

A. Project Information:

Report type: Final

FREP grant number: 16-0678-000-SA

Time covered by the grant period: January 1, 2017- June 30 2020

Project title: University of California Nursery and Floriculture Alliance Fertilizers and Plant Nutrition Education Program

Project leaders: Lorence R. Oki, UC Davis
Dave Fujino, UC Davis
Don Merhaut, UC Riverside
Maria de la Fuente, UCCE Monterey County

B. Abstract:

The California 2018-19 Agriculture Statistics Review lists the combined value of Nursery and Floral Products at \$3.84 billion and, combined, places them as the 4th largest agricultural commodity in the state. The majority of greenhouse and nursery crop production is in containers, although there is some field production of specific nursery and floricultural crops. Since these crops are grown in highly intensive systems at high plant densities and compressed crop times, they have high demands for water, energy, labor, and nutrients.

Crops in these production systems are grown in substrates that are “synthetic” in that they contain very little or no natural mineral soils, so nutrition must be provided by fertilizers for healthy and productive growth. In these intensive production systems, fertilization rates of some nursery and floricultural crops can be very high compared to other agronomic crops. For example, a liquid feed program for poinsettia typically provides nitrogen at 250 ppm but can be as high as 400 ppm. Improper management of plant nutrition can affect crop health and result in poor crop quality. Poor management may also have negative economic impacts, waste fertilizer products, and potentially pollute surface and ground water.

The overall project objective was to provide greenhouse and nursery growers (including owners, managers, supervisors, and foremen) with knowledge to improve crop plant nutrition and fertilizer management. To achieve this, the project developed an educational program for greenhouse and nursery growers on the proper and efficient use of fertilizers. Previous outreach programs on the topics were reviewed, assessed, revised, and adapted into Spanish. Specific topics were selected from the revised programs and short “YouTube” videos were produced in both English and Spanish and made available online to growers for viewing at the University of California Nursery and Floriculture Alliance website at: <http://ucnfa.ucanr.edu>.

C. Introduction:

The California 2018-19 Agriculture Statistics Review lists the combined value of Nursery and Floral Products at \$3.84 billion (B) and, combined, places them as the 4th largest

agricultural commodity in the state following Grapes (\$7.59B), Almonds (\$6.47B), and Milk and Cream (\$6.37B) and ahead of Cattle and Calves (\$3.53B).

Fertilizers are an essential part of greenhouse and nursery plant production. Crops in these production systems are grown in substrates that are “synthetic” in that they contain very little or no natural mineral soils. Since there is little to no fertility in these substrates, all of the nutrients must be provided by fertilizers for healthy and productive growth. In California, the majority of these crops are grown in containers, although there is some field production of specific nursery and floricultural crops. In either case, since these crops are produced in highly intensive systems of high plant densities and compressed crop times, there is also a high demand for resources including water, energy, labor, and nutrients. The recommended fertilization rates of some floricultural crops can be very high compared to other agronomic crops. For example, a liquid feed program for poinsettia typically provides nitrogen at 250 ppm and can be as high as 400 ppm.

Improper management of plant nutrition can affect crop health and both under- and over-applying fertilizers can result in poor crop quality. Poor crop quality not only has negative economic impacts, but improperly managing plant nutrition can also result in wasted fertilizer products, and the pollution of surface and ground water and other environmental impacts.

To provide greenhouse and nursery growers with knowledge to improve crop plant nutrition and fertilizer management, this project developed an educational program for greenhouse and nursery growers on the proper and efficient use of fertilizers. This project addressed the Education and Outreach (Technical Education) area of grower education and consisted of the evaluation and improvement of a current workshop program on Fertility and Plant Nutrition for greenhouse and nursery growers. The improved course of workshops were adapted into Spanish and delivered in four areas of the state in 2017-2019. Short topic-specific videos were produced in both English and Spanish and are made available on the University of California Nursery and Floriculture Alliance (UCNFA) website (ucnfa.ucanr.edu). This program is targeted to greenhouse and nursery growers, however growers of field produced nursery and floriculture crops will also benefit from the information presented.

D. Objectives:

1. Objective 1-Improve program

Improve the workshop program that is currently delivered based on input from attendees and instructors. Topics may be reduced, expanded, and others added. Topics that may be added include training on how to read soil and water analyses and how to interpret the information for greenhouse and nursery crop fertility and irrigation management.

a. Define learning objectives

The current program delivered will be shared among project participants to reexamine learning objectives. Learning objectives will be defined and organized into specific workshops.

b. Program assessment

The workshop program, in conjunction with evaluations from the 2016 presentations, will be reviewed to assist with an assessment of the program.

c. Program adjustment and rebuilding

Adjustments will be made accordingly for improvements and additional learning modules developed to meet learning objectives. Topics for each workshop will be determined and agendas developed.

d. Teaching materials (PowerPoint slides and handouts) will be adapted into Spanish.

e. Syllabi for each workshop will be written describing the content to be taught.

2. Objective 2- Deliver program

Deliver the improved workshops to nursery and greenhouse growers in the regions of the state where there are concentrations of growers such as San Diego, Ventura, San Joaquin Valley, and Watsonville/Salinas areas.

a. Workshops using the revised program will be organized and delivered in four regions based on grower density.

b. Instructors among the project team will be identified for each workshop date and location.

c. Up to four events will take place in 2017.

d. After the first year (2017), workshops will be revisited and evaluated to determine success in meeting learning objectives.

e. Adjustments will be made based on the assessment of the year 1 presentations.

f. Additional workshops, up to a total of six for both years, will be provided using the newly adjusted program.

