Fertilizer Research and Education Program

Final Report Form

A. Project Information

Project Title	Training on Crop Management and Integrated Climate, Soil and Irrigation System Data to Minimize Nutrient Loss and Optimize Irrigation Efficiency	
Project leaders	Trina Walley, Khaled M. Bali	
Grant Number	17-0489-000-SA	
Project Duration	Start Date: 1.1.2018	End Date:12.31.2021
Email and Phone	Programs@eaststanrcd.org (209) 287 - 3662	
Report Type	Final	
Reporting Period	Start Date: January 2018	End Date: December 2021

B. Abstract

As technology in irrigation, chemigation and fertigation advance, there is an increased need to provide information for agricultural workers on best management practices. The East Stanislaus Resource Conservation District (ESRCD) addresses local resource concerns through a variety of outreach programs such as irrigation and nutrient management workshops, which include material on integrated management practices. The workshops and trainings help ensure decision makers are using water efficiently, are able to accurately monitor nitrogen application levels and are better able to manage the health of their soil for optimum productivity while preventing deep percolation of nitrates that contaminates groundwater. Workshops were held in both English and Spanish covering topics such as Distribution Uniformity, Flowmeters, Calculations, Data Management, Irrigation Scheduling, Soil Health and Nutrient Management. The trainings have benefited 306 growers with continuing education units. A previously unidentified benefit of these training has been to fill the educational gap for the Irrigated Lands Regulatory Program, which requires growers to maintain self-certification for nutrient management plans.

The program had a significant positive environmental impact resulting from 84 irrigation evaluations covering 7,877 acres. Full reports were given to make the connection between irrigation system uniformity and the effectiveness of nutrient application. This positive environmental impact has a direct correlation with a positive economic impact. Through working to increase the producers' soil health, irrigation system, fertilizer application efficiency, minimizing water and nutrient waste, the amount of money spent on yearly inputs needed for crop health will significantly decrease. Lastly, the program had a positive agronomic impact on the participants in the form of increasing an awareness of new technology available to both producers and employees to help increase efficiency, increase soil health and stability, monitor actual nutrient, and water levels, and finally provide options to create or improve a precise schedule for nutrient and water application.

C. Introduction:

A 2015 FREP funded research project titled "Water and Nitrogen Management: Recognizing and Adapting to Logistical Challenges at the Farm Field Level" brought attention to the challenges that producers in the Central Coast region face when it comes to balancing Water and Nitrogen (N) best management practice and the production

quantity and quality requirements implemented by the demands of the market. One major issue emerging from the research done by Mr. Marcus Buchanan was the lack of technical training and trained employees when it came to water and nitrogen management. Management systems are a costly investment that promise a reduced negative impact on the environment through more precise application of nutrients and water. The potential yield benefits through the precise placement of fertilizers and irrigation directly to the root zone have made installation of these systems a priority. However, maximizing the efficiency of nutrient and water application is prevented without one key element: EDUCATION.

This project focuses on the FREP goal of improving input management through Irrigator Workshops and increasing the level of penetration of information regarding best management practices has in local agricultural companies. Thus far, the project has documented and confirmed the need for continued education for growers and farm managers on best management practices. Despite years of experience, there were many growers that the evaluations were able to identify issues with their system operation or maintenance which they can improve on immediately, that will have a long-term impact of how efficiently they apply irrigation water and fertilizers.

D. Objectives

Objective 1: Promote best management practices through workshops for agricultural workers in English and Spanish based on existing resources from University of California Cooperative Extension, USDA-Natural Resource Conservation Services, NCAT/ATTRA and CDFA-FREP.

Objective 2: Establish training materials and workshops that can be approved for continuing education credits towards maintaining certifications through Irrigation Association, California Certified Crop Advisors and Department of Pesticide Regulation.

Objective 3: Encourage irrigators to share individual challenges and successes in workshops, which will create a networking environment for ongoing farmer-to-farmer education.

E. Methods – Education and Outreach

East Stanislaus RCD focused on making industry connections in year 1 to support outreach events and trainings. ESRCD built on the existing relationship with USDA NRCS and Almond Board of California to reach farmers through their existing relationship with those organizations. Farmers enrolled in programs with USDA NRCS already had the interest in conservation and were the ideal target audience for irrigation evaluations. Attended multiple grower “Lunch & Learns”, regional workgroup meetings, and industry conferences. These methods worked well in 2018 and 2019, however with staff furloughs and loss of in person meetings our outreach suffered in 2020. This required us to return to one-on-ones through farmer relationships built previously to come back in 2021 to complete our program deliverables.

