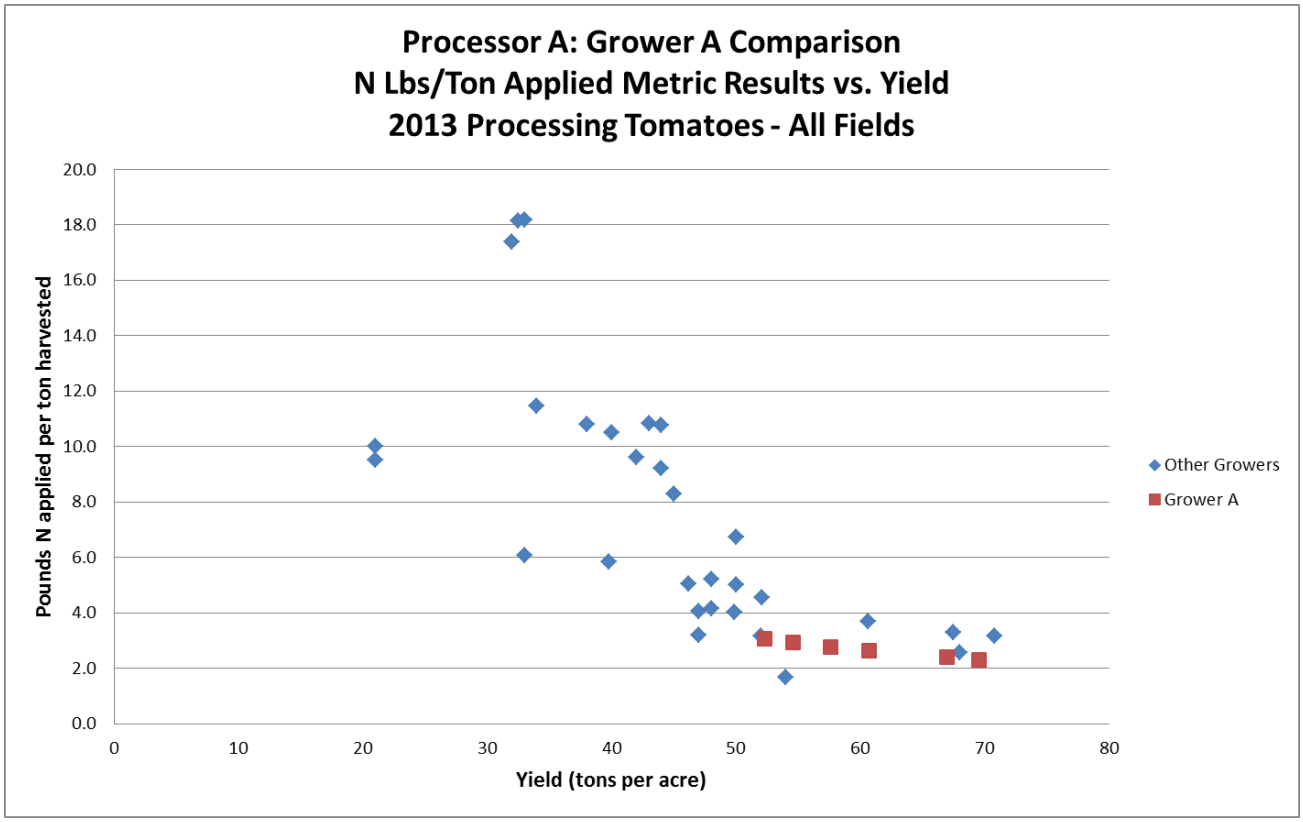


Figure 6: Nitrogen applied per ton harvested vs. yield for Processor A's growers only and breaking out Grower A

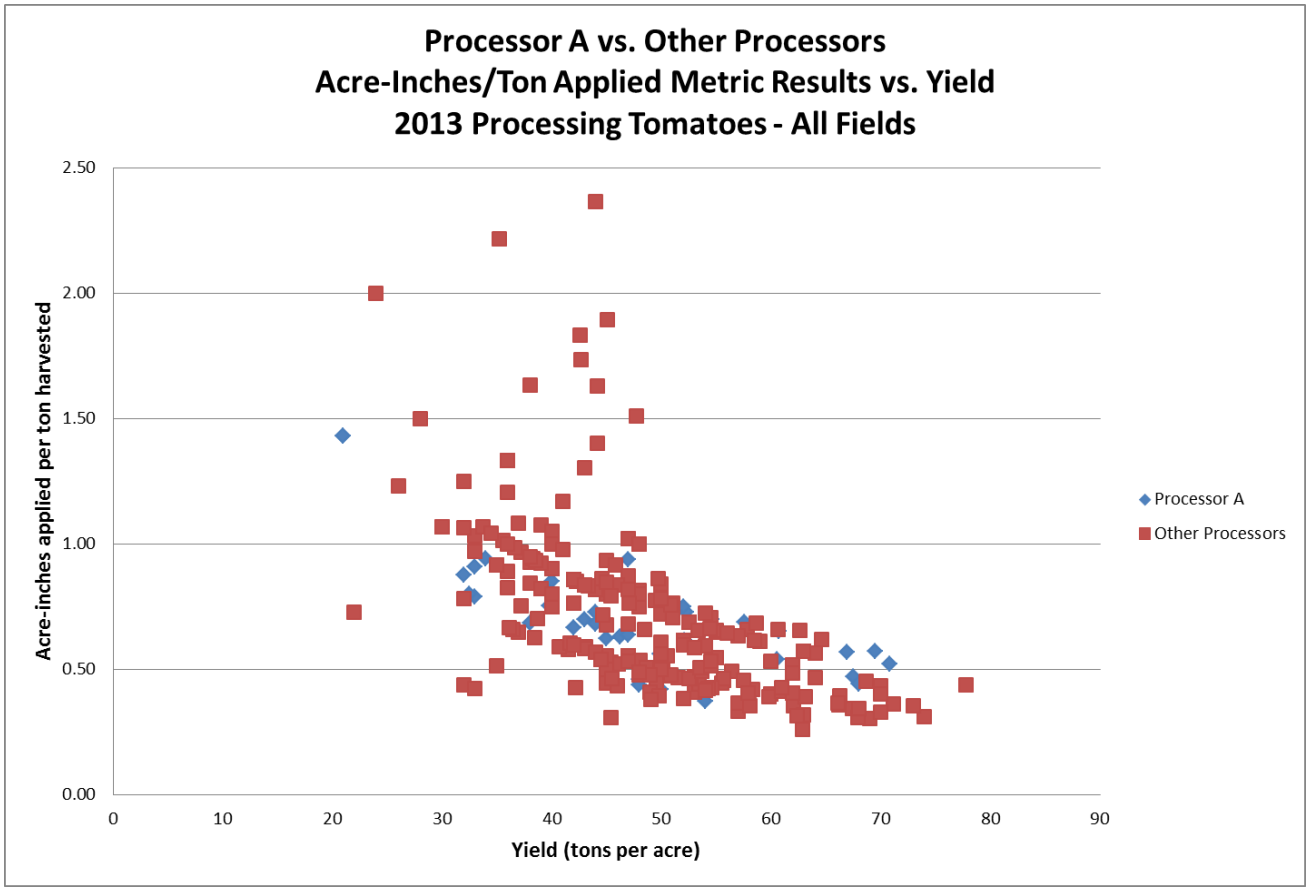


Figure 7: Acre-inches applied per ton harvested vs. yield for Processor A compared to all processors

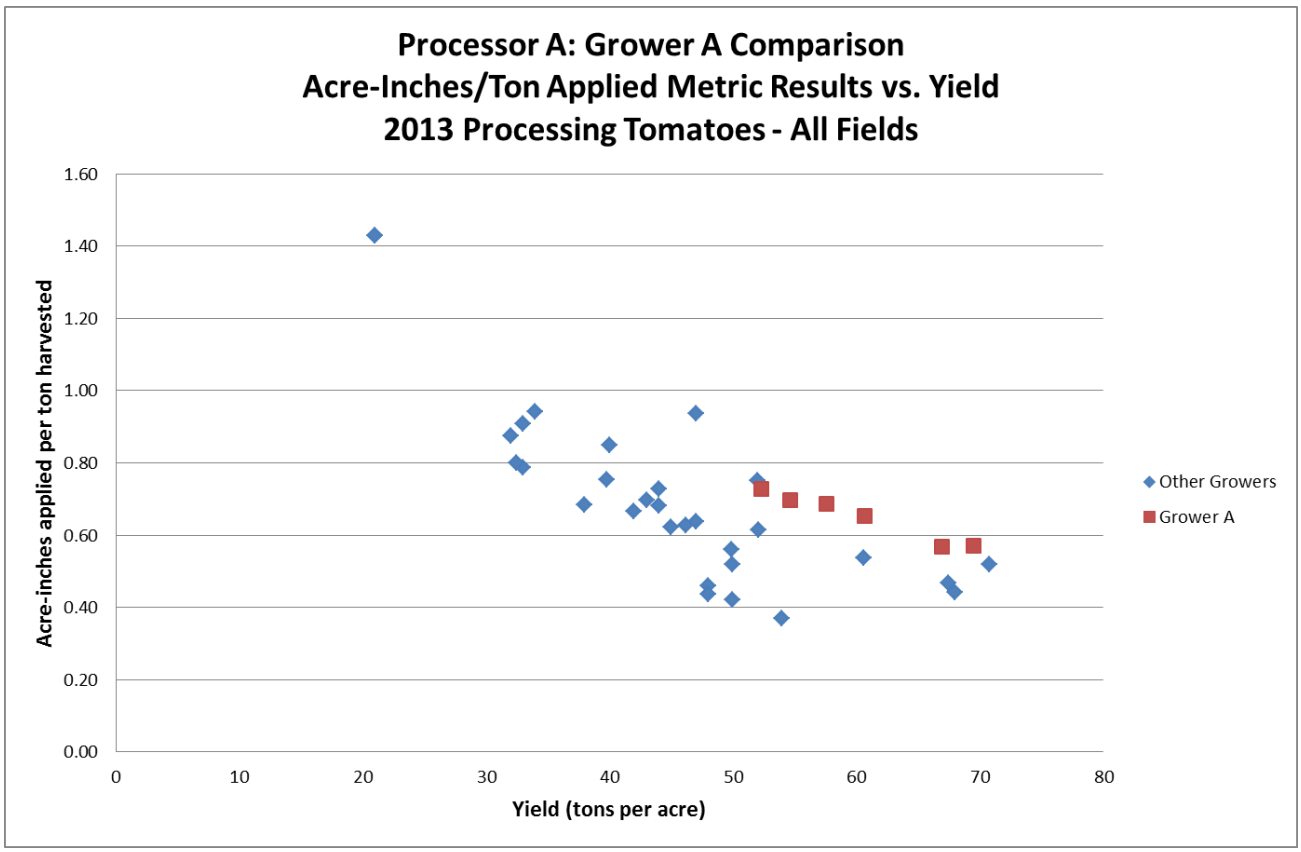


Figure 8: Acre-inches applied per ton harvested vs. yield for Processor A's growers only and breaking out Grower A

