Guidance on Utilizing Continuous Improvement Project Data to Respond to The Sustainability Consortium's Key Performance Indicators

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Field to Market®

Introduction

INTRODUCTION

Field to Market: The Alliance for Sustainable Agriculture and The Sustainability Consortium (TSC) are working to harmonize measurement and reporting of sustainable agriculture and encourage data platform interoperability. Field to Market's Fieldprint® Platform is approved by TSC as a ready-to-use tool for alfalfa, barley, corn, cotton, peanuts, potatoes, rice, sorghum, soy, sugar beet and wheat commodity sourcing from farms in the United States and Canada, while Field to Market's Continuous Improvement Accelerator is a recognized standard against which to satisfy 27 THESIS Key Performance Indicators (KPIs) across 39 product categories.

Companies sourcing these commodities through Continuous Improvement Projects can use these guidelines to aggregate data from the Fieldprint Platform and report against the following TSC KPIs:

- Biodiversity Management - Cow-Calf/Stocker Backgrounder Operations
- Biodiversity Management - Growing Operations
- Biodiversity Management - On-farm
- Cotton cultivation - Environmental Impacts
- Cotton Fiber Supply Mapping
- Crop Supply Mapping
- Environmental Impacts - Priority Ingredient Sourcing
- Farm-Level Environmental Impacts - Animal-based Priority Ingredient Sourcing
- Farm-level Environmental Impacts - Plant-based Priority Ingredient Sourcing
- Feed Sourcing - Cow-Calf/Stocker Backgrounder Operations
- Grain Supply Mapping
- Greenhouse Gas Emissions - Supply Chain
- Greenhouse Gas Emissions Intensity - Animal Farm Operations
- Greenhouse Gas Emissions Intensity - Finishing Stage
- Greenhouse Gas Emissions Intensity - Growing Operations
- Greenhouse Gas Emissions Intensity - On-farm
- Ingredient Supply Mapping
- Irrigations Water Use Intensity - Growing Operations
- Irrigation Water Use Intensity - On-Farm
- Soil Erosion Growing Operations
- Soil Erosion-On-Farm
- Sourcing - On-farm, cotton cultivation
- Supply Chain Mapping
- Sustainable Material Sourcing - Cotton
- Water use - Supply Chain
- Yield - Growing Operations
- Yield-On-farm

Field to Market members are encouraged to use aggregated data collected from their Continuous Improvement Project(s) and the Measurement Claims process to report verified measurements to TSC using the five-step process described below.

Projects utilizing Field to Market's online Fieldprint Calculator can now take advantage of an automated calculation function to directly export data within the online tool. For projects collecting data through a Qualified Data Management Partner (QDMP), this guidance document and accompanying spreadsheet provide detailed instructions on Step Three: Continuous Improvement Project Data Analysis.

Step 1: **Establishing a Continuous Improvement Project:** Data generated from Field to Market's Continuous Improvement Accelerator always begins with the establishment of a project in a relevant sourcing region. Continuous Improvement Projects registered in the Insight and Innovation Pathways are both elegible to report into TSC. Companies must follow Field to Market's project registration and reporting requirements to secure aggregate datasets that are eligible for Steps 3, 4 and 5 in this process. Be sure to follow appropriate enrollment methodologies for each participating farm, which includes at least 10% of the acres of a farm's relevant commodity being entered into the Fieldprint Platform. Please refer to:

- Field to Market Project Handbook

Step 2: **Data Collection:** Each Continuous Improvement Project is unique to the project sponsors and partners. Data can be collected utilizing the Fieldprint Platform, which is available to growers either through Field to Market's online Fieldprint Calculator or by working with a Qualified Data Management Partner (QDMP) to collect data through approved technology partners that have integrated Field to Market's sustainability metrics into their farm management software.

Step 3: **Continuous Improvement Project Data Analysis:** Once data has been collected for a given growing season, the project manager can analyze Yield, GHG Emissions, Soil Erosion and Irrigated Water Use in the appropriate units noted in this document using the Fieldprint Platform. Additional information can be found on pages 5-6 for the following project types:

3A: Projects utilizing the online Fieldprint Calculator: The online Fieldprint Calculator now includes an automated function for projects interested in reporting to TSC. Project administrators should simply navigate to "Reports" and select "TSC Reporting" to export data to Excel in the appropriate units.