3. Objective 3- Produce videos

Utilize the delivery of the improved workshops to produce video on specific topics. Videos would topics specific and brief and recorded in both English and Spanish. The UC Agriculture and Natural Resources (UCANR) videography group will be utilized for the production of the videos.

a. Short videos on specific topics will be developed.

i. The workshop syllabi and programs may be used to develop scripts for videography of the workshop content

ii. Videos will be produced, taped, and edited to develop online training.

4. Objective 4- Post videos

Post the videos online at the UCNFA website (UCNFA.UCANR.edu) for use and evaluation. Final versions of the videos will be made available to CDFA FREP.

- a. Videos will be posted on the UCNFA website for use and evaluation
 - i. Videos in their final edited form will be made available to CDFA FREP.

5. Objective 5- Measure impacts

Measure impact through surveys of workshop attendees to assess implementation of nutrient management methods.

- a. Short term learning
 - i. The workshops will include questionnaires at the beginning of the workshop and another at the conclusion to assess increases of attendee knowledge and awareness.
 - ii. Attendees will also complete evaluations of the workshop to assess program effectiveness.
- b. Long term impacts
 - i. Workshop attendees would be asked to participate in a survey after the first year that workshops have been conducted to assess longer term impacts.
 - ii. The follow-up survey will be developed by the project team and distributed by email. Information will be sought regarding the implementation of management methods presented in the workshops.
 - iii. All response results will be compiled, analyzed, and reported.
- c. Impact of videos
 - i. Effectiveness of the online videos will be measured by tracking the number of views of the videos. Specific information will be gathered on the number of complete and incomplete views of each video, multiple views by a single user, identifying the videos with the most and least views, and other measures.

E. Methods:

Events were promoted through the UCNFA website and mail list. Flyers and information were developed in English and Spanish and shared with the California Association of Nurseries and Garden Centers and the Nursery Growers Association to be posted to their websites and inclusion in newsletters. Information was also shared with the local University of California Cooperative Extension Horticulture Advisor, with whom the events are being coordinated and organized. Registration for the events was conducted online through the UC Agriculture and Natural Resources (UCANR) Survey Tools application to collect information and payment of the registrants.

The workshops in Salinas (4) and in San Marcos (4) were followed by evaluations provided by the attendees to assess program effectiveness. The information from the Salinas workshops were important to the development of the programs of future

workshops and the video production. Copies of the results of those evaluations are included in Section L. Appendix. The information was also important because, although the targeted audience was growers, attendees also included consultants, educators, and representatives from agencies, industry organizations and allied trades.

F. Data/Results:

a. Material deliverables

1. Materials distributed at workshops that are included in Section L. Appendix.
2. Copies of presentations in English and Spanish.
3. Handout on the pour-through method was provided in the second workshop in Salinas.
4. Presentation of University of California Nursery and Floriculture Alliance. Fertilizers and Plant Nutrition Program at the FREP WPHA Conference Seaside, CA October 24, 2018
5. Video announcement

b. Information on Event(s)

Workshops were provided as a series of two separate events at the same location and with English and Spanish sessions where UC Cooperative Extension advisors Dr. Donald Merhaut and Dr. Maria de la Fuente presented plant nutrition and fertilizer management information useful to nursery growers, managers, and personnel.

January 11, 2018

Fertilizers Plant Nutrition and the Nursery Infrastructure

UC Cooperative Extension Auditorium

Salinas, CA

Participants: 36 English session, 19 Spanish session

February 20, 2018

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

UC Cooperative Extension Auditorium

Salinas, CA

Participants: 25 English session, 18 Spanish session

September 25, 2018

Fertilizers: Plant Nutrition and the Nursery Infrastructure

UC Cooperative Extension Auditorium

Fresno, CA

Participants: 5 English session, 22 Spanish session

October 25, 2018

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

UC Cooperative Extension Auditorium

Fresno, CA

Participants: 18 English session, 10 Spanish session

August 21, 2019

Fertilizers: Plant Nutrition and the Nursery Infrastructure

Target Specialty Products

San Marcos, CA

Participants: 17 English session, 9 Spanish session

September 18, 2019

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

Target Specialty Products

San Marcos, CA

Participants: 14 English session, 6 Spanish session

c. Impact Measures

1. Evaluation tools

Evaluations were conducted following each of the workshops in Salinas and San Marcos. Compilations of the results are included in Section L. Appendix.

2. Any improvements made based on feedback

The evaluations from the Salinas workshops were used in the assessment and evaluation of the existing workshops. The information obtained guided the reorganization of the workshop content and was utilized in the Fresno and San Marcos workshop series.

G. Discussion and Conclusions:

- a. All objectives were achieved except for obtaining video usage analytics and impacts since final post-production was delayed.
- b. Video production is time intensive and requires extensive and detailed planning and organization. Storyboards are key to successful video production.
- c. Videos need to be kept short (10 to 15 minutes or less) to retain viewer interest. For crop production topics, this may mean that MANY videos are necessary to fully cover a management practice such as fertility management. It was estimated that 25 separate videos would be needed to fully cover plant fertility and nutrition including a brief section(s) on irrigation management.
- d. Feedback from testing with growers indicated high impact and usefulness. A nursery testing drafts of the videos utilized them as training tools for mid-level growers. They provide positive feedback and encouraged the development of

additional videos on plant nutrition and suggested other topics including irrigation management and others.