The following comments are from processors on the peer grower view of the data:

- "We don't do this yet. It would be very useful for growers to see where they fit."
- "Peer comparisons would drive some very interesting discussions."
- "Growers could quickly see how they compare to other growers. We could explore the practices that top performers are using."
- "We do this for our internal fields, but this helped catalyze the need to expand this to our contract growers."

Metric Results Observations

The data presented in Figs. 1 – 8 show a high degree of variability in the metric results. Undoubtedly a combination of different tomato hybrids, early vs. late plantings, soil types, crop rotations, management practices and disease pressure during the 2013 season is the "story behind the numbers." This forms the context of the metric results. Better understanding these dynamics will have both economic and environmental benefits for growers and the industry. The question becomes what other data would need to be collected from growers to be able to interpret and explain the results.

The downward trend in Figs. 2 and 4 implies, at a high level, that additional N and applied irrigation does not increase yields. This may be an artifact of the reported data. For applied N amounts, 24 growers out of 57 reported the same amount applied across the multiple fields they reported data for. For applied irrigation amounts, 21 growers out of 57 reported the same amount applied across the multiple fields they reported data

for even across drip and irrigation systems. Most of these irrigation amounts were based upon estimates. Growers using meters provided more precise amounts.

However, these trends may also imply that some growers are using a one-size-fits-all N and irrigation management approach. Interviews with growers would help clarify this observation. Another possibility is that some growers may have entered guesstimates to save time on actually searching for accurate data – a number of growers had the exact same yield for all of their fields (a total of 63 fields). This speaks to the ability to assess the quality/accuracy of the submitted data which has an impact on the accuracy of the metrics results themselves. Quantitative crop production data is often seen as being proprietary and some growers are hesitant to share the information.

As with other field data studies, there were outliers in the data that would need follow-up with growers to determine if there was a data collection/entry issue or whether in fact they are legitimate values due to some agronomic or management situation. (Refined analysis of the data based upon ground truthing or excluding potential outliers was beyond the scope of this project.)

The usage of metrics in industry- and peer-level programs will be dependent on a high degree of accuracy of submitted data. Participants must see value in using the results for operational needs or to provide input for regulatory discussions or market requests. As one processor stated, “those requests aren’t going away.”

Next Steps

The case study provided a robust data set for the participating processors to review and use to guide their discussions with their grower suppliers. The case study also provides an example for the California processing tomato industry of how SISC metrics can be used to potentially drive industry-wide activities to better understand sustainability issues and work with growers on resource challenges.

- Processors could provide their grower suppliers with a report showing how they compare with other grower suppliers using anonymized data for the other growers.
- Processors could have discussions with growers on the high and low ends of the metric results spectrum to help determine what management practices or other factors attribute to their performance.
- An analysis of the data by county/region would also help determine the geographic impact on metric results.
- Stakeholder discussions with growers, processor and researchers could help define additional contextual data that would help better understand the metrics results.
- Stakeholder discussions with processors and their customers (i.e., retailers, foodservice companies, ingredient buyers, etc.) will help the group better understand the potential limitations in using metric results in supply chain studies and purchasing decisions.
- The tomato industry could commit to a longer term study as part of an industry sustainability program to better understand short-, mid- and long-term implications of the data to help drive industry-wide continuous improvement strategy.

The California League of Food Processors is an association that represents the business interests of California food processing companies. They have a number of committees focused on broad issues and specific issues like the Processing Tomato Research Committee. The results of this study could be useful to their Ag Production Committee that is looking at the intersection of nitrogen application and drip irrigation technology as a means to

better understand the carbon footprint of processing tomatoes. This could help support the reduction of greenhouse gas emissions in the tomato supply chain.

From the perspective of a broader learning experience, these results could be shared in some form with other food processors in California and other regions as a case study of data collection, aggregation and comparative analysis to benefit both growers and processors and help drive the sustainability discussion.

A complementary SISC case study was done with UC Davis researchers on processing tomato production in the university research farm. The "*UC Davis Russell Ranch Processing Tomato Multi-Year Metrics Analysis*" case study provides a view of processing tomato production over 11 years in one farming setting. Longer term studies will provide insights on metric trends over time in conjunction with single year or year-over-year results where annual climate phenomenon may impact the metrics.

Acknowledgements

The following individuals were instrumental in coordinating data collection with their grower suppliers:

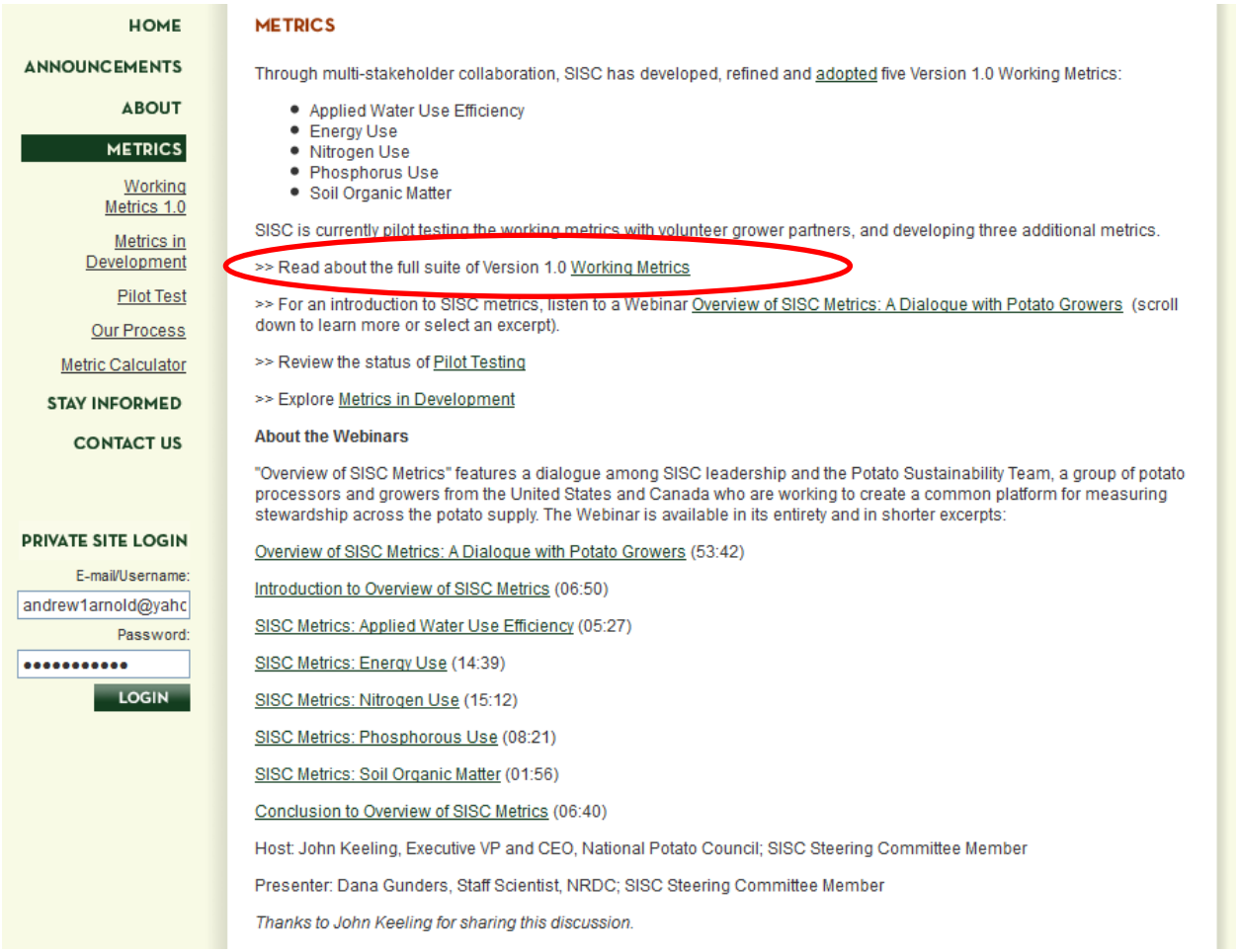
- Campbell Soup Company - Dan Sonke, Sustainable Ag Manager
- Del Monte Foods - Steve Balling, Director, Agricultural & Analytical Services
- Los Gatos Tomato Products - Lance Dami, Director of Field Operations
- The Morning Star Packing Company - Renee Rianda, Raw Product Team
- Olam Spice & Vegetable Ingredients - Erik Wilson, Agricultural Operations Manager