3B: Projects partnering with a QDMP: If a project collects data through an approved technology partner, the project administrator will need to work directly with that technology partner to conduct the data analysis utilizing the guidance provided in this document.

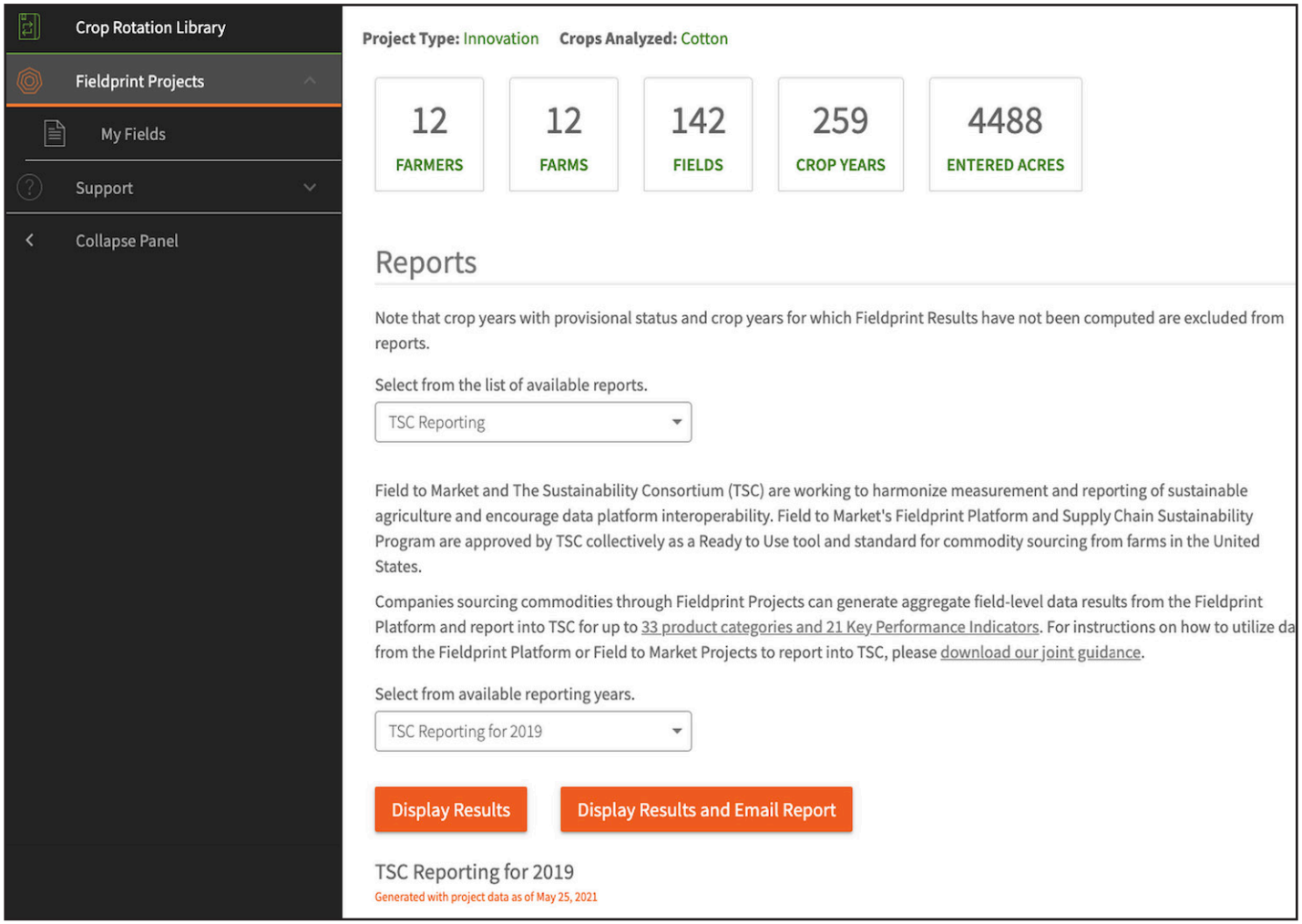
Step 4: **Field to Market Claim:** Once a project-level analysis is conducted with the intent to utilize this data to report into THESIS, best practice is to update Field to Market via a Claims form to reflect the measurement claim with the associated level of verification depending upon the method for conducting the data analysis (first-, second-, or third-party verification). If desired, Field to Market partners or another independent entity can offer third party verification the project wishes to use the claim publicly in sustainability reporting or if the downstream customer requires additional levels of assurance.