Workshops and Trainings were developed to get the soil and water conservation message delivered with the most incentives to attend. ESRCD worked closely with the San Joaquin Water Quality Coalition on getting trainings promoted to their membership. In return,

ESRCD collaborated with NCAT to provide training to their membership to complete the annual nitrogen budgeting required as part of the Irrigated Lands Regulatory Program. NCAT created instructions in both English and Spanish which was presented at the workshops. This served the farmers well and provided CEUs to remain certified which also let to eventually getting CCA credits approved in 2021 for trainings due to the value of the content created. These trainings were then picked up by UC Cooperative Extension to continue providing in the San Joaquin Valley which again shows the success of initial funding in bringing the need to the forefront that resulted in ongoing programs.

Follow-up with past farmers that participated in programs was used to measure success as well as the capacity building in the San Joaquin Valley for technical assistance. Every farmer was contacted to determine how they used the data from irrigation evaluations to improve their soil and water conservation. Data was shared among industry partners to help build capacity that met growers needs. There was over a 60% improvement rate for farmers that had a follow-up evaluation which means they made the adjustments to maintenance and/or management to address the poor uniformity results.

Capacity building in the San Joaquin Valley was another impact that was intended to be a measurement of success. The number of irrigated lands in the valley compared to programs and technical assistance providers shows the valley is greatly underserved with the largest need. The program was designed to be shareable with other Resource Conservation Districts. At the completion of this project in 2021, there were 3 additional mobile irrigation labs under development in San Joaquin County, Merced County and Madera County. Merced and Madera counties launched theirs in 2022 and San Joaquin is on track to launch in 2023.

To maintain these programs, funding is key, so program success was also measured by impact on local funding mechanisms. FREP provided the ESRCD an opportunity to work with Almond Board of California on a pilot project for irrigation evaluations. That pilot has now developed into a standing program that funds over 10 irrigation labs throughout the state. In addition, the report that was developed with ABCs assistance meets USDA NRCS standards which provides a source of funding for producers to apply for through EQIP to continue to fund on-farm evaluations in the event other funding is not available therefore ensuring program continuation in all potential funding scenarios.

F. Data/Results

Results for each task: Outreach summary of results

a. Material deliverables – Flyers, presentations, and reports
b. Information on Event(s) (include all the following that apply)

Event 1

1. May 9, 2018
2. Modesto
3. Irrigation & Nutrient Management Workshop
4. See agenda for all presentations
5. 42
6. Farmers and farm managers
7. Agenda and flyer in support docs appendix

8. 3.5 CEUs for Growers

Event 2

1. October 2018
2. Monterey
3. FREP Annual Conference 2018
4. Project Board Presentation
5. Estimated 50-60
6. Farmers, students, researchers
7. Poster Board in support docs appendix
8. CCA CEUs/Grower CEUs offered – YES by FREP

Event 3

1. October 23, 2018
2. Modesto
3. Spanish Workshop
4. See agenda for all presentations
5. 16
6. Farmers and Farm Managers
7. Agenda and flyer in support docs appendix
8. 1.5 CSUs for Growers

Event 4

1. November 2018
2. San Diego
3. CARCD Annual Conference 2018
4. ESRCD Maintenance, Assessment and Training (MAT) program
5. Estimated 30-40
6. Conservation Partners and RCDs
7. Letter submission
8. Not applicable

Event 5

9. December 2018
10. Sacramento
11. Almond Board of CA Annual Conference 2018
12. Presentation Board at Expo
13. Estimated 150-200 views of board
14. Farmers and Almond Industry
15. Poster Board in support docs appendix
16. CCA CEUs/Grower CEUs offered – Yes by ABC

Event 6

1. May 29, 2019
2. Modesto
3. Irrigation & Nutrient Management Workshop
4. See attached agenda
5. 25
6. Farmers and Farm Managers
7. Flyer and agenda in support docs appendix
8. 3 CEUs for Growers