Attachment B. SISC Site – Metrics Page Screenshots

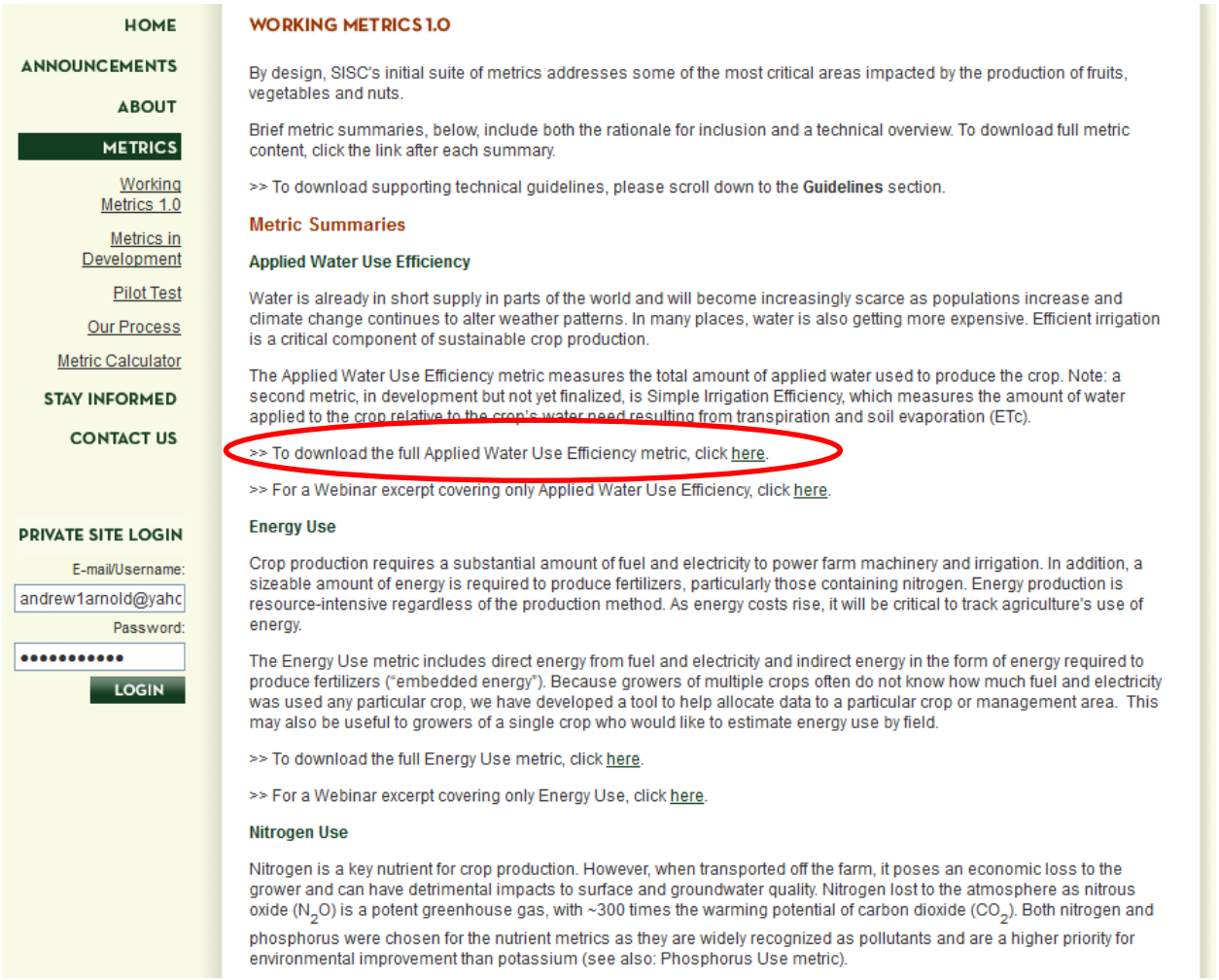
The following screenshots are from the **Metrics** page on the SISC website. The **Metrics** page is the culmination of much of the work done in the SISC project. The SISC site can be accessed at: http://www.stewardshipindex.org/

To access the **Metrics** page, click Metrics on the SISC home page.

The following screenshot of the main **Metrics** page has a number of sub-pages that describe the working metrics, the process used to develop the metrics, metrics still under development, and the Excel-based metric calculator.



By clicking on various links, growers are taken to the other pages to learn more about metrics. An important section of the main page contains a recorded webinar given to potato growers as part of a SISC event hosted by the National Potato Council. Webinar segments for individual metrics are also accessible. The following screenshot shows the **Working Metrics 1.0** page.



Growers can click to download each of the metrics to see what data is required,
After clicking on "To download the full Applied Water Use Efficiency metrc," the following screenshot shows the PDF that is displayed and describes the Applied Water Use Efficiency Metric. All of the metric description PDFs are accessed in this manner.

Applied Water Use Efficiency

Working Metric Version 1.0 | Adopted July 31, 2013

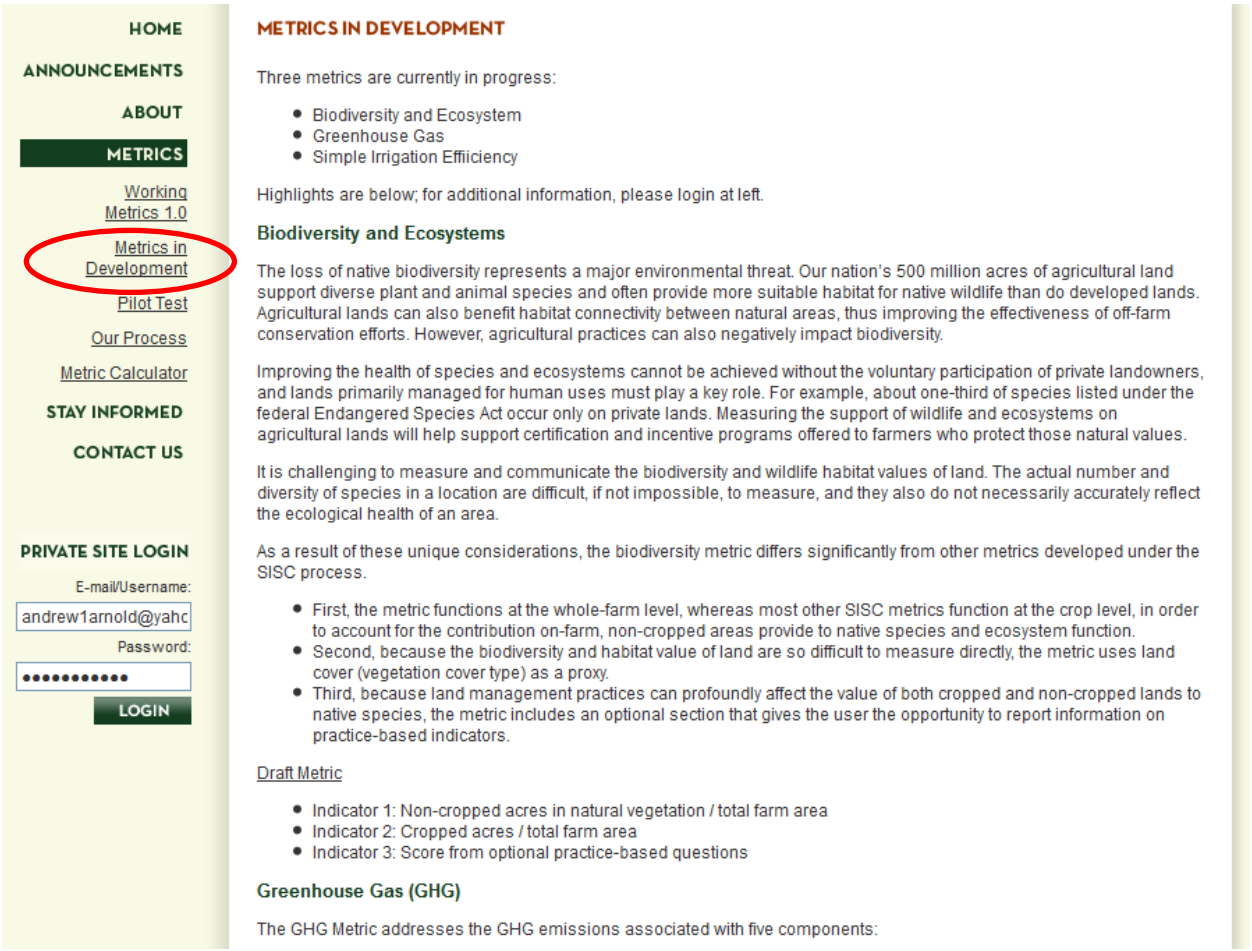
Water is already in short supply in parts of the world and will become increasingly scarce as populations increase and climate change continues to alter weather patterns. It is also increasing in cost in many places. Therefore, efficient irrigation is a critical component of sustainable crop production.

The **Applied Water Use Efficiency** metric measures the total amount of applied water used to produce the crop. A second metric, **Simple Irrigation Efficiency**, which measures the amount of water applied to the crop relative to the crop's water need resulting from transpiration and soil evaporation (ETc), is in development, but has not yet been finalized.