Step 5: **Entering Data into THESIS, TSC's KPI platform:** Data can be used to report into THESIS for the relevant KPIs in the product categories outlined above.

Step 3A: Data Analysis for Projects Utilizing the Online Fieldprint Calculator

The online Fieldprint Calculator now includes an automated function for projects interested in reporting to TSC. When logged into the Fieldprint Calculator, project administrators can follow a few brief steps to export their data in the appropriate units, and may disregard the guidance on the following pages of this document. To export your data, simply:

1. Navigate to your "Project Dashboard" and click "Reports"
2. From the first dropdown menu, select "TSC Reporting"
3. From the second dropdown menu, select the relevant crop year which you would like to analyze.
4. Display your results in your browser, or click "Display Results and E-mail Results" to receive a full report via e-mail.



Project administrators should refer to the Field to Market TSC KPIs Reporting Spreadsheet to explore how data from the Fieldprint Platform can satisfy 27 THESIS KPIs across 39 product categories.

Step 3B: Data Analysis for Projects Partnering with a QDMP

Field to Market has created this document to provide the necessary technical guidance for Qualified Data Management Partners (QDMPs) needed to complete Step 3B by illustrating an example of how to aggregate from individual field data entries and metric scores to a project average result. To explore which QDMPs have operationalized Field to Market's THESIS reporting module within their platform, please reference the Finding a Data Management Partner Guide.

Appendix:
Technical Guidance

TECHNICAL GUIDANCE

The examples provided below are also available in the Field to Market TSC KPIs Reporting Spreadsheet with the relevant calculations and equations embedded for ease of use. This spreadsheet follows a simple example of a project with two farmers, who each have more than one field entered in the Continuous Improvement Project. To calculate a project average, these instructions lead you through a three-step process:

1. A farmer-level area or production-weighted average based on the Entered Acres for all fields is calculated;
2. This average can be used to scale up to the Enrolled Acres for each farmer; and
3. Finally, an area or production-weighted average across all Enrolled Acres in the project can be calculated

In addition to calculating the project level average for each value, TSC also requires the results to be converted into metric units. This conversion is illustrated as the final step, except for irrigation where the example calls for the conversion before aggregating the data. You may choose to conduct all conversions on a data set prior to performing the aggregation step.

Data used in the examples below are for corn, and therefore includes the conversion from corn bushels to metric tons. For other crops, please reference the conversion factors listed in the reference table below.

Conversion Table

English units (Field to Market)	Metric Units (TSC)
1 acre	0.405 hectares (ha)
1 bushel (60 lb)(potatoes, soybeans, wheat)	0.027 metric tons
1 bushel (56 lb) (corn)	0.025 metric tons
1 bushel (48 lb) (barley)	0.022 metric tons
1 pound (cotton, rice, sugar beets)	0.0045 metric tons
1 short ton (soil erosion)	0.9907 metric tons
1 US acre-inch (irrigation water)	102.8 cubic meters

Yield

YIELD

TSC Reporting Guidelines:

Answer in metric tons of crop supply harvested per hectare planted. Calculate the average of the most recent yield estimates from the farms that produced your crop supply, weighted by the mass of crop supplied by each farm. For each farm, calculate yield as the mass of crop harvested (metric tons), divided by the hectares planted.

Continuous Improvement Project Aggregation Guidelines:

To answer B1, use the project average crop yield. This is a required input to the Fieldprint Platform and is used to calculate the Land Use Metric. For this reporting, you will need the data input fields "Effective Yield" and "Area" for each field, as well as the Enrolled Acres for each grower. To calculate the project average yield, you must first derive the average yield for each of your growers. Then you calculate an area-weighted project average yield using total enrolled acres and average yield for each grower. The project average yield must then be converted to metric units (tons/ha).

Step One: Calculate Grower Average Yield (Table 1)

1. Use entered acres for each field that a participating grower has entered into the Fieldprint Platform utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working.
2. Use the Effective Yield (bushel/acre) for each field utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working.
3. Calculate actual field production for each field by multiplying each field's acreage by its associated yield.
4. Calculate average yield for each grower by dividing the summed total field production by the summed yields.