H. Challenges

The major challenges that occurred during the project were changes in staff directly working on the project and in the UCANR department providing video production support. This resulted in very long delays in the final development of the videos. Finally, the COVID-19 outbreak also caused delays in the posting of the videos. This late posting prevented the obtaining data on video usage in time for this report.

I. Project Impacts:

Although it wasn't possible to obtain usage data of the videos for this report, testing of the videos at a local grower informed us that the videos will be effective. The local grower utilized drafts of the videos to train mid-level growers about plant nutrition and there are plans to continue their use in future training sessions. They encouraged us to develop additional videos on plant nutrition and other nursery management topics. The feedback from the workshop evaluations were also encouraging that the topics were important and useful to the attendees. Summaries of the evaluations are included in Section L. Appendix.

J. Outreach Activities Summary:

Announcements for all events are provided in Section L. Appendix

Preliminary workshop events for evaluation of existing programs

January 11, 2018

Fertilizers Plant Nutrition and the Nursery Infrastructure

UC Cooperative Extension Auditorium

Salinas, CA

Participants: 36 English session, 19 Spanish session

February 20, 2018

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

UC Cooperative Extension Auditorium

Salinas, CA

Participants: 25 English session, 18 Spanish session

Modified events following assessments and evaluations for preliminary events

September 25, 2018

Fertilizers: Plant Nutrition and the Nursery Infrastructure

UC Cooperative Extension Auditorium

Fresno, CA

Participants: 5 English session, 22 Spanish session

October 25, 2018

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

UC Cooperative Extension Auditorium

Fresno, CA

Participants: 18 English session, 10 Spanish session

August 21, 2019

Fertilizers: Plant Nutrition and the Nursery Infrastructure

Target Specialty Products

San Marcos, CA

Participants: 17 English session, 9 Spanish session

September 18, 2019

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

Target Specialty Products

San Marcos, CA

Participants: 14 English session, 6 Spanish session

Participants consisted of growers, consultants, educators, and representatives from agencies, industry organizations and allied trades.

Survey results of workshops are provided separately as attachments in Section L. Appendix.

K. References:

L. Appendix:

Workshops 1 & 2, English and Spanish

Descriptions

Workshop 1

Fertilizers: Plant Nutrition and the Nursery Infrastructure

This workshop will focus on plant nutrition in a nursery production system. The program will be divided into two topics: The first half will be dedicated to the essential plant nutrients. We will describe the essential nutrients, their role in plant growth, how they move in the container media, and how they are taken up into the root system and transported throughout the plant. We will finish this topic by training individuals on how to identify plant nutrient deficiency and toxicity symptoms in the plant. The second half of the workshop will provide an overview of a nursery production system, from the perspective of developing a profitable and sustainable fertilizer management program. We will discuss production practices such as propagation, canning, bed design and management, media management, and irrigation water management and how they affect fertilizer inputs, outputs, and fertilizer performance in a nursery. After completion of this second half of the program, the individual will have the basic information to help design and optimize their fertilizer management program and troubleshoot fertilizer management problems, as it relates to overall nursery operations.

At the end of this program participants will be able to:

- Identify and understand the role of plant nutrients in plant growth and their role in plant growth.
- Identify plant nutrient deficiency and toxicity symptoms.
- Understand the sources and movement of fertilizers in a nursery production system.
- Develop the groundwork for optimizing fertilizer use in a container nursery operation.

Workshop 2

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

This workshop will focus on fertilizers and their use in nursery operations. The first half of this program will describe fertilizer types such as granular fertilizers, Controlled Release Fertilizers (CRFs) and liquid fertilizers. We will describe the pros and cons of each fertilizer type and how to optimize fertilizer performance. The second half of the program will be dedicated to monitoring and measuring the quality of irrigation water and media. We will identify and demonstrate methods of conducting on-site tests for measuring media quality and water quality. We will then review protocols for proper sampling for off-site sample analyses.

At the end of this program participants will be able to:

- Have a working knowledge of fertilizer types.
- Choose the proper fertilizer(s) to optimize plant growth and have a sustainable operation
- Use fertilizers properly to optimize nutrient uptake into plants
- Monitor media and water quality
- Develop a record keeping program to track production with fertilizer usage.

Workshops 1 & 2 announcement

Plant Nutrition and Fertilizer Management in Nursery Operations



Join us for a workshop series!

Jan 11Th, 2018
Fertilizers: Plant Nutrition
and the Nursery
Infrastructure

Feb 20Th, 2018
Fertilizers: Type, Use, and
Methods of Monitoring
Fertilizer Status in a Nursery
Operation

REGISTRATIONS NOW OPEN!!

Thanks to our partners!

UCCE Auditorium
1432 Abbott Street
Salinas, Ca 93901



Workshops 1 and 2 Promotion and Agenda



<http://ucnfa.ucanr.edu/>

Plant Nutrition and Fertilizer Management in Nursery Operations

UC Cooperative Extension Auditorium,
1432 Abbott Street
Salinas, CA 93901

REGISTRATION: \$15

Join us for a workshop series (English and Spanish sessions available) where UC Cooperative Extension advisors Donald Merhaut and María de la Fuente will present plant nutrition and fertilizer management information useful to nursery growers, managers, and personnel.