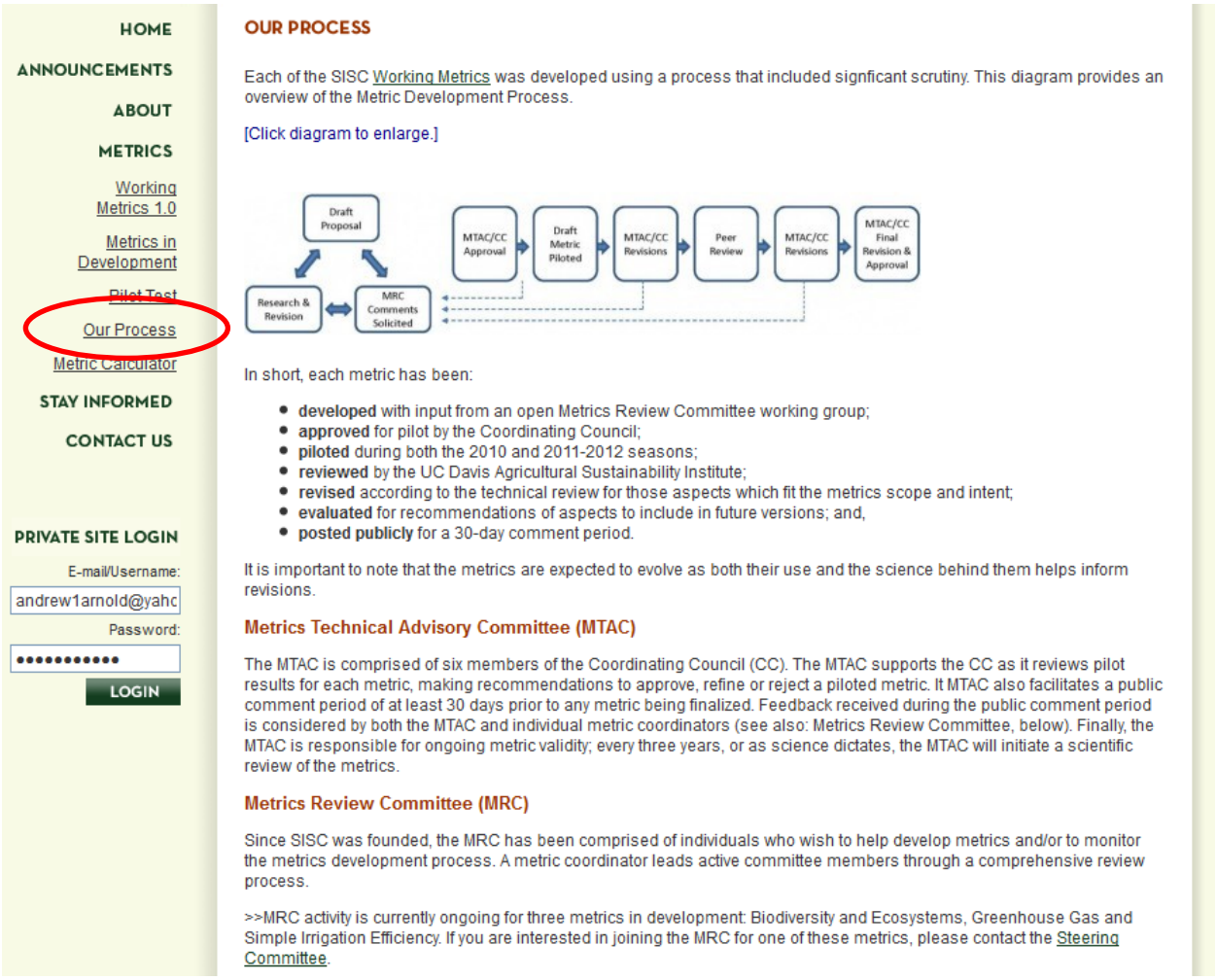
Metric:

Applied Water Use Efficiency	$\frac{\text{Acre-inches applied water}}{\text{Tons of product harvested}}$
	Notes: - *Applied water: Total ground and surface water applied.* - *The same land area (an acre, a field of known size) should be used to quantify both acre-inches applied and tons of product harvested.* - *Includes all irrigation events from the end of the previous harvest to the current harvest.* - *For educational purposes, metric can also be presented on a per acre basis as:* **Acre-inches applied water/acre planted**

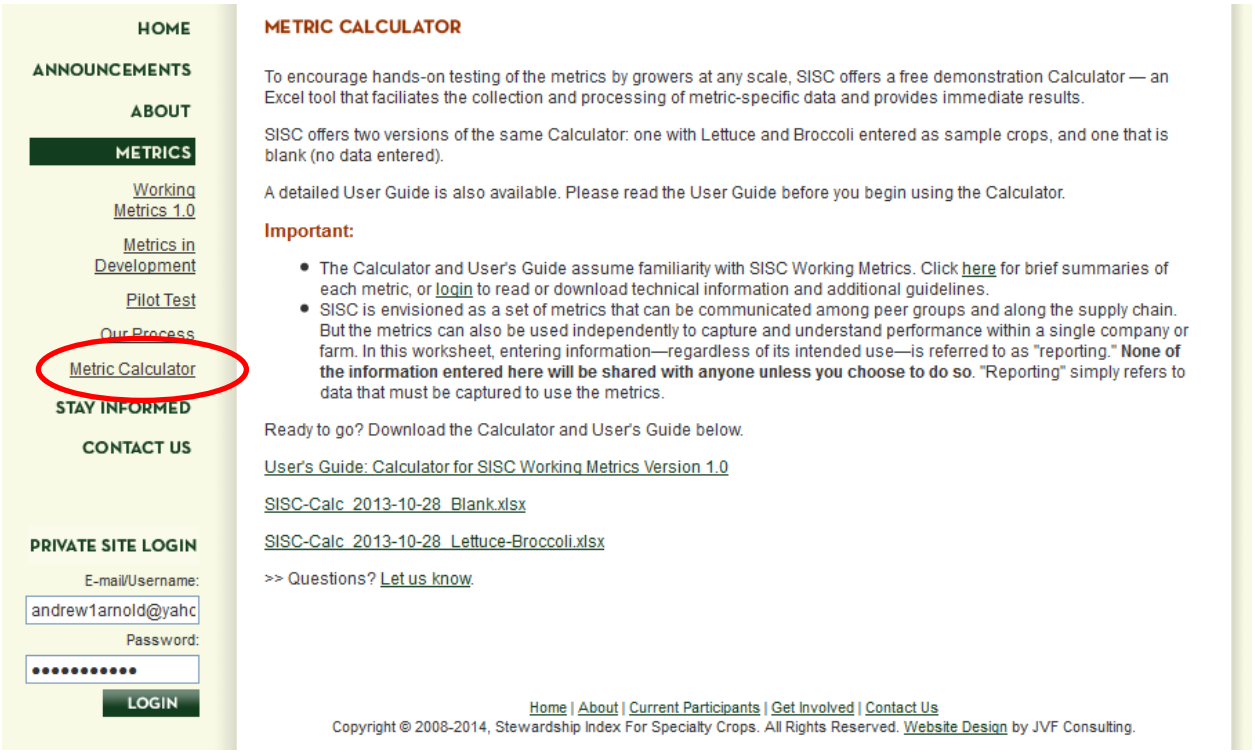
The following screenshot shows the **Metrics in Development** page which is used to keep all stakeholders informed about the metrics that are still being developed via the SISC process. The status of each metric is described as well as the draft metric itself. See the Biodiversity and Ecosystems metric in the following screenshot.



One of the differentiating elements of SISC compared to other current metric development initiatives is the transparency of the process used to develop metrics. The following screenshot of the **Our Process** page describes the metrics development process, the role of the Metrics Technical Advisory Committee, and the role of the Metrics Review Committee.



The **Metric Calculator** page is where growers can download the Excel-based metric calculator and the 23-page user's guide with instructions on how to use the calculator. A blank Excel calculator is provided as well as an example calculator with data for a field with a lettuce-broccoli rotation.


HOME
ANNOUNCEMENTS
ABOUT
METRICS
Working Metrics 1.0
Metrics in Development
Pilot Test
Our Process
Metric Calculator
STAY INFORMED
CONTACT US
PRIVATE SITE LOGIN
E-mail/Username:
andrew1arnold@yahc
Password:
LOGIN
METRIC CALCULATOR
To encourage hands-on testing of the metrics by growers at any scale, SISC offers a free demonstration Calculator — an Excel tool that faciliates the collection and processing of metric-specific data and provides immediate results.
SISC offers two versions of the same Calculator: one with Lettuce and Broccoli entered as sample crops, and one that is blank (no data entered).
A detailed User Guide is also available. Please read the User Guide before you begin using the Calculator.
Important:
The Calculator and User's Guide assume familiarity with SISC Working Metrics. Click here for brief summaries of each metric, or login to read or download technical information and additional guidelines.
SISC is envisioned as a set of metrics that can be communicated among peer groups and along the supply chain. But the metrics can also be used independently to capture and understand performance within a single company or farm. In this worksheet, entering information—regardless of its intended use—is referred to as "reporting." None of the information entered here will be shared with anyone unless you choose to do so. "Reporting" simply refers to data that must be captured to use the metrics.
Ready to go? Download the Calculator and User's Guide below.
User's Guide: Calculator for SISC Working Metrics Version 1.0
SISC-Calc_2013-10-28_Blank.xlsx
SISC-Calc_2013-10-28_Lettuce-Broccoli.xlsx
>> Questions? Let us know.
Home | About | Current Participants | Get Involved | Contact Us
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Attachment C. SISC Update Brochures

Grower Update

GROWER UPDATE

The Stewardship Index for Specialty Crops (SISC) is a multi-stakeholder-driven system for measuring sustainability performance throughout the specialty crop supply chain. SISC offers a suite of outcomes-based metrics, or measurements, that enables operators to benchmark and communicate their own performance.

"SISC provides an industry-wide methodology to benchmark sustainability, manage farm impact and respond to buyer demands with farmer-friendly calculators developed with grower input"

LARRY JACOBS, PRESIDENT
JACOBS FARM / DEL CABO

The Stewardship Index is:

- **An on-farm measurement system**, not a standard or certification
- **Focused on performance**, rather than practices (e.g., how much water was used, not what type of irrigation system)
- **Open-source** – available to anyone
- **Credible and independent** – developed through unprecedented collaboration among growers, buyers, public interest groups, subject matter experts, scientists, and interested individuals

MISSION & VISION

SISC promotes the development and adoption of a **single, widely accessible system for measuring performance** across the specialty crop supply chain. Widespread adoption of SISC metrics will:

- Reduce producers' reporting burdens;
- Recognize sustainability efforts already underway;
- Align the performance goals of the entire supply chain; and,
- Set a path for continuous improvement of the industry's footprint.