Table 1: Calculate Grower Average Yield

Farmer	Entered Area (ac)	Yield (bu/ac)	Total Field Production (bu)	Grower Average Yield (bu/ac)
1	25	170	4250	
1	100	180	18000	
1	150	210	31500	
Total	**275**		**53750**	
				195
2	100	175	17500	
2	125	200	25000	
Total	**225**		**42500**	
				189

Step Two: Calculate Project Average Yield (Table 2)

1. Derive the total Enrolled Acres for each grower participating in the Continuous Improvement Project.
2. Calculate the total estimated farm production for each farmer by multiplying total enrolled acres by the entered acre yield average calculated in Step One.
3. Calculate the project average yield (bushels/acre) by summing the total estimated farm production number (bushels) and dividing by the total enrolled acres number (acres).

Table 2: Calculate Project Average Yield

Farmer	Enrolled Area (ac)	Grower Average Yield (bu/ac)	Total Grower Enrolled Production (bu)
1	1000	195	195454
2	2000	189	377778
Total	**3000**		**573232**
Project Average Yield		**191**	

Step Three: Conversion to Metric Units Required by TSC (Table 3)

1. To calculate the THESIS yield KPI, multiply the bushels by the metric tons per bushel conversion and divide by the multiplied acres per hectare conversion utilizing the conversion table above or provided in Field to Market's TSC KPIs Reporting Spreadsheet.

Table 3: Convert Project Average Yield

Converted Project Average Yield	
Project Average Yield (bu/ac)	**Converted Project Average Yield (MT/Ha)**
191	**11.8**

Greenhouse Gas Emissions

GREENHOUSE GAS EMISSIONS

TSC Guidelines:

Calculate B1 as the average of the most recent greenhouse gas (GHG) emissions intensity estimates for the farms that produced your crop supply, weighted by the mass of crop supplied by each farm. For each farm, calculate GHG emissions intensity as the mass of all GHGs emitted, divided by the mass of crop harvested.

Continuous Improvement Project Aggregation Guidelines:

To answer B1, you will need to calculate the production-weighted project average greenhouse gas emissions metric result (pounds of CO_2e per unit of output) and convert using pounds to kilogram and bushel to metric ton conversions. The relevant data field in the data output file provided by the Fieldprint Platform is labeled "GHG per Unit Output".

To calculate the project average yield, you must first derive the average yield for each of your growers. Then you calculate an area-weighted project average yield using total enrolled acres and average yield for each grower. The project average yield must then be converted to metric units (tons/ha).

Step One: Calculate the Grower Average GHG Emissions (CO_2e/bu) (Table 4)

1. Use actual production for each field each grower has entered into the Platform (calculated in Table 1)
2. Use the GHG metric outcome for each field (in units of pounds (lbs) of carbon dioxide equivalent (CO_2e) per unit of crop production) utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working.
3. Calculate total GHG emissions for each field by multiplying each field's production by its associated GHG metric.
4. Calculate the production-weighted average GHG emissions in CO_2e/bu by dividing the total GHG emissions by the total production for each grower.

Table 4: Production-Weighted Average GHG For Each Grower

Farmer	Actual Field Production (bu)	GHG metric (lbs CO_2e/bu)	Total Field GHG (lbs CO_2e)	Grower Average GHG Emissions (lbs CO_2e/bu)
1	4250	6	25500	
1	18000	9	162000	
1	31500	12	378000	
Total	**53750**		**565500**	
				10.52
2	17500	8	140000	
2	25000	10	250000	
Total	**42500**		**390000**	
				9.18

Step Two: Calculate the Project Average GHG Emissions (lb CO_2e/bu) (Table 5)

1. Derive the total enrolled acres for each grower in the project.
2. Use the total grower enrolled production from Table 2 (multiply enrolled acres by average entered yield)
3. Calculate the total enrolled emissions GHG for each farmer by multiplying total enrolled acres by the grower average GHG calculated in Table 4.
4. Calculate the project average by dividing the total enrolled GHG emissions by the total enrolled acres.

Table 5: Total Grower & Project Average GHG Emissions

Farmer	Total Grower Enrolled Production (bu)	Estimated Grower Average GHG (lbs CO_2e/bu)	Total Grower GHG Emissions (lbs CO_2e)
1	195455	10.52	2056364
2	377778	9.18	3466667
Total	**573232**		**5523030**
Project Average GHG Emissions (CO_2e/bu)		**9.63**	

Step Three: Convert Project Average GHG Emissions to Metric Units (Table 6)

1. Convert the project average GHG from (pounds CO_2e per bushel) to (kilograms CO_2e per metric ton).
2. Multiply the pounds CO_2e by kilograms per pound conversion and divide by the metric tons per bushel conversion.