English session,

Moderator/Presenter: Donald Merhaut, UCCE Specialist, for Nursery and Floriculture Crops. UC Riverside

Spanish session,

Moderador: María de la Fuente, County Director, UCCE Santa Cruz and Monterey Counties

Presentador: María de la Fuente, Asesora Agrícola, UC Extensión Cooperativa Condado de Monterey

Workshop 1: JANUARY 11th, 2018

Fertilizers: Plant Nutrition and the Nursery Infrastructure

This workshop will focus on plant nutrition in a nursery production system. The program will be divided into two topics: The first half will be dedicated to essential plant nutrients. We will describe the essential nutrients, their role in plant growth, how they move in the container media, and how they are taken up into the root system and transported throughout the plant. We will finish this topic by training individuals on how to identify plant nutrient deficiency and toxicity symptoms in the plant. The second half of the workshop will provide an overview of a nursery production system, from the perspective of developing a profitable and sustainable fertilizer management program. We will discuss production practices such as propagation, canning, bed design and management, media management, and irrigation water management and how they affect fertilizer inputs, outputs, and fertilizer performance in a nursery. After completion of this second half of the program, the individual will have the basic information to help design and optimize their fertilizer management program and troubleshoot fertilizer management problems, as it relates to overall nursery operations.

Workshop “Key” Learnings:

- Identify and understand the role of plant nutrients in plant growth and their role in plant growth.
- Identify plant nutrient deficiency and toxicity symptoms.
- Understand the sources and movement of fertilizers in a nursery production system.
- Develop the groundwork for optimizing fertilizer use in a container nursery operation.

Workshop 2: FEBRUARY 20th, 2018

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

This workshop will focus on fertilizers and their use in nursery operations. The first half of this program will describe fertilizer types such as granular fertilizers, Controlled Release Fertilizers (CRFs) and liquid fertilizers. We will describe the pros and cons of each fertilizer type and how to optimize fertilizer performance. The second half of the program will be dedicated to monitoring and measuring the quality of irrigation water and media. We will identify and demonstrate methods of conducting on-site tests for measuring media quality and water quality. We will then review protocols for proper sampling for off-site sample analyses.

Workshop “Key” Learnings:

- Have a working knowledge of fertilizer types.
- Choose the proper fertilizer(s) to optimize plant growth and have a sustainable operation
- Use fertilizers properly to optimize nutrient uptake into plants
- Monitor media and water quality
- Develop a record keeping program to track production with fertilizer usage.

To register, go to: ucnfa.ucanr.edu and follow the link Para registrarte, ingresa a: ucnfa.ucanr.edu y sigue el link

These workshops are partially funded by the CDFA Fertilizer Research and Education Program

Thanks to our partners!



Handouts for workshops 1 and 2

These are provided as pdfs due to the number of pages of each document and are provided with this report.

Filename	Title
W1 English Part 1 Handout	Fertilizers: Plant Nutrition and the Nursery Infrastructure
W2 English Part 2 Handout	Fertilizers and Monitoring Crop Fertility Status
W1 Spanish Part 1 Handout	Nutrición Vegetal y Manejo de Fertilizantes en Operaciones de Viveros
W2 Spanish Part 2 Handout	Fertilizantes y Monitoreo del Estado Fertilidad del Cultivo
PourThru 123s Handout	1,2,3's of PourThru
Pour Thru 123s Handout Spanish	Método de Verter-a-Través

Content for workshops 3, 4, 5, & 6

These are provided as pdf files due to the number slides in each presentation and are provided with this report.

Filename	Title
W3 English Part 1	Fertilizers: Plant Nutrition and the Nursery Infrastructure
W4 English Part 2	Fertilizers and Monitoring Crop Fertility Status
W3 Spanish Part 1	Nutrición Vegetal y Manejo de Fertilizantes en Operaciones de Viveros
W4 Spanish Part 2	Fertilizantes y Monitoreo del Estado Fertilidad del Cultivo

Workshops 1 & 2 Summary of Surveys

Workshop 1: January 11, 2018

Fertilizers: Plant Nutrition and the Nursery Infrastructure

Spanish Session Survey Report

According to the participants, the overall rating of the program was: excellent (20 people) and good (5 people). The program's level of value to their work activities was: excellent (18 people) and good (6 people).

Additional comments regarding the program content:

- Really good, excellent. I'd like to come back!
- Excellent, please continue offering this type of seminars and workshops to educate ourselves
- Really good information, excellent way to present and teach this type of information
- This was really interesting because I learn things I didn't know
- Really fast presentation but well explained
- Too fast and intense; I'd like to have more time to process and understand the topics
- Excellent! Great information
- It was really interesting for me since I learn about plant nutrition and fertilizers
- Thank you so much for everything! I learn so much and hope to keep attending these classes
- Great information, in fact, too much information but it was excellent!
- All the programs were really interesting
- To me it was excellent!
- I am learning things I didn't know

8 people traveled 25-50 miles and 13 traveled 0-25 miles to attend this program. Most of the participants (20) agreed that the presentation was excellent, 5 agreed that the presentation was good, understandable and contained useful information for the following topics: Essential nutrients, developing fertilizers programs, fertilizer types, monitoring crop fertility status. 9 people considered that the demonstration activities were useful, the remaining didn't answer.