WHAT'S IN IT FOR ME?

- **Identify efficiency and cost reduction opportunities.** Specifically, the Beta Metric Calculator:
  - Enables you to capture water use, nutrient use, energy use and soil management data;
  - Provides immediate results, facilitating measure-to-manage; and,
  - Enables internal comparisons year-over-year.
- **Get credit** for existing sustainability efforts—even if you haven't thought of them as "sustainability efforts" before
- **Expedite** the process of collecting, organizing and reporting your data
- **Increase industry and market relevance**—fact-based, credible reporting can lead to:
  - Increased access to new buyers/markets
  - Empowered discussions with regulators at local, state and federal levels
- **Confidence** that SISC metrics are not just another burden—but truly make it easier to meet market demands using a single system that:
  - Was developed in partnership among diverse stakeholders
  - Avoids redundant reporting formats
  - Is enjoying increased acceptance across the supply chain
- **No fees**

DEFINITIONS

Specialty crops include fruits, vegetables and nuts. SISC views **sustainability** as an ongoing process to advance best outcomes through the most efficient use of resources. The project does not aim to identify what level of performance is "sustainable," but instead to help participants assess and enhance stewardship using a common set of measurements. This concept is often referred to as **measure-to-manage**.

stewardshipindex.org

WATER USE
Acre inches applied / ton harvested

Acre inches applied / Crop Tc

ENERGY
Total BtU / ton harvested

NUTRIENTS
Pounds of N / ton harvested

Pounds of P / ton harvested

SOIL
Soil organic matter / soil organic matter potential

THE METRICS

SISC currently offers four metrics (left) and a Beta Metric Calculator for capturing and analyzing metric data. Many of the metrics can be considered on a per-area or per-yield basis, and users may choose to view metrics with one denominator or the other depending on their needs. A detailed "Guide to Metrics" explains how each metric is calculated, data sources, and how the data may be used.

USING THE METRICS

It's easy to get started:

- Participate in a webinar to **learn more about SISC**—its value to individual growers and to the overall supply chain
- **Participate in pilot testing**—use the Beta Metric Calculator to capture information for a single field/management area
- **Contribute anonymous, field-level data** to enable benchmarking:
  - SISC aims to collect enough anonymous, farm-level data to aggregate it and establish crop- and region-specific benchmarks for resource use.
  - When benchmarks are feasible, SISC's data partner, SureHarvest, may summarize and report that aggregated data. SureHarvest could also provide an individual report comparing your performance to that of comparable operations. So even if you stop after pilot testing a single field/management area, you will have gained a new understanding of your operation in hard numbers.

HOW WE GOT HERE

After experiencing a proliferation of food safety reporting requirements, the industry stakeholders who first met in 2008 to collaborate on sustainability set a goal of developing a single suite of performance metrics through an inclusive and fully transparent process. Since then, more than 500 representatives from production agriculture, food companies, NGOs, academic institutions, government agencies and consulting groups have participated in metric-specific workgroups, designing and field-testing draft metrics that are practical and useful for all supply chain partners. SISC metrics have been developed with significant input from scientists and experts, and **pilot-tested by over 200 specialty crop growers** in all key U.S. growing regions.

WHAT'S NEXT?

SISC metrics are being adopted by retailers, trade associations, and agriculture software providers who are beginning the process of working with their grower suppliers, members and clients on collecting, analyzing and communicating data about sustainability performance. Additional metrics are in development and will be pilot tested in 2013. **Join our efforts: visit stewardshipindex.org**

LEADERSHIP

SISC's Coordinating Council is comprised of a balanced mix of growers, buyers, their trade associations, and NGOs. The Council has chosen a **consensus-based** decision-making structure to support lasting outcomes that work for the broadest mix of stakeholders.

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Buyers
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CONTACT: Jessica Winberry, Executive Director
Ag Innovations Network | Ph: 707.823.6111 | info@stewardshipindex.org | stewardshipindex.org

Buyer Update

BUYER UPDATE

The Stewardship Index for Specialty Crops (SISC) is a multi-stakeholder-driven system for measuring sustainability performance throughout the specialty crop supply chain. SISC offers a suite of outcomes-based metrics, or measurements, that enables operators to benchmark and communicate their own performance.

*"How stakeholders view a company and understand [its] impact on society and the environment matters to business value."**

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- Set a path for continuous improvement of the industry's footprint.

BENEFITS

- Leadership – build awareness and enhance brand positioning among shoppers and consumer advocates, in the media, and with regulators
- Credibility
  - SISC and the data-driven metrics were developed through open collaboration among diverse stakeholders
  - Tell your sustainability story to customers with transparency to the farm level
  - Recognize suppliers' achievements
- Simplicity and efficiency
  - Adopting SISC metrics precludes having to develop your own
  - SISC complements other corporate sustainability efforts
- Consistency
  - Reduce growers' reporting burden by establishing a harmonized metric approach
  - Base your agricultural sustainability program on fact-based, comparable data

**"Drivers of long-term business value," Deloitte (2012)*

stewardshipindex.org

THE METRICS

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Acre inches applied / ton harvested

Acre inches applied / Crop Tc

ENERGY
Total BtU / ton harvested

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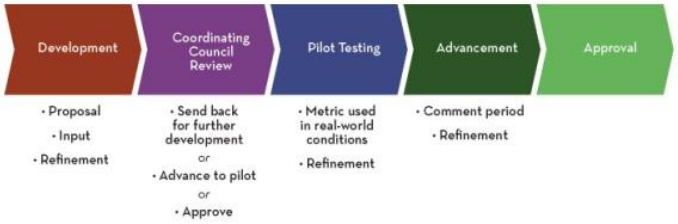
PROCESS

Metrics are developed in an open, five-step process:



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Program Update

PROGRAM UPDATE

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PROGRESS HIGHLIGHTS

- More than 500 representatives from production agriculture, food companies, NGOs, academic institutions, government agencies and consulting groups have participated in metric-specific workgroups, **designing and field-testing draft metrics** that are practical and useful for all supply chain partners.
- SISC metrics have been **pilot-tested** by over 200 specialty crop growers in key growing regions across the United States.
- SISC metrics are being adopted by retailers, trade associations, and agriculture software providers who are beginning the process of working with their grower suppliers, members and clients on collecting, analyzing and communicating data about sustainability performance.
- **Additional metrics are in development** and will be pilot tested in 2013.

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stewardshipindex.org

METRICS

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Acre inches applied / Crop Tc

ENERGY

Total BtU / ton harvested

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Soil organic matter / soil organic matter potential

SUPPLY-CHAIN BENEFITS

	GROWER/ PRODUCER	SHIPPER/ PROCESSOR	RETAIL/FOOD SERVICE BUYER
Provides growers with free tools enabling "measure-to-manage" within their operations	■		
Provides a common foundation for industry to use in benchmarking and communicating sustainability performance	■	■	■
Minimizes the proliferation of "proprietary" reporting requirements in the supply chain	■	■	■
Is pre-competitive – does not impact any company's ability to differentiate itself from its primary competitors	■	■	■
Encourages continuous improvement and increased awareness	■	■	■
Complements, rather than competes with, programs addressing other aspects of operational sustainability		■	■
Unites all supply chain participants in answering the question: "How is our industry contributing to business, ecosystem and human wellbeing?"	■	■	■

LEADERSHIP

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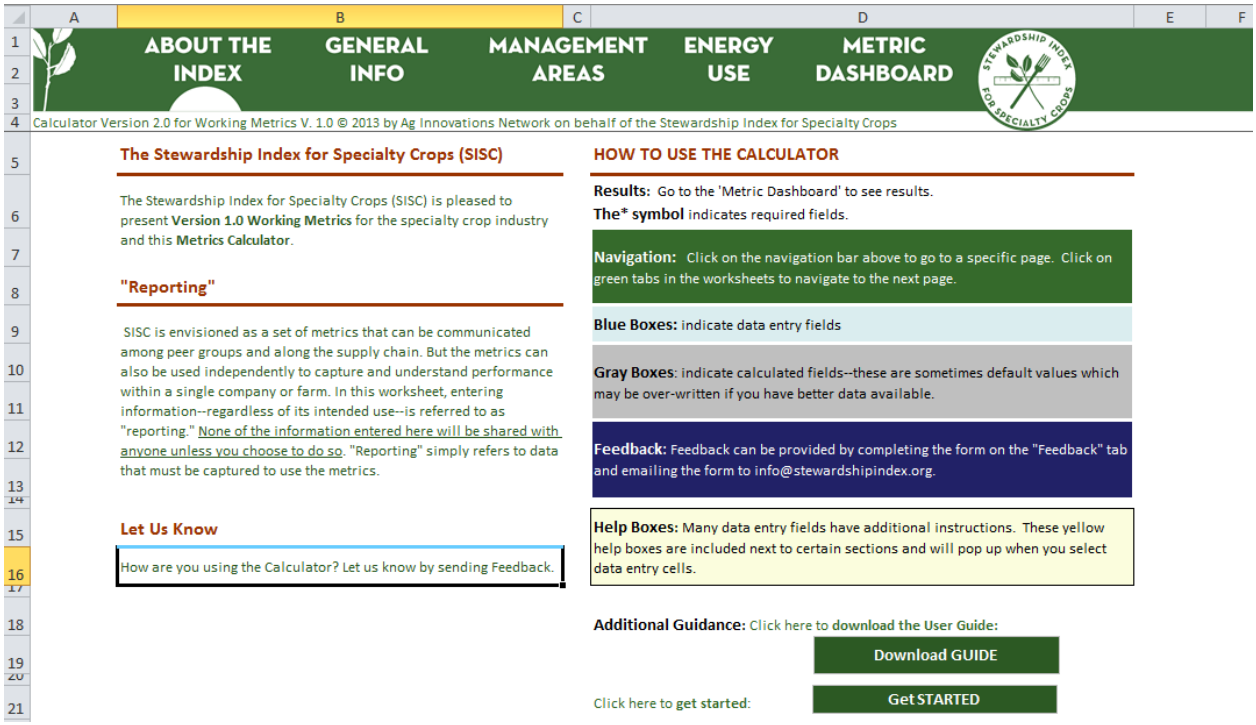
Attachment D. Excel Calculator Screenshots