Table 6: Convert Project Average GHG Emissions to Metric Units

Converted Project Average GHG Emissions	
Project average (lbs CO_2e/bu)	**Converted Project Average (kg CO_2e/MT)**
9.63	**174.97**

Soil Erosion

SOIL EROSION

TSC Guidelines:

Calculate B1 as the average of the most recent soil erosion estimates from the farms that produced your crop supply, weighted by the mass of crop supplied by each farm. For each farm, calculate soil erosion as the estimated mass of soil eroded from production fields due to wind or water flow, divided by the mass of crop harvested.

Continuous Improvement Project Aggregation Guidelines:

To answer B1 you will need to calculate the area-weighted project average erosion rate. The Fieldprint Platform uses the TSC approved Natural Resources Conservation Service (NRCS) erosion models to calculate total erosion from wind and water for each field, in units of tons of soil loss per acre. You will need the data from the "Total Soil Erosion" with units of "ton/acre/year" utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working. This data will need to be combined with the entered acres from each field, as well as the enrolled acres for each grower as determined for the Yield KPI.

Step One: Calculate the Grower Average Erosion Rate (Table 7)

1. Use entered acres and soil erosion results for each field from each grower.
2. Calculate the total soil erosion for each field by multiplying the soil erosion by the entered acres. Be sure to use the data labeled tons/acre/yr utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working.
3. Calculate area-weighted average soil erosion rate for each grower (tons/acre/year) by dividing the summed total soil erosion number by the total entered acres.

Table 7: Calculate Grower Average Soil Erosion Rate

Farmer	Entered Area (ac)	Soil Erosion (Tons/Ac/Yr)	Actual Total Field Soil Erosion (Tons/Yr)	Grower Average Soil Erosion rate (Tons/Ac/Yr)
1	25	2.3	58	
1	100	5.0	500	
1	150	3.1	465	
Total	**275**		**1023**	
				3.7
2	100	1.9	190	
2	125	3.0	375	
Total	**225**		**565**	
				2.5

Step Two: Calculate the Project Average Erosion (Table 8)

1. Derive the total enrolled acres for each grower in the project.
2. Calculate the project average soil loss for each farmer by multiplying total enrolled acres by the grower average soil erosion rate from Table 7.
3. Calculate the area-weighted project average by dividing the summed total estimated farm soil loss number by the enrolled acres number.

Table 8: Calculate Project Average Erosion

Farmer	Enrolled Area (ac)	Estimated Grower Average Erosion Rate (Tons/Ac/Yr)	Total Estimated Farm Soil Erosion (tons/yr)
1	1000	3.7	3718
2	2000	2.5	5022
Total	**3000**		**8740**
Project Average		**2.9**	

Step Three: Conversion (Table 9)

1. Convert the area-weighted Project Average Soil Erosion from tons/acre/year to metric tons / hectare/year.
2. Multiply the project average number by metric tons per short tons conversion and divide by the hectares per acre conversion.

Table 9: Convert Soil Erosion To Metric Units

Converted Project Average Soil Erosion	
Project average soil erosion (Tons/Ac/Yr)	**Converted Project Average (MT/Ha/Yr)**
2.9	**6.53**

Irrigation Water Use

IRRIGATION WATER USE

TSC Guidelines:

Calculate B1 as the average of the most recent irrigation water use intensity estimates for the farms that produced your crop supply, weighted by the mass of crop supplied by each farm. For each farm, calculate irrigation water use intensity as the volume of irrigation water applied, divided by the mass of crop harvested. Include the crop grown between the end of the harvest of the previous crop through the harvest of the crop that produced your supply.

Continuous Improvement Project Aggregation Guidelines:

To answer B1, you will need to use data from all irrigated fields for your project. Do not include non-irrigated fields in this calculation. If your project includes both irrigated and rain-fed production, you will need to re-calculate the grower and project average yield, entered acreage and production using only the data from the irrigated fields. You will want to extract the Effective Yield as well as the Water Applied (in units of acre-in) from the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working. The example here conducts the conversions to metric units first; if your project is 100% irrigated, you may use the grower average production and entered acreage from previous steps in this document.