The top four topics of interest for future UCNFA meetings were:

1. Insect management
2. Disease management
3. Fertilizers and Plant Nutrition
4. Pesticide work safety

Printed documents in binder was the preference to receive educational materials for future meetings. Most of the participants are interested in attending online continuing education classes as live webinars and text-based learning modules.

Workshop 1: January 11, 2018

Fertilizers: Plant Nutrition and the Nursery Infrastructure

English Session Survey Report

According to the participants, the overall rating of the program was: excellent (15 people) and good (3 people). The program's level of value to their work activities was: excellent (15 people) and good (3 people).

Additional comments regarding the program content:

- Old pictures in power point presentation, need an update
- Guest speaker was great and he explained everything very well
- I learned a lot of information and cover all the stuff I was looking for
- A lot of information but was really interesting to take this class. Explained really well
- GREAT INFO!
- The content was very informative- especially as a fairly newcomer to working in the nursery industry
- Very useful information that I can use immediately for my situation. Thank You!
- Laminated info card is great! Thank you!
- It is too many topics so not enough time to cover in depth
- Give notes for presentation. It was given only one document but it was two parts in workshop. Have ready video presentation for not wasting time.
- Great information and presentation, thank you!
- Everything is really good, excellent information on plant nutrition!
- Show more pictures of greenhouse plants and installations

Moreover, 2 people traveled 25-50 miles, 6 traveled 0-25 miles, and 8 traveled over 100 miles to attend this program. Most of the participants (16) agreed that the presentation was excellent, 2 agreed that the presentation was good, understandable and contained useful information for the following topics: Essential nutrients, developing fertilizers programs, fertilizer types, monitoring crop fertility status. 11 people considered that the demonstration activities were useful, the remaining didn't answer.

The top five topics of interest for future UCNFA meetings were:

1. Insect management
2. Disease management
3. Greenhouse and nursery production technology
4. Fertilizers and Plant Nutrition
5. Best management practices

Other topics of interest: biochar, or charcoal use in media, soil biology, mycorrhiza inoculation

Printed documents in binder was the preference to receive educational materials for future meetings. Most of the participants are interested in attending online continuing education classes as live webinars and text-based learning modules.

Workshop 2: February 20, 2018

Fertilizers: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

Spanish Session Survey Report

According to the participants, the overall rating of the program was: excellent (11 people) and good (3 people). The program's level of value to their work activities was: excellent (11 people).

Additional comments regarding the program content:

- Great class! Practical information that can be applied to our job.
- I would like to have this information presented at my work
- The information presented was really good! The presentation strengthens my desire to know more about fertilizer applications at Matsui
- I hope you can keep delivering this type of presentations/workshops. Thank you so much for these classes!
- Everything is great!
- I'd like to attend more of these workshops!
- It was difficult for me to understand the topic of Water Analyses since I haven't applied/heard about this type of knowledge at work
- Great class with useful information!

9 people traveled 25-50 miles to attend. All the participants agreed that the presentation was excellent for the following topics: Types of Fertilizers, Fertilizer Source and content, Monitoring Crop Fertility Status, Water Media, Tissue Analyses. 11 people considered that the demonstration activities were useful.

The top four topics of interest for future UCNFA meetings were:

5. Disease Management
6. Insect Management
7. Irrigation
8. Water Conservation

Printed documents in binder was the preference to receive educational materials for future meetings. Most of the participants are not interested in attending online continuing education classes.

Workshop 2: February 20, 2018

Fertilizers: Types, Use and Methods of Monitoring Fertilizer Status in a Nursery Operation

English Session Survey Report

According to the participants, the overall rating of the program was: excellent (10 people) and good (8 people). The program's level of value to their work activities was: excellent (8 people) and good (10 people).

Additional comments regarding the program content:

- Good basic information. Real world examples really help make sense of why, how, and results.
- Handouts are hard to read. Please send PDF.
- We can do longer time covering more topics or having more time in the ones from presentations. More hands on bring samples from other places and check pH;EC.
- Handouts were difficult to read (Black letter over white background). Figures too small to read.
- Content was very informative and helpful.
- Determining PPM in solution would be a great addition
- An agenda with topic and time on the website could be helpful for planning.
- More real world hands on learning, maybe going to a nursery to do the class.
- Get the presentation in @ as well it's very handy

Moreover, 3 people traveled 25-50 miles, 5 traveled 0-25 miles, 3 traveled 50-100 miles and 7 traveled over 100 miles to attend this program. 10 participants agreed that the presentation was excellent, 8 agreed that the presentation was good, understandable and contained useful information for the following topics: Fertilizer Source and Content, and Water, Media, Tissue Analyses. 18 people considered that the demonstration activities were useful.

The top five topics of interest for future UCNFA meetings were:

1. Greenhouse and Nursery Production Technology
2. Disease Management
3. Insect Management
4. Weed Management
5. IPM

Other topics of interest: disease topics such as Phytophthora and other root diseases

Digital Files available for download before meeting was the preference to receive educational materials for future meetings. Most of the participants are interested in attending online continuing education classes as live webinars and text-based learning modules.

