2022 Verification Project Results

Madera County Grower Workshop

DAVIDS ENGINEERING, INC

Serving Stewards of Western Water Since 1993

Agenda

1. Overview
2. Objectives and Results
3. Conclusions and Recommendations

2022 Verification Project Overview

- In late 2020, IrriWatch was selected by a stakeholder group as the method to quantify ETAW[1] in comparison to groundwater allocations
- During the 2021 calendar year, ETAW from IrriWatch was provided to growers for the first time
- During the 2022 calendar year, the Verification Project was completed to perform a more extensive review of ETAW from IrriWatch and compare it to AGW[2] measured by flowmeters

1. ETAW = Evapotranspiration of Applied Water
2. AGW = Applied Groundwater

2022 Verification Project Objectives

1. Increase grower engagement and outreach
2. Evaluate flowmeter accuracy
3. Develop and test processes to collect, QA/QC, and use totalizing flowmeter data
4. Evaluate data needs and data collection methods for both ETAW and AGW
5. Develop improvements to processes for quantifying AGW and ETAW volumes
6. Compare ETAW from IrriWatch and AGW from flowmeters

Terminology Overview

- Parcel/APN
- Field
- Parcel-Field
- Irrigation Supply Well
- Irrigation Unit

1

Parcel/APN – legal property boundaries developed and maintained by the Madera County Assessor's office. *"123-456-789"*

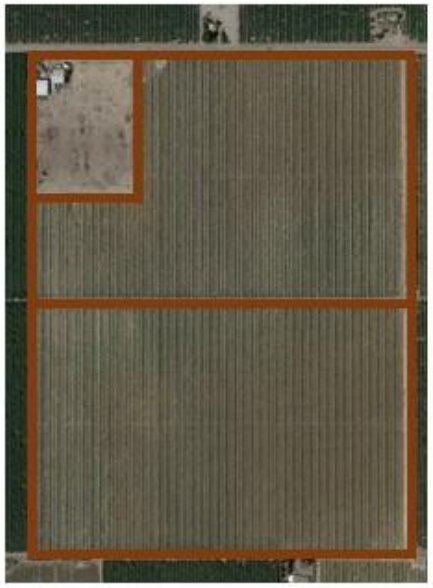
Two Parcels/APNs are depicted to left; subsequent images focus on eastern Parcel/APN.

2

Field – 2018 statewide coverage of irrigated lands developed by California Department of Water Resources. *"12345"*

Three Fields are depicted to the right; two are cropped and one is idle or unplanted and not irrigated.

3



Parcel-Field – The union of Parcels/APNs and Fields. Parcel-Field ID is a combination of the Parcel/APN and Field IDs. *"123456789_12345"*

Three Parcel-Fields are depicted to the left. The one parcel shown has three separate fields delineated on it; two are cropped and one is idle and not irrigated.