Event 7

1. June 2019
2. Modesto
3. Regional Spanish Irrigation Workshop
4. Maintenance for Optimum Efficiency
5. 18
6. Farmers and Farm Managers
7. NRCS program – no docs
8. None

Event 8

9. November 2019
10. Redding
11. CARCD Annual Conference 2019
12. Working with CDFA and Partners
13. Estimated 30-40
14. Conservation Partners and RCDs
15. Presentation Slides with Natalie
16. Not applicable

Event 9

1. December 5, 2019
2. Modesto
3. Advanced Irrigation & Nutrient Management Workshop
4. See attached agenda
5. 11
6. Farmers and Farm Managers
7. Flyer and agenda in support docs appendix
8. 3 CEUs for Growers

Event 10

1. April 2020
2. Modesto
3. Advanced Irrigation Management
4. See attached agenda
5. Cancelled due to covid – 5 requests for technical assistance
6. Farmers and Farm Managers
7. Agendas for English and Spanish in appendix
8. None

Event 11

1. October 2021
2. San Luis Obispo
3. FREP Annual Conference 2021
4. Project title
5. Estimated 100-150
6. Farmers, Industry and Researchers
7. See FREP
8. CCA CEUs/Grower CEUs offered – by FREP

Event 12

1. October 14, 2021
2. Modesto
3. Irrigation & Nutrient Management (English/Spanish)
4. See agenda
5. 22
6. Type of audience
7. Flyer and agenda in support docs appendix
8. 3 CEUs for both CCA and Growers

Event 13

1. October 21, 2021
2. Merced
3. Irrigation & Nutrient Management (English/Spanish)
4. See agenda
5. 24
6. Type of audience
7. Flyer and agenda in support docs appendix
8. 3 CEUs for both CCA and Growers

Event 14

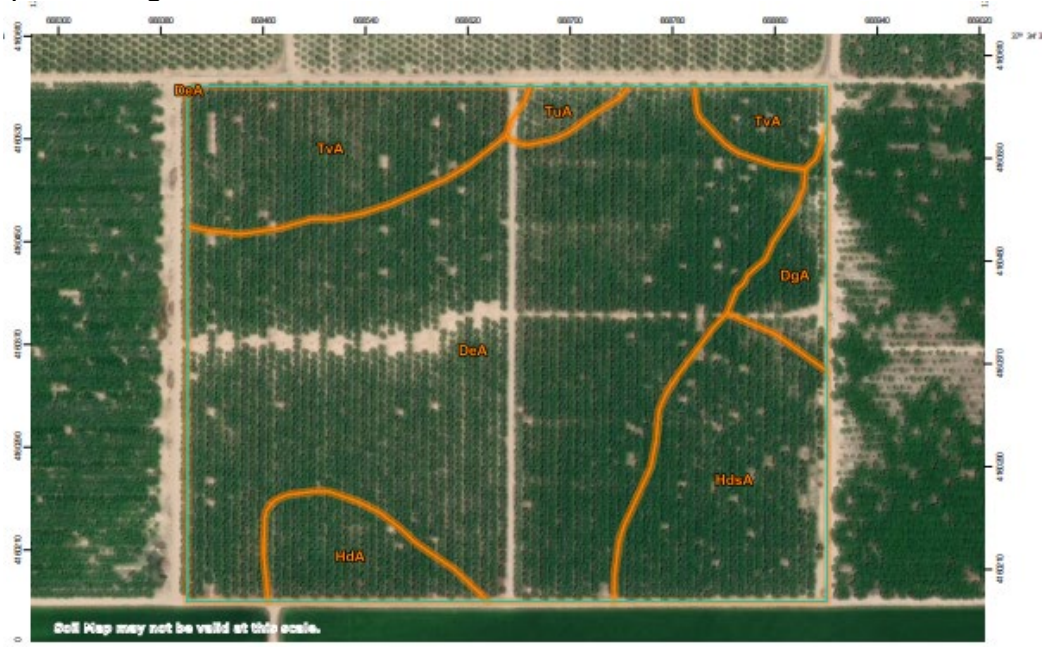
1. October 28, 2021
2. Madera
3. Irrigation & Nutrient Management (English/Spanish)
4. See agenda
5. 21
6. Type of audience
7. Flyer and agenda in support docs appendix
8. 3 CEUs for both CCA and Growers