Workshops 5 & 6



Expand Your Horticultural Knowledge

University of California Nursery and Floriculture Alliance



FERTILIZERS: PLANT
NUTRITION AND THE
NURSERY INFRASTRUCTURE

ucnfa.ucanr.edu

Part 1: Plant Nutrition and the Nursery Infrastructure

August 21, 2019

[Register Now!](#)

Location: Target Specialty Products
431 Daisy Lane
San Marcos, CA 92078

English Session: 8:00 AM - 12:00 PM; *Check in begins at 7:30 AM*

Spanish Session: 1:00 PM - 5:00 PM; *Check in begins at 12:30 PM*

For more information, please visit ucnfa.ucanr.edu

Join us in **San Marcos** for a workshop series in English and Spanish. Cooperative Extension Specialist Donald Merhaut and Monterey County Director María de la Fuente will present plant nutrition and fertilizer management information useful to nursery growers, managers, and personnel.

This is a series of two workshops with English sessions in the morning and Spanish in the afternoon.

**Part 2: Fertilizer type, Uses, and Methods of Monitoring Fertilizer Status
in a Nursery Operation**

September 18, 2019

Registration Coming Soon

Need more information? Contact us at our NEW email address:

ucnfa@ucanr.edu

The University of California Nursery and Floriculture Alliance (UCNFA) aims to serve the educational needs of the various agricultural production industries in California that produce greenhouse ornamental crops and outdoor nursery products.

Visit the UCNFA main website at UCNFA.ucanr.edu for information about UCNFA, its members, and grower educational programs.



Expand Your Horticultural Knowledge

University of California Nursery and Floriculture Alliance



FERTILIZERS: PLANT
NUTRITION AND THE
NURSERY INFRASTRUCTURE

ucnfa.ucanr.edu

Fertilizers Part 2: Types, Use, and Methods of Monitoring Fertilizer Status in a Nursery Operation

September 18, 2019

[Register Here!](#)

Location: Target Specialty Products
431 Daisy Lane
San Marcos, CA 92078

English Session: 8:00 AM - 12:00 PM; *Check in begins at 7:30 AM*

Spanish Session: 1:00 PM - 5:00 PM; *Check in begins at 12:30 PM*

For more information, please visit ucnfa.ucanr.edu

Join us in **San Marcos** for a workshop series in English and

Spanish. Cooperative Extension Specialist Donald Merhaut and
Monterey

County Director María de la Fuente will present plant nutrition and
fertilizer management information useful to nursery growers,
managers, and personnel.

This is the second in a series of two workshops with the English session in the morning
and Spanish in the afternoon.

Need more information? Contact us at our NEW email address:

ucnfa@ucanr.edu

Workshops 5 & 6 Evaluations

UCNFA Program Evaluation

Fertilizers: Plant Nutrition and Fertilizer Management in Nursery Operations (*English Sessions*)

August 21, 2019 San Marcos, CA

Program Content:

What is your overall rating for this program? **Excellent: 11/12** **Good: 1/12** **Fair: Poor:**

Please indicate the program's level of value to your work activities

Excellent: 9/11 **Good: 2/11** **Fair: Poor:**

Additional comments regarding program content:

- Great overview (for me) or review for other professionals
- Good at simplifying concepts for easier understanding
- Could benefit from learning more about what happens when changing fertilizers

Program Presentations: Do you agree that the presentation was understandable and contained useful information?

Essential Nutrients: **Excellent: 11/12** **Good: 1/12** **Fair: Poor:**

Nutrient Uptake: **Excellent: 10/12** **Good: 2/12** **Fair: Poor:**

Nutrient Allocation in Plants: **Excellent: 10/12** **Good: 2/12** **Fair: Poor:**

Plant Nutrient Disorders: **Excellent: 11/12** **Good: Fair: 1/12** **Poor:**

Please share any comments regarding the program presentations:

- Presenter was extremely knowledgeable and enthusiastic—presented info clearly and with great explanation
- Slides were difficult to read. Font color and text was poor
- The speaker was excellent and very knowledgeable
- Include nutrient toxicities as well as deficiencies
- It would be helpful to have more demonstration of the methods and let the growers try them
- Really good information given; easy to understand

Were the demonstration activities useful for your learning?

Yes: 11/12 **Somewhat: 1/12** **No:**

How far did you travel to attend this program?

0-25 miles: **7/12** 25-50 miles: **2/12** 50-100 miles: **2/12** over 100 miles: **1/12**

Future Meetings

What topics would be of interest to you for future UCNFA meetings (check all of interest)?

- Disease management: **7**
- Insect management: **8**
- Weed management: **4**
- IPM: **7**
- Pesticide laws and regulations: **1**
- Water conservation: **4**
- Water quality issues: **5**
- Irrigation: **6**
- Greenhouse and nursery production technology: **6**
- Crop insurance: **0**
- Postharvest handling and distribution: **1**
- Marketing: **1**
- Best Management Practices: **3**
- Fertilizer/Plant Nutrition: **6**
- Pesticide application and sprayer calibration: **5**
- Pesticide worker safety: **1**
- Bilingual education (Spanish) specify topic: **1: topics above—irrigation/nutrients**
- Other, please specify topic:

In what form would you like to receive educational materials for future meetings?

- Printed documents in binder or folder: **4/13**
- Digital files on a flash drive: **2/13**
- Digital files available for download before meeting: **4/13**
- Any format: **3/13**

Would you be interested in attending online continuing education classes?