The Fieldprint Platform Irrigation Metric results are reported in acre inches per incremental bushel gained by applying irrigation(ac-in/bu). This is NOT the value to use for TSC reporting. The THESIS KPI calls for irrigation applied per unit of total production, and does not account for the non-irrigated yield component. In summary:

- **DO NOT** use the Irrigated Water Use metric outcome.
- **DO** use the production-weighted project average of total water applied in acre-inches divided by the total irrigated production. Convert using the cubic meters and metric tons conversions.
- **DO** count only the irrigated fields in your project for reporting into this KPI.

Step One: Calculate Grower Average Water Applied and Convert To Metric Units (Table 10)

1. Use entered acres for each irrigated field each grower has entered into the has entered into the Fieldprint Platform, utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working, and convert to hectares.
2. Use the actual water applied (acre-inches) for each irrigated field and convert to cubic meters, utilizing either the data output file provided by the Fieldprint Calculator or reports from the approved technology partner with which you are working.
3. Calculate total volume of water applied for each field by multiplying water applied (in cubic meters) by the field area (in hectares).
4. Calculate the area -weighted grower average water applied (cu m / ha) by dividing the actual water applied (cubic meters) by the total entered area in hectares. This results in the final column of Table 10 (Grower Average Irrigation Volume (cubic meters per ha).

Table 10: Calculate Grower Average Water Applied In Metric Units

Farmer	Entered area (ac)	Water Applied (ac-in)	Actual volume of water applied to field (cubic meters)	Entered Field area (ha)	Grower Average Irrigation Volume (cubic meter per ha)
1	25	4	10200	10.1	
1	100	8	81600	40.4	
1	150	6	91800	60.6	
Total	**275**		**183600**	**111.1**	
					1653
2	100	8	81600	40.4	
2	125	10	127500	50.5	
Total	**225**		**209100**	**90.9**	
					2300

Step Two: Calculate Grower Average Yield (Table 11)

1. Calculate the total production using the irrigated yield and the actual acreage. If the entire project is irrigated, you may use data from the section for "Yield" (Tables 1-3).
2. Multiply the irrigated yield by the entered acres to get the total irrigated production for each field and grower (bushels).
3. Use actual field area in hectares from Table 10.
4. Convert the total production in bushels to tons by multiplying by the crop conversion factor provided in the Conversion Table (0.025 for corn).
5. Calculate the grower average yield based on total tons of production and total hectares of entered area.

Table 11: Calculate Grower Average Irrigated Yield In Metric Units

Farmer	Entered Acres (ac)	Irrigated Yield (bu/acre)	Total Irrigated Production (bu)	Actual Field area (ha)	Total irrigated production (ton)	Grower average irrigated yield (ton/ha)
1	25	170	4250	10.1	106.25	
1	100	180	18000	40.4	450	
1	150	210	31500	60.6	787.5	
Total	**275**		**53750**	**111.1**	**1343.75**	**12.09**
2	100	175	17500	40.4	437.5	
2	225	200	25000	50.5	625	
Total	**225**		**42500**	**90.9**	**1062.5**	**11.69**

Step Three: Calculate Project Average Water Applied (Table 12)

1. Derive the total enrolled acres for each grower in the project and covert to hectares.
2. Use the grower average irrigation rate (cubic meters per ha from Table 10) and the grower average irrigated yield (tons per ha from Table 11).
3. Calculate the total water applied by multiplying the irrigation rate (cubic meters per ha) by the total enrolled area (ha).
4. Calculate the total irrigated production for each grower by multiplying the grower average irrigated yield (ton/ha) by the enrolled area (ha).
5. Calculate the project average irrigation per ton by dividing the summed total irrigation rate number by the total irrigated production.

Table 12: Calculate Project Average Water Applied

Farmer	Enrolled area (ac)	Enrolled area (ha)	Grower Average Irrigation volume (cubic meters per ha)	Total Water Applied (cubic meters)	Grower Average Irrigated Yield (ton/ha)	Grower Total Irrigated production (tons)	Average irrigation rate (cubic meters per ton)
1	1000	405	1653	1652565	12.09	12095	137
2	2000	2023	2300	4600660	11.69	23377	197
Total	**3000**	**2428**		**6253225**			
Project Average							**176**

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