c. Impact Measures
    1. Evaluation tools - East Stanislaus RCD actively engaged with workshop attendees throughout the grant. Follow-up surveys with attendees looked at content of workshops and secured in-field technical assistance for the growers. Provided one-on-one technical assistance through irrigation evaluations and soil conservation plans to 82 farms representing over 8,000 acres of irrigated lands. Over 60% of the farmers indicated they had implemented recommend improvements to increase distribution uniformity for post-surveys.
    2. Any improvements made based on feedback – Continued work on workshop content. A lack of research that correlates with the intersection of soil health and nutrient cycling with the impacted use of water. UC Merced has taken on that research project because of this feedback and will be a good follow-up to this project when the results are available.

G. Discussion and Conclusions

There will be a significant positive environmental impact resulting from the MAT program due to the connection being made between irrigation system uniformity and the effectiveness of nutrient application. This positive environmental impact has a direct correlation with a positive economic impact. Through working to increase the producers' soil health, irrigation system, fertilizer application efficiency, minimizing water and nutrient waste, the amount of money spent on yearly inputs needed for crop health will significantly decrease. Lastly, the MAT program will have a positive agronomic impact on the participants in the form of increasing an awareness of new technology available to both producers and employees to help increase efficiency, increase soil health and stability, monitor actual nutrient and water levels, and finally provide options to create or improve a precise schedule for nutrient and water application.

This project delivered 8 workshops in English and Spanish with attendance total of 150 producers and 82 properties were provided technical assistance covering over 8,000 acres with an average DU at 76% which is considered poor. The lowest global distribution uniformity (DU) found was 24% which was a result of running the system at a low pressure. There was a variety to issues include poor pressure, plugged emitters, not irrigating according to soil properties. These issues resulted in a poor performing field with visible stress



Soil Map showing change in soil and visible tree stress

Majority of the fields had a global DU of between 82-88% which is considered satisfactory. The most common issues identified in all evaluations were related to lack of maintenance and operation errors, such as, flushing hoses, leaks, plugged

emitters, running systems below recommended operating range, high pressure losses across filters, not operating system as designed and poor scheduling. These issues will be addressed in upcoming workshops in both English and Spanish.

Partner organizations have shown interest to continue to provide similar trainings to their growers from Madera to Sacramento. Currently, the Almond Board of California has made the pilot into an annual program that fund 10 Mobile Irrigation Labs throughout the state. These lasting partnerships will ensure that growers continue to get the support they need for irrigation and nutrient management.

H. Challenges

The most significant challenge that this project faced was the impact of closures due to COVID. RCD staff was furloughed for almost six months due to the closure of or NRCS office where we are co-located. These closures just as our program was gaining momentum entering its third year. As an outreach program, not being able to meet and engage with the farmers was almost detrimental. Meeting opportunity remained closed until we only had four months left of the grant and were able to complete the deliverables. The Irrigation Lab at Modesto Junior College was never made available to the program again due to continued closure of the campus to outside organizations.

I. Project Impacts

The project helped establish not only the Mobile Irrigation Lab for Stanislaus County but also laid the groundwork for San Joaquin, Merced, and Madera Counties. In addition, strong support was established with USDA NRCS, Almond Board of California, and UC Cooperative Extension to continue supporting education and evaluations.

J. Outreach Activities Summary – included in data/results section

K. References – Not applicable

L. Appendix – supporting documents.

Attached appendix with agendas, presentations, and flyers.

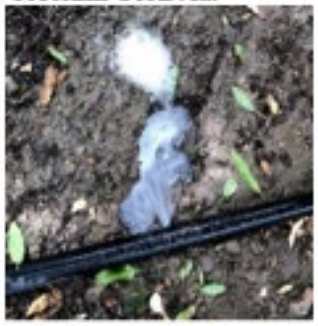
A. Tools and Evaluations:

Nitrate Testing

Pressure test (both drip & micro)

Drip Line DU Testing

B. Problems Observed:



In field hose damage

Hose Flush

Sticks as plugs in the ~~hose~~

C. In-Field Equipment (provided specs on equipment found including pumps, emitters, etc)

Flow Meter

Pump & Filter Station

M. Factsheet - attached

N. Copy of Full DU Report attached