- Yes, live webinars only: **1/10**
- Yes, text-based learning modules available anytime only: **1/10**
- Yes, both online formats: **7/10**
- No: **1/10**

Would you like to receive information on future programs via email? If so, please provide us with your contact information (please print clearly):

- **Christian Loyola** ○ Altman Plants ○ cloyola@altmanplants.com
- **Manuel Aguirre** ○ Enzazaden USA ○ M.aguirre@enzazaden.com
- **Paul Zerbe** ○ Rancho Tissue Technologies ○ Paulzerbe12@gmail.com
- **Alberto Santoyo** ○ Corey Nursery ○ alberts@coreynursery.com

- **Ariana McCray** ○ LAILG ○ ariana@nurserygrowers.org
- **Monica Winters** ○ County of San Diego ○ Monica.winters@sdcounty.ca.gov

UCNFA Evaluación del Programa
Nutrientes Vegetales y Fertilizantes
(Sesión en Español)
 Agosto 21, 2019 San Marcos , CA



Gracias por asistir a este programa de UCNFA. Algunos de los temas tratados hoy fueron sugeridos por participantes de reuniones anteriores. El comité organizador de los programas de UCNFA (productores, industria aliada, Universidad) hace un esfuerzo para armar programas informativos y su aportación nos ayudará a desarrollar futuros talleres.

Contenido del Programa

¿Cuál es su valoración global para este programa?

Excelente	Bueno	Regular	Malo
6/8	2/8		

Por favor, indique el nivel del valor del programa para sus actividades laborales

Excelente	Bueno	Regular	Malo
6/8	2/8		

Comentarios adicionales sobre el contenido del programa:

Content was comfortable
 Very well explained
 I learned a lot of things I didn't know about fertilizers
 None. Great Class!!

Los tópicos del programa: ¿Está de acuerdo en que la presentación es comprensible y contiene información útil?

	Excelente	Bueno	Regular	Malo
Tipos de Fertilizantes	6/8	2/8		
Fuente y Contenido de Fertilizantes	6/8	2/8		
Monitoreo de Fertilidad de Cultivos	7/8	1/8		
Análisis de Agua, Sustrato y Tejidos	7/8	1/8		

Por favor comparta cualquier comentario relativo a los tópicos del programa:

Las actividades de demostración, ¿le fueron útiles para su aprendizaje? Sí 7/8 Algo 1/8 No

¿De qué tan lejos viajó para asistir a este programa? :

5/8 0-25 Millas 3/8 25-50 Millas ____ 50-100 Millas ____ Más de 100 Millas

Continúa por atrás

Reuniones futuras

¿Qué temas serían de su interés para futuras reuniones de UCNFA (marque todos los intereses)?

8/8 Manejo de Enfermedades
 7/8 Manejo de Plagas
 2/8 Manejo de Malezas
 1/8 IPM Manejo Integrado de Plantas

- 2/8 Leyes y Regulaciones de Pesticidas
- 1/8 Conservación del Agua
- 3/8 Problemas de Calidad del Agua
- 1/8 Riego o Irrigación
- 2/8 Tecnología de Producción de Viveros e Invernaderos
- 1/8 Aseguranza de Cultivos
- 2/8 Manejo y distribución de Post-cosecha
- ☐ Mercadeo
- ☐ Prácticas Óptimas de Manejo
- ☐ Fertilizantes/Nutrición Vegetal
- 1/8 Aplicación de Pesticidas y Calibración de Aspersores
- 3/8 Seguridad de los Trabajadores con Pesticidas

☐ Educación Bilingüe (Español). Especifique Tema(s) : **Anything in Spanish, more in Spanish, Crop Production, Pesticides and Laws, Advanced Plant Nutrition, more classes in Spanish.**

Otros, por favor especifique temas: _____

¿En qué forma le gustaría recibir materiales educativos para los talleres futuros?

- | | | | |
|---|---|---|-----------------------|
| 6/8 Documentos Impresos
en una carpeta | <input type="checkbox"/> Archivos digitales en una
unidad portátil | <input type="checkbox"/> Los archivos digitales
disponibles para su
descarga antes del taller | 2/8 Cualquier formato |
|---|---|---|-----------------------|

¿Estaría interesado en asistir a las clases de educación continua en línea?

- | | | | |
|-------------------------------------|--|---|--------|
| 2/8 Sí, seminario en web en
vivo | 1/8 Sí, módulos de
aprendizaje basados en
texto disponible en
cualquier momento | <input type="checkbox"/> Sí, ambos formatos en
línea | 5/8 No |
|-------------------------------------|--|---|--------|

¿Le gustaría recibir información sobre futuros programas vía e-mail? Si es así, por favor proporcione su información de contacto (por favor escriba claramente):

Francisco Ruiz	Altman Plants
Melquiades Rojas	Altman Plants
Eusebio Rojas	Altman Plants



Muchas Gracias por sus Comentarios

UCNFA Program Evaluation

Fertilizers: Plant Nutrition and Fertilizer Management in Nursery Operations (*English Sessions*)

August 21, 2019 San Marcos, CA

Program Content:

What is your overall rating for this program? **Excellent: 11/12** **Good: 1/12** **Fair:** **Poor:**
Please indicate the program's level of value to your work activities
Excellent: 9/11 **Good: 2/11** **Fair:** **Poor:**

Additional comments regarding program content:

- Great overview (for me) or review for other professionals
- Good at simplifying concepts for easier understanding
- Could benefit from learning more about what happens when changing fertilizers

Program Presentations: Do you agree that the presentation was understandable and contained useful information?