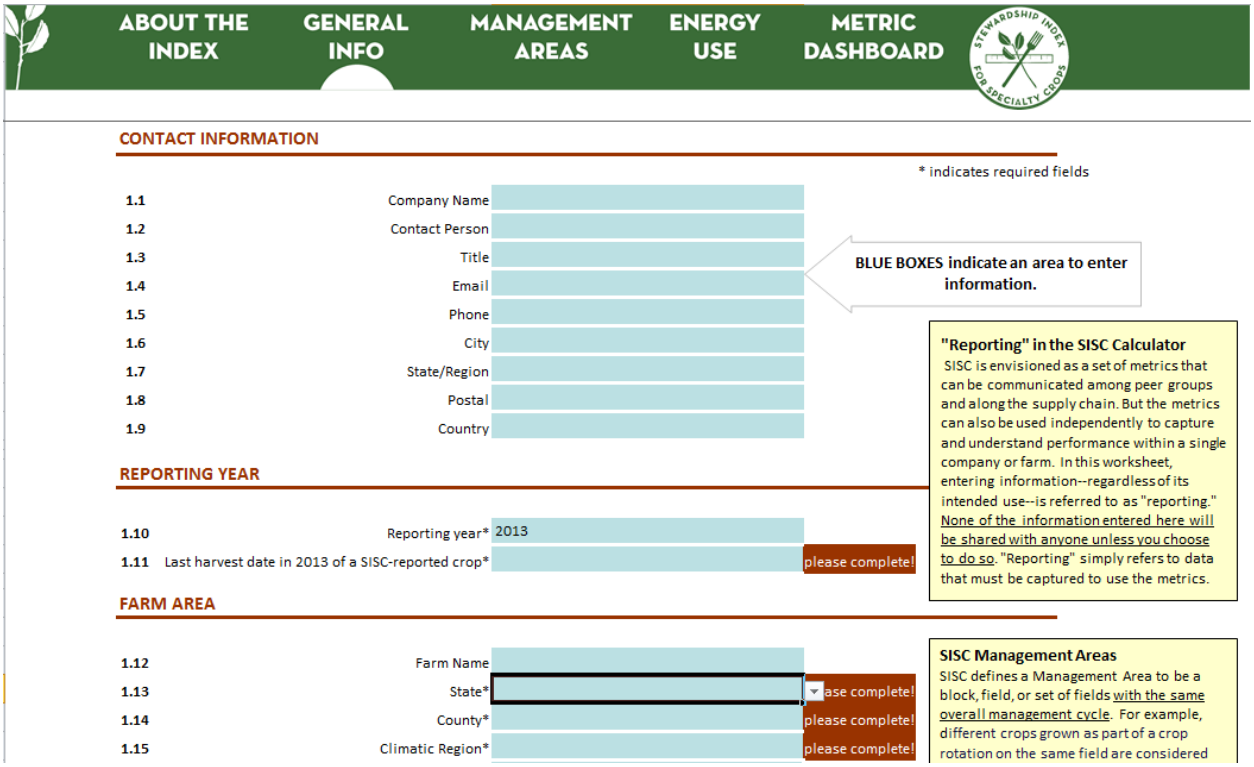
The Excel-based metric calculator was a key deliverable of the SISC project. While not the ideal technology to maintain, revise and distribute to users, it served a useful purpose as a prototype to allow growers to enter data and see the resulting metrics calculations.

The calculator is an Excel workbook with numerous sheets to enter data, see reference data and see the actual metric results that are calculated by underlying calculation alogorthims built into the Excel workbook.The following are screenshots for the calculator.

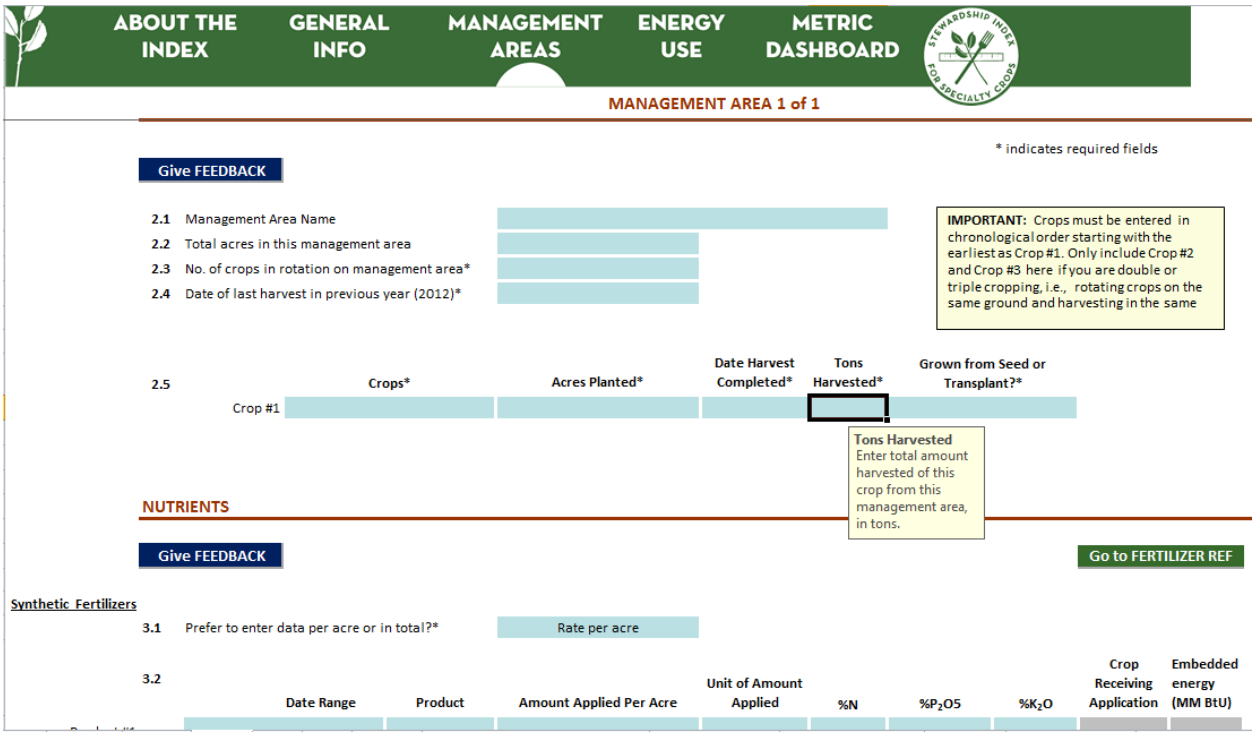
The **About the Index** screen below of the is the calculator "home" page that describes how to use the calculator. A user can download the User Guide from the sheet.

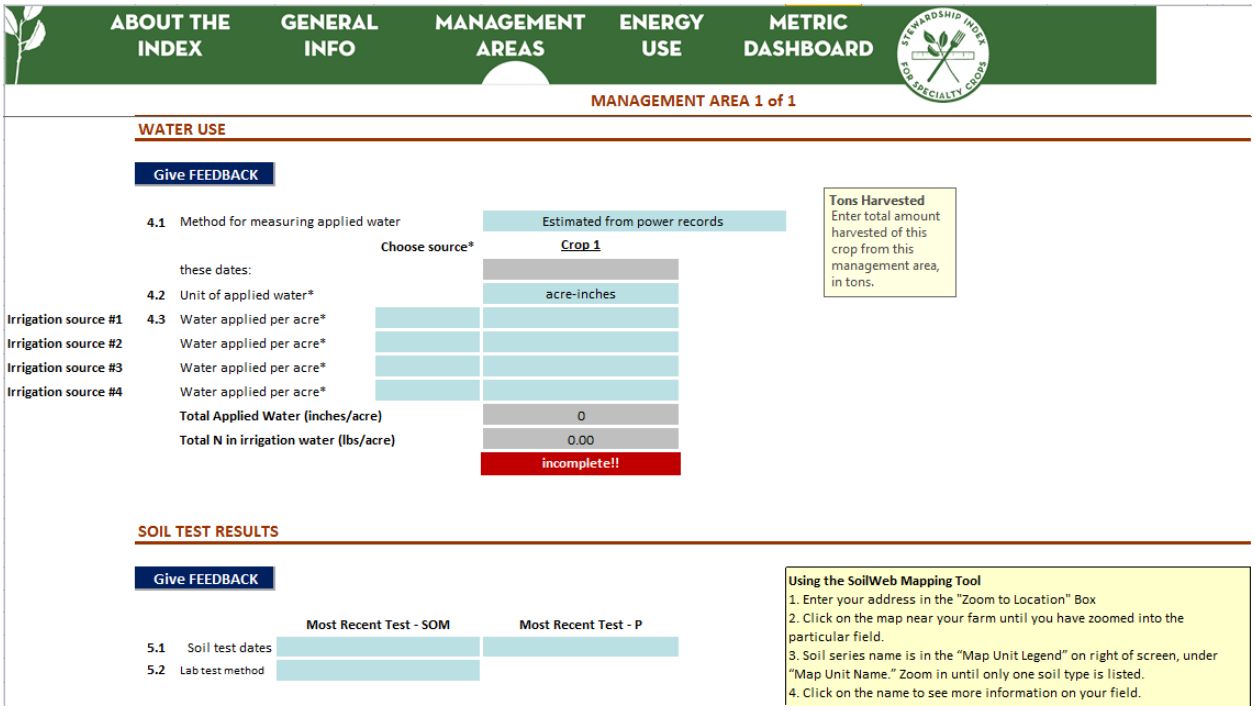


The **General Info** sheet collects high-level information on the company and individual entering data as well as information on the farm where data was collected.