4

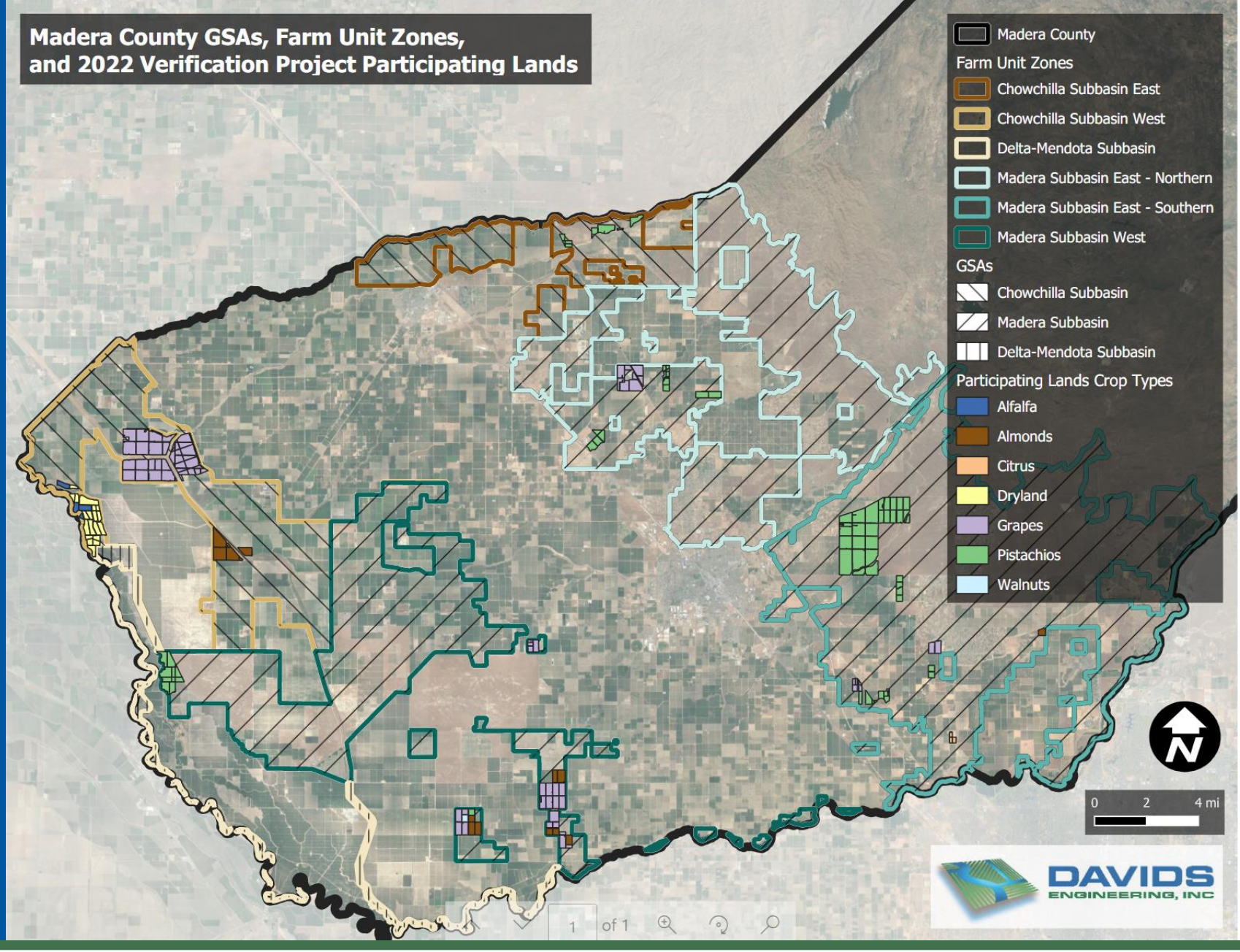
Irrigation Supply Wells (supplying a shared irrigation system for the two cropped parcel-fields)

Irrigation Unit (IU) – one or more Parcel-Fields receiving all of the irrigation water pumped from one or more groundwater wells.

One IU comprised of two wells and two cropped parcel-fields is shown to the right.

Participating Lands

Crop	2022 Madera Verification Project		
	Parcel-Field Count	Acreage	Acreage %
Alfalfa	4	174	1.5%
Almonds	16	1,053	8.9%
Citrus	4	48	0.4%
Dryland	21	862	7.3%
Grapes	74	4,785	40.5%
Pistachios	86	4,836	41.0%
Walnuts	1	42	0.4%
Other	0	0	0.0%
Totals	**203**	**11,800**	**100%**



Participating Lands

Crop	2022 Madera Verification Project			Madera County GSAs			Acreage % Difference (Verification Project - GSAs)
	Parcel-Field[1] Count	Acreage	Acreage %	Parcel-Field[1] Count	Acreage	Acreage %	
Alfalfa	4	174	1.5%	184	6,580	5.4%	-3.9%
Almonds	16	1,053	8.9%	1,606	43,059	35.4%	-26.5%
Citrus	4	48	0.4%	59	1,327	1.1%	-0.7%
Dryland[2]	21	862	7.3%	133	3,963	3.3%	4.0%
Grapes	74	4,785	40.5%	512	14,625	12.0%	28.5%
Pistachios	86	4,836	41.0%	1,000	22,204	18.2%	22.8%
Walnuts	1	42	0.4%	26	653	0.5%	-0.1%
Other[3]	0	0	0.0%	1,782	29,261	24.1%	-24.1%
Totals	**203**	**11,800**	**100%**	**5,302**	**121,672**	**100%**	-

- 16 growers and 36 Irrigation Units (IUs)[4] total
- Approximately 10 % of the cropped areas in the Madera County GSAs
- **Verification Project IUs representative of primary crops (*i.e.*, almonds, grapes, pistachios) in Madera County GSAs**

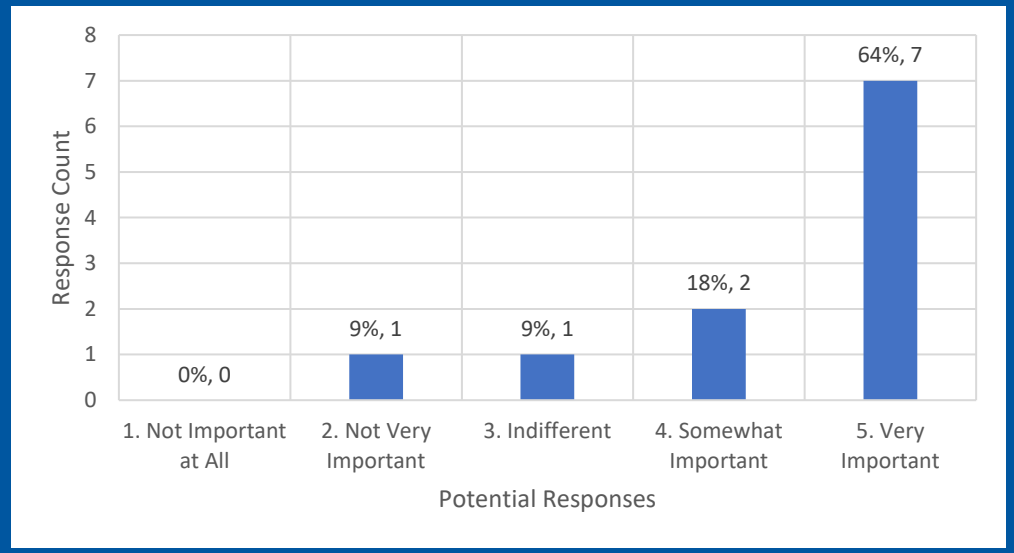
1. A parcel-field is the union of legal parcel boundaries, from the Madera County Assessor's Office, and 2018 California statewide irrigated and urban lands coverage, from the California Department of Water Resources (DWR).
2. Dryland is currently not a specific crop class available from IrriWatch; it describes lands farmed using only precipitation and no applied water. The dryland areas included in the Project are dryland wheat, and the Parcel-Field Count and Acreage were calculated using IrriWatch's Parcel-Fields that have a planted crop, but are not irrigated.
3. There are other land uses/crop classes that make up the rest of the Parcel-Fields in the Madera County GSAs. These include cherries, figs, kiwis, olives, pasture, pomegranates, wheat, fallowed fields, and variety of other tree crops. The two largest crop classes that had no representation in the Project were irrigated wheat fields and fallowed fields, which comprise roughly 10,000 acres each (a total of approximately 17%) of the Madera County GSAs according to IrriWatch. Although crop type was field verified and accurate for lands participating in the 2022 Verification Project, there were some corrections required from the original crop shown in IrriWatch at the outset of the Project. For cropping in the overall Madera County GSAs, the coverage is generally representative but not expected to be completely accurate. Improving land use coverage is a recommendation resulting from the Project.
4. An Irrigation Unit is defined as one or more Parcel-Fields receiving all of the irrigation water pumped from one or more groundwater wells.