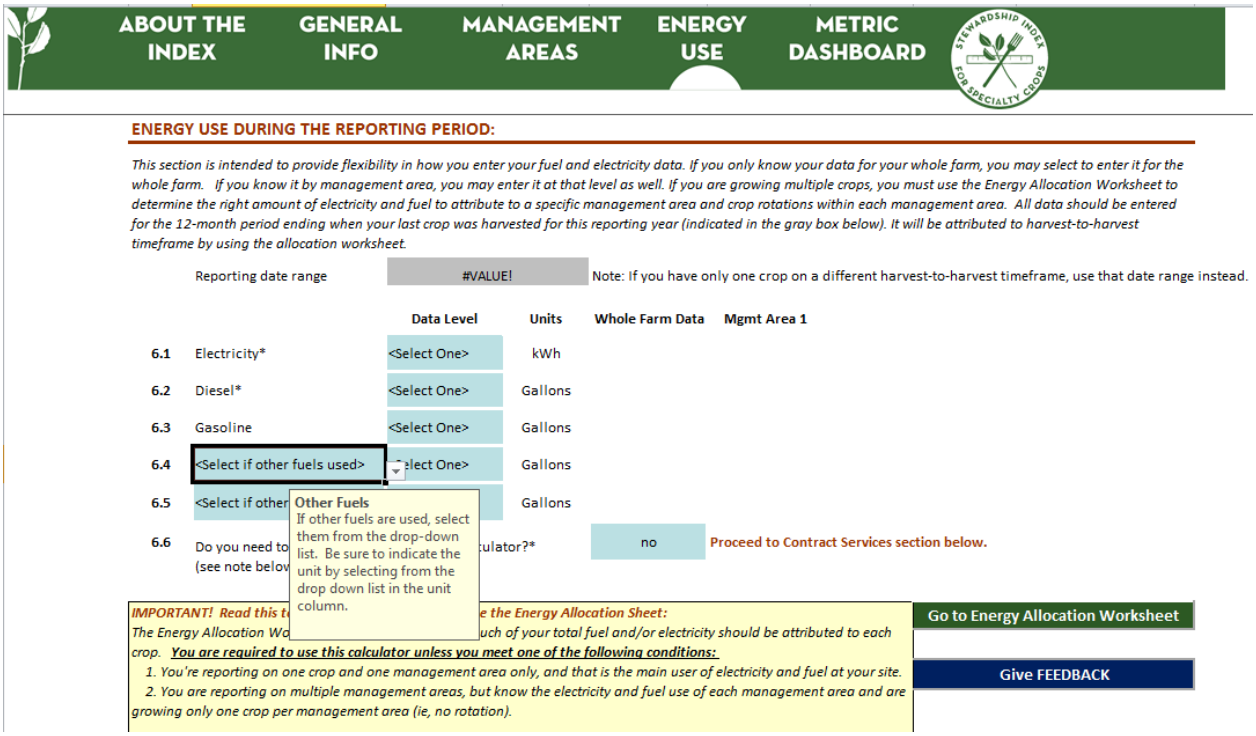


The **Management Areas** sheet(s) collects data on the field (Management unit) being assessed. Nutrient and water usage data is collected as well as soil test results.

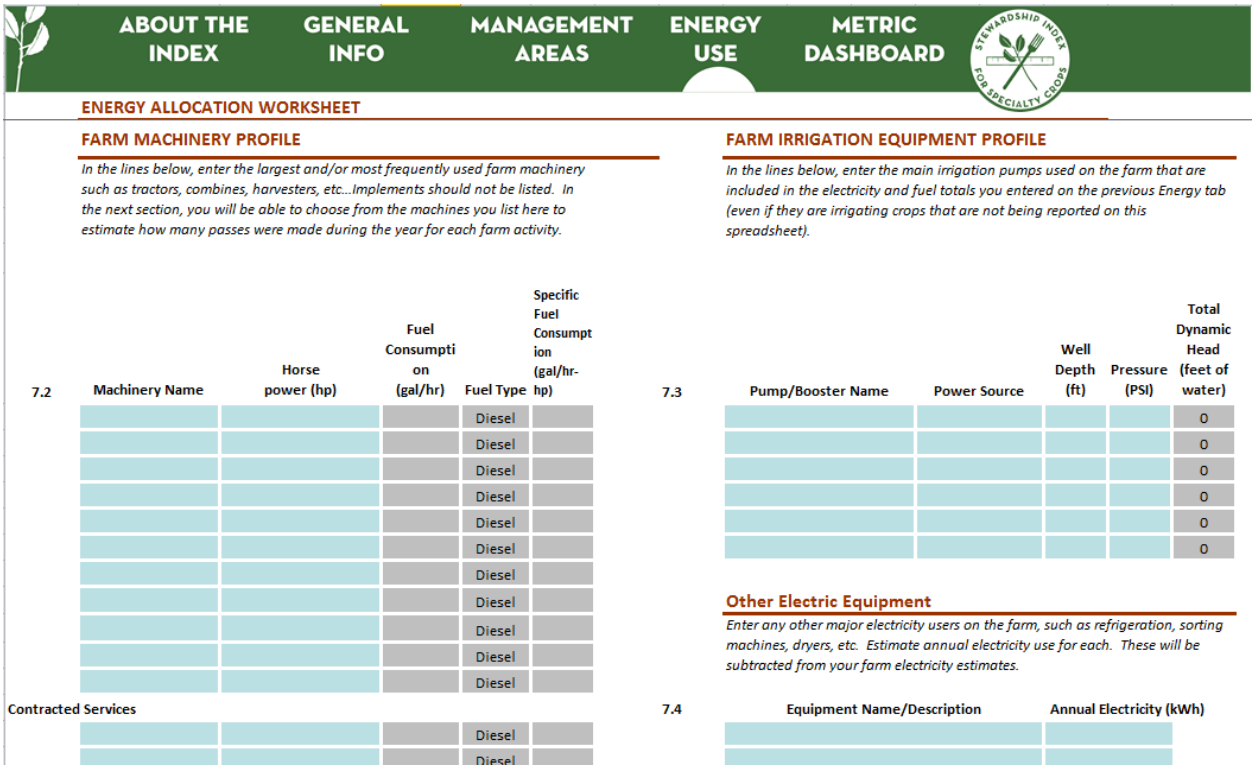




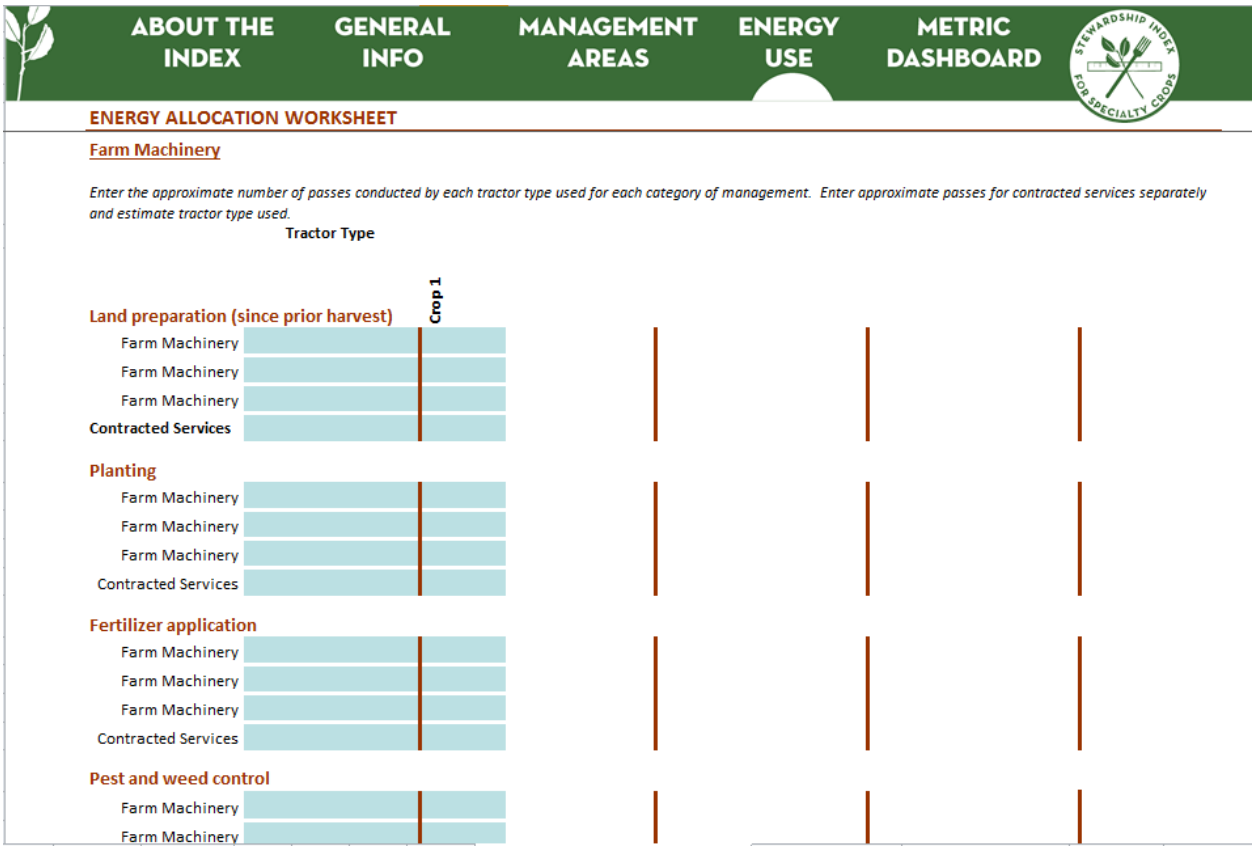
The **Energy Use** sheet shown below is used to enter fuel and electricty usage data for the management unit. If field-level data was not collected, whole farm data is used to allocate down to the field level.