Objective 1

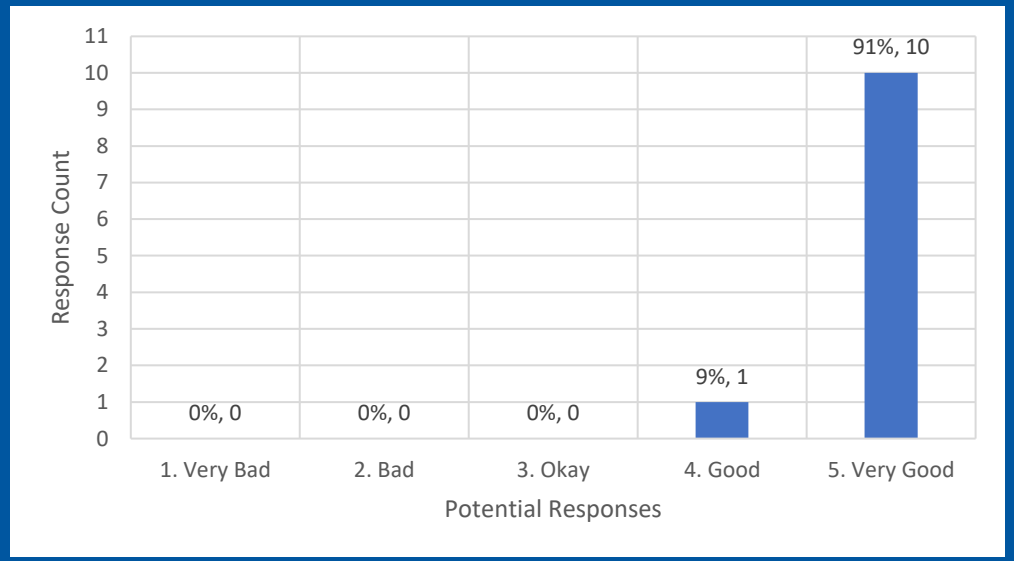
Increase Grower Engagement and Outreach

1. Held two rounds of individual meetings with participating growers, and communicated and coordinated on a weekly basis with participating growers through the irrigation season
2. Requested feedback from growers following Project completion[1]

How important is it to you to have County engagement and involvement in the field at a farm scale?



Overall, how would you rate your satisfaction with the 2022 Verification Project?



1. 11 of the 16 participating growers (69%) provided feedback following Project completion.

Objective 2
Evaluate flowmeter accuracy

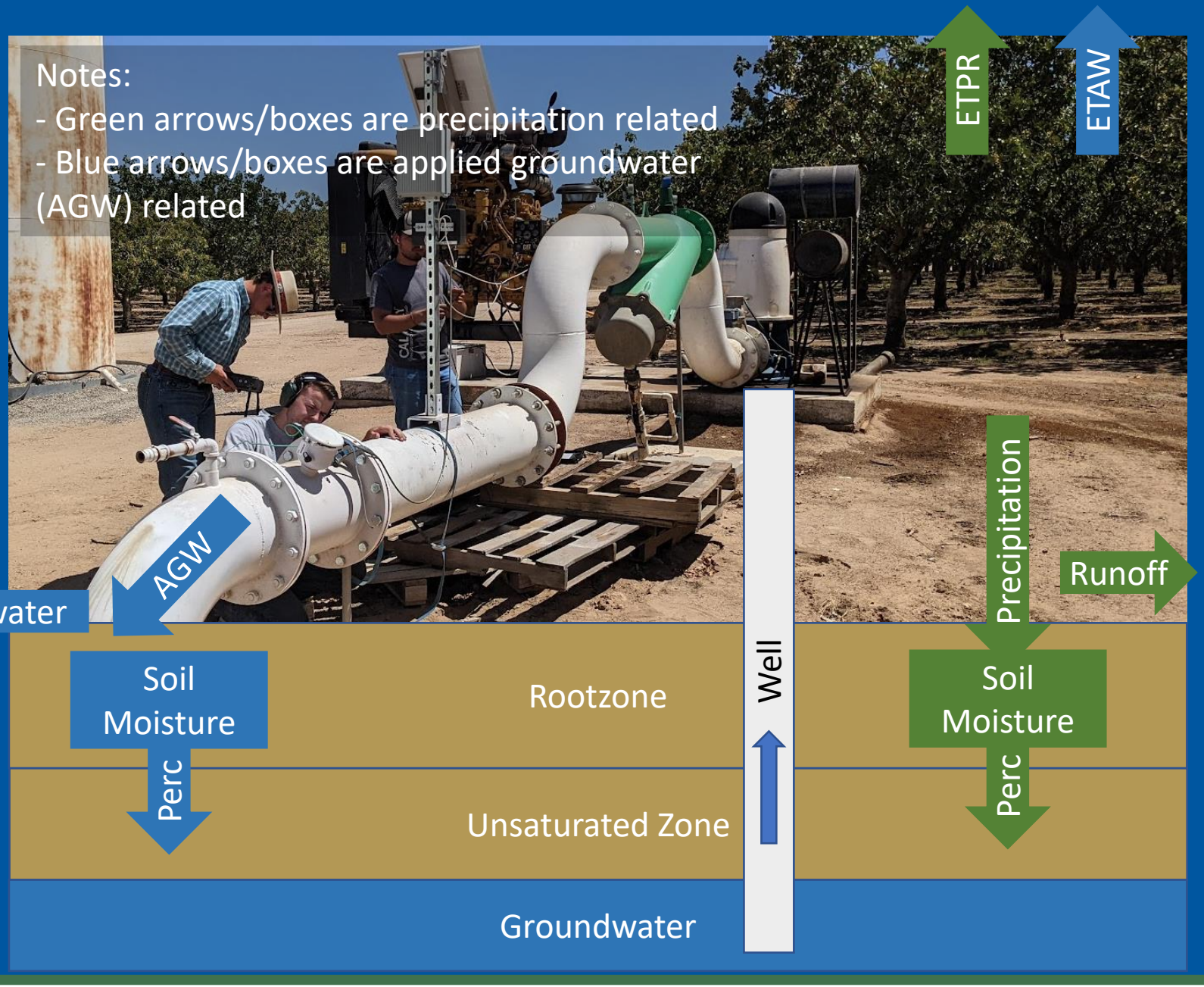
1. Completed an inspection of flowmeter installation on all permanent flowmeters included in study[1]

2. Completed independent flow measurements with a portable transit time flowmeter[2] for direct comparison to permanently installed flowmeters

1. These inspections were for use related to the 2022 Verification Project only and do not constitute an official meter inspection, pursuant to Resolution 2021-113.
2. The portable transit time flowmeter used was a Fuji Electric Portaflow-C FSC-4 Ultrasonic flowmeter.

Data Collection

- Applied Groundwater (AGW) measured with permanent flowmeters
- Independent flowmeter measurements with Portable Transit Time Meter
- Evapotranspiration of Applied Water (ETAW) measured with IrriWatch
- ETAW = ET - ETPR (ET from Precipitation)
- CUF[1] = ETAW / AGW



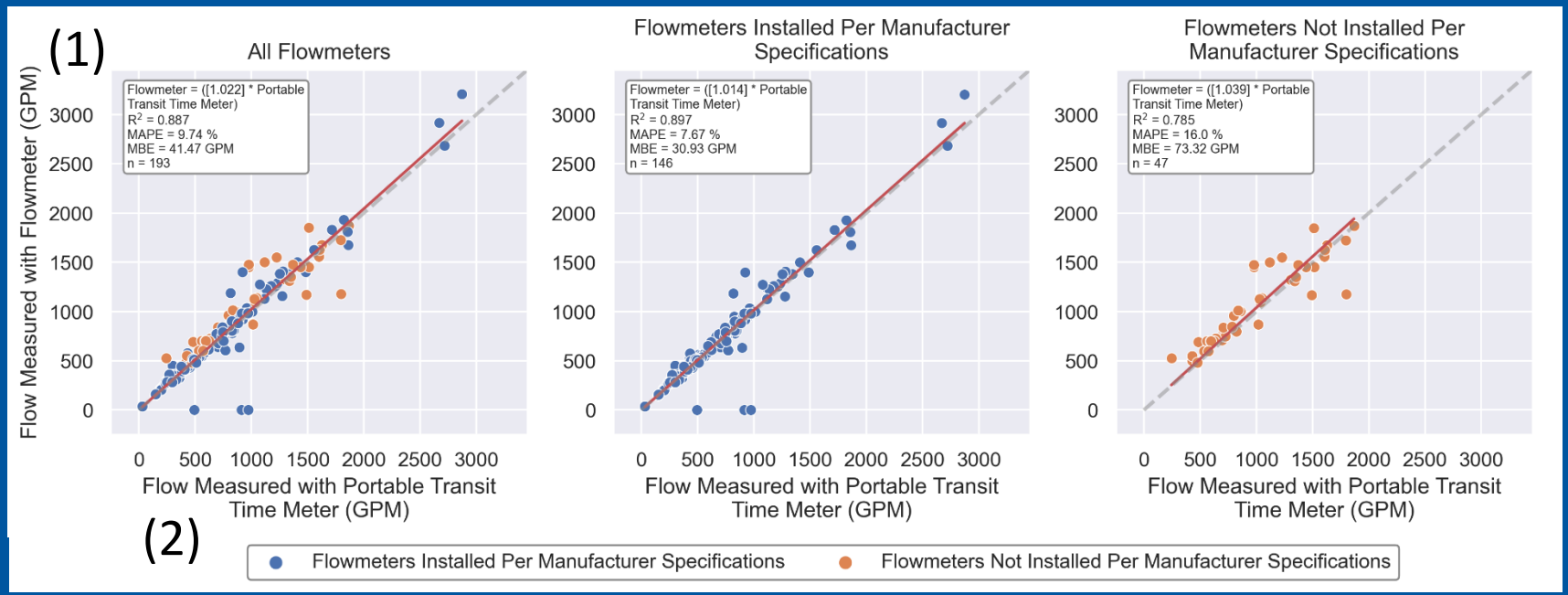
1. CUF = Consumptive Use Fraction

Flowmeter Comparison Results

- 97 permanent flowmeters
  - 74 (76%) installed per manufacturer specifications
  - 23 (24%) were not
- 194 comparison measurements
- Mean Absolute Percent Error (MAPE):
  - All measurements = **9.7%**
  - Installed per Manufacturer Specs = **7.7%**
  - Not Installed per Manufacturer Specs = **16.0%**
- **<u>Correct installation substantially improves flowmeter accuracy.</u>**

(1) Flowmeter