The **Energy Allocation Worksheet** provides the grower a means to enter information on their irrigation pumping equipment and their farm machinery that is then used to calculate energy usage at the field level.

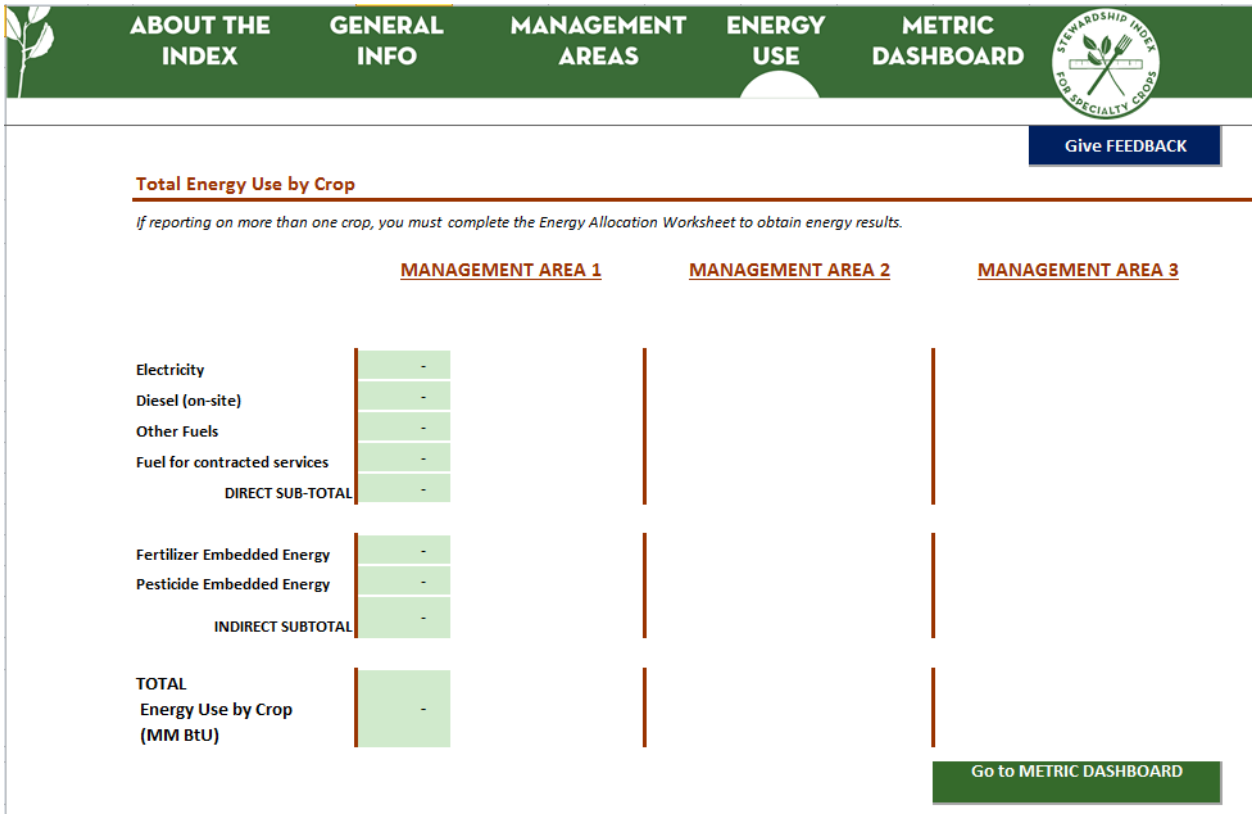


The grower then enters the number of passes made by various farm machinery for various agronomic and harvesting activities. The approximate fuel usage is then calculated for the activities. Irrigation energy is calculated using the water applied information entered previously and the irrigation equipment infrastructure (i.e., motor size, well depth, flow, etc.).

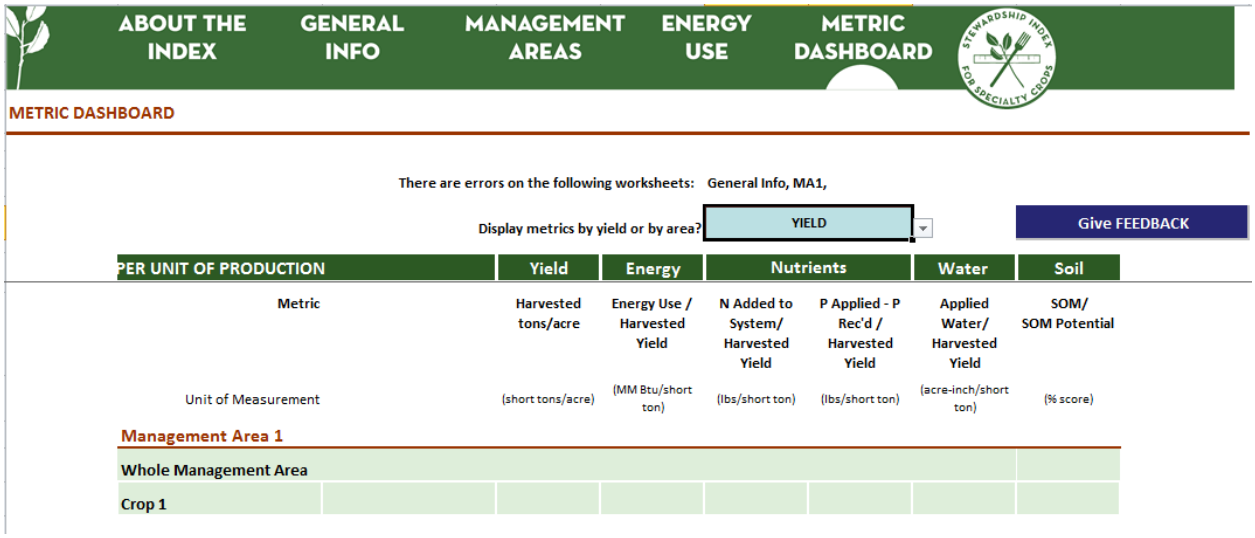


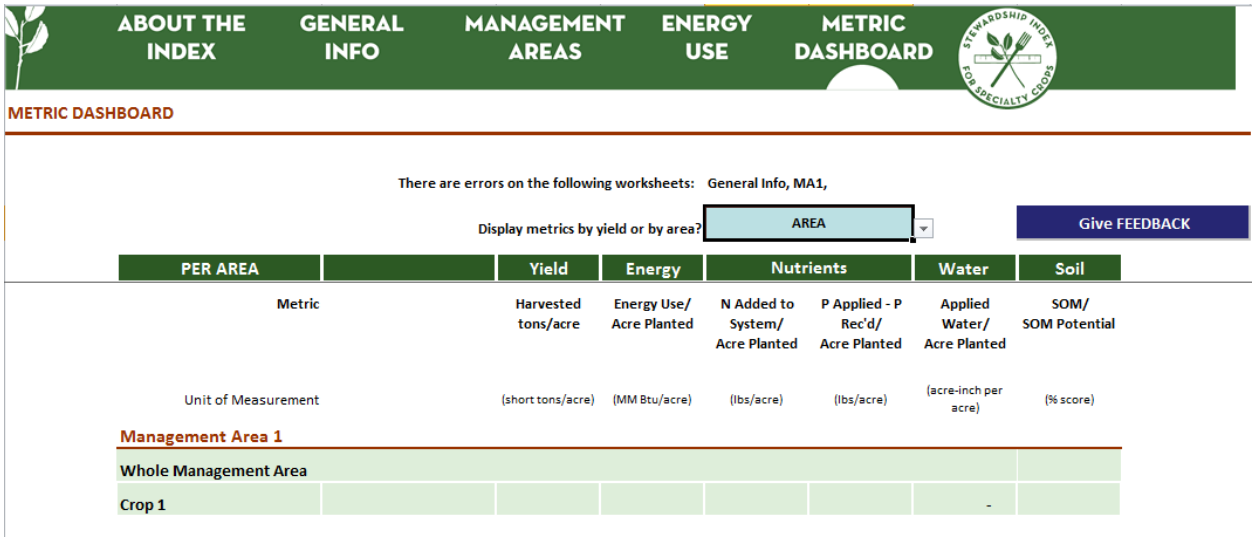
The **Energy Results** sheet summarizes total direct and indirect energy use by the various energy sources used in crop production.

Note: The indirect energy from pesticide use was removed based upon direction from the Metrics Technical Advisory Committee around the relatively small contribution from pesticides and feedback from growers on the difficulty of using the pesticide entry mechnism.



The **Metric Dashboard** sheet is where the metrics calculation results themselves are displayed. The grower can select either Yield or Area to display the metrics results either per harvested ton of production or per acre, respectively.


ABOUT THE INDEX
GENERAL INFO
MANAGEMENT AREAS
ENERGY USE
METRIC DASHBOARD
METRIC DASHBOARD
There are errors on the following worksheets: General Info, MA1,
Display metrics by yield or by area?
YIELD
Give FEEDBACK
PER UNIT OF PRODUCTION
Yield
Energy
Nutrients
Water
Soil
Metric
Harvested tons/acre
Energy Use / Harvested Yield
N Added to System/ Harvested Yield
P Applied - P Rec'd / Harvested Yield
Applied Water/ Harvested Yield
SOM/ SOM Potential
Unit of Measurement
(short tons/acre)
(MM Btu/short ton)
(lbs/short ton)
(lbs/short ton)
(acre-inch/short ton)
(% score)
Management Area 1
Whole Management Area
Crop 1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P Applied - P Rec'd/ Acre Planted
Applied Water/ Acre Planted
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(lbs/acre)
(lbs/acre)
(acre-inch per acre)
(% score)
Management Area 1
Whole Management Area
Crop 1
-