(2) Portable Transit Time Meter



Objective 3

Develop and test processes to collect, QA/QC, and use totalizing flowmeter data

1. Developed and implemented mobile data collection forms that can be filled out using an internet browser or smartphone app. These were utilized by both growers and DE field staff as part of the project[1]

2. Related flowmeter data to corresponding irrigated lands to develop an estimate of total AGW for comparison to ETAW

3. Developed a list of data and procedural needs for more widespread use of flowmeter data for comparison to groundwater allocations (Objective 4)

1. Data collection as part of the Project included over 900 submissions by growers and over 1,600 by DE field staff.

Objective 4

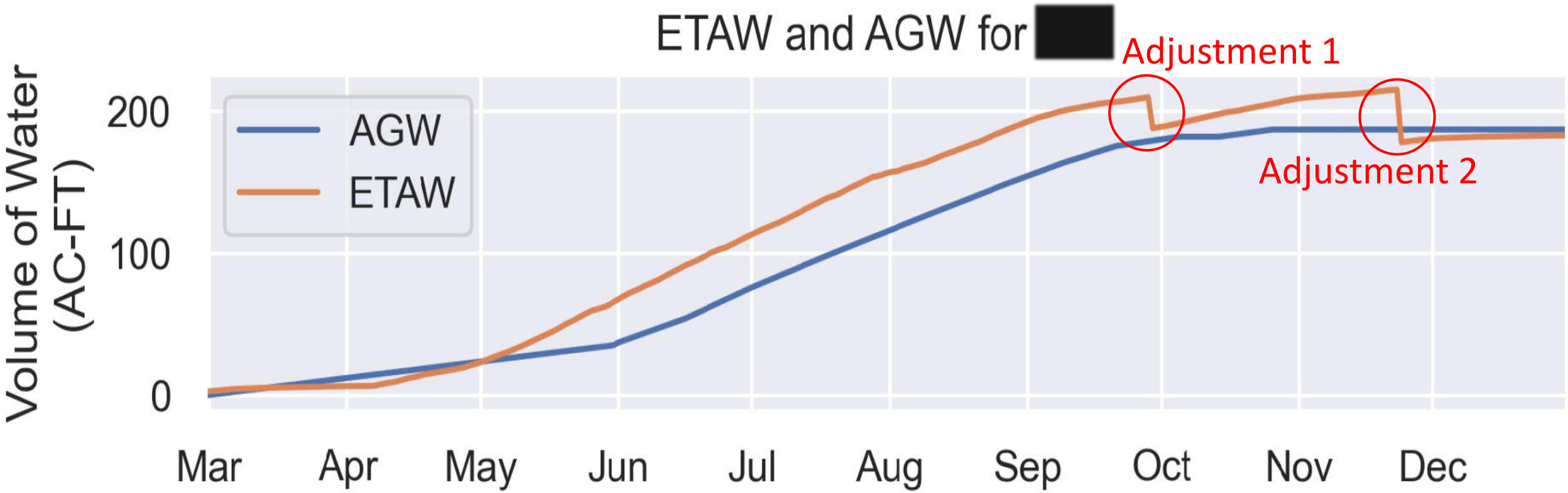
Evaluate data needs and data collection methods for both ETAW and AGW

Objective 5

Develop improvements to processes for quantifying AGW and ETAW volumes

- Review of preliminary results for the Project led to important refinements in the methodology and assumptions that IrriWatch uses to quantify ETAW, resulting in an adjustment to ETAW values for 2022 and future years

Comparison Between AGW and ETAW



Questions & Discussion