Essential Nutrients:	Excellent: 11/12	Good: 1/12	Fair:	Poor:
Nutrient Uptake:	Excellent: 10/12	Good: 2/12	Fair:	Poor:
Nutrient Allocation in Plants:	Excellent: 10/12	Good: 2/12	Fair:	Poor:
Plant Nutrient Disorders:	Excellent: 11/12	Good:	Fair: 1/12	Poor:

Please share any comments regarding the program presentations:

- Presenter was extremely knowledgeable and enthusiastic—presented info clearly and with great explanation
- Slides were difficult to read. Font color and text was poor
- The speaker was excellent and very knowledgeable
- Include nutrient toxicities as well as deficiencies
- It would be helpful to have more demonstration of the methods and let the growers try them
- Really good information given; easy to understand

Were the demonstration activities useful for your learning?

Yes: 11/12 **Somewhat: 1/12** **No:**

How far did you travel to attend this program?

0-25 miles: 7/12 **25-50 miles: 2/12** **50-100 miles: 2/12** **over 100 miles: 1/12**

Future Meetings

What topics would be of interest to you for future UCNFA meetings (check all of interest)?

- Disease management: **7**
- Insect management: **8**
- Weed management: **4**
- IPM: **7**
- Pesticide laws and regulations: **1**
- Water conservation: **4**
- Water quality issues: **5**

- Irrigation: **6**
- Greenhouse and nursery production technology: **6**
- Crop insurance: **0**
- Postharvest handling and distribution: **1**
- Marketing: **1**
- Best Management Practices: **3**
- Fertilizer/Plant Nutrition: **6**
- Pesticide application and sprayer calibration: **5**
- Pesticide worker safety: **1**
- Bilingual education (Spanish) specify topic: **1: topics above—irrigation/nutrients**

Other, please specify topic:

In what form would you like to receive educational materials for future meetings?

- Printed documents in binder or folder: **4/13**
- Digital files on a flash drive: **2/13**
- Digital files available for download before meeting: **4/13**
- Any format: **3/13**

Would you be interested in attending online continuing education classes?

- Yes, live webinars only: **1/10**
- Yes, text-based learning modules available anytime only: **1/10**
- Yes, both online formats: **7/10**
- No: **1/10**

Would you like to receive information on future programs via email? If so, please provide us with your contact information (please print clearly):

- **Christian Loyola**
 - Altman Plants
 - cloyola@altmanplants.com
- **Manuel Aguirre**
 - Enzazaden USA
 - M.aguirre@enzazaden.com
- **Paul Zerbe**
 - Rancho Tissue Technologies
 - Paulzerbe12@gmail.com
- **Alberto Santoyo**
 - Corey Nursery
 - alberts@coreynursery.com
- **Ariana McCray**
 - LAILG
 - ariana@nurserygrowers.org
- **Monica Winters**
 - County of San Diego
 - Monica.winters@sdcounty.ca.gov

UCNFA Evaluación del Programa
Nutrientes Vegetales y Fertilizantes
Parte 2
(Sesión en Español)



Septiembre 18, 2019 San Marcos, CA

Gracias por asistir a este programa de UCNFA. Algunos de los temas tratados hoy fueron sugeridos por participantes de reuniones anteriores. El comité organizador de los programas de UCNFA (productores, industria aliada, Universidad) hace un esfuerzo para armar programas informativos y su aportación nos ayudará a desarrollar futuros talleres.

Contenido del Programa

¿Cuál es su valoración global para este programa?

6/7 1/7
 Excelente Bueno Regular Malo

Por favor, indique el nivel del valor del programa para sus actividades laborales

6/7 1/7
 Excelente Bueno Regular Malo

Comentarios adicionales sobre el contenido del programa:

Very well explained by teacher Maria de la Fuente

Everything was very good

I liked it a lot

The class was very useful to know how to manage fertilizers and how to apply them correctly

Los tópicos del programa: ¿Está de acuerdo en que la presentación es comprensible y contiene información útil?

	Excelente	Bueno	Regular	Malo
Fuentes y Formulaciones	6	1		
Fertilizantes Solubles	7			
Fertilizantes Granulares	6	1		
Fertilizantes Orgánicos	7			
Monitoreo del Agua de Riego	7			
Monitoreo de Sustrato o Medio	7			
Monitoreo de Tejidos	6	1		

Por favor comparta cualquier comentario relativo a los tópicos del programa:

All comments and participation were very good

They all applied to my job

Very good

I would like to expand my knowledge on water management and quality. Perhaps another workshop?

Las actividades de demostración, ¿le fueron útiles para su aprendizaje? Sí 7/7 Algo No

¿De qué tan lejos viajó para asistir a este programa? :

__2__ 0-25 Millas __3__ 25-50 Millas __2__ 50-100 Millas ____ Más de 100 Millas

Continúa por atrás

Reuniones futuras

¿Qué temas serían de su interés para futuras reuniones de UCNFA (marque todos los intereses)?

One individual selected ALL

- 6 Manejo de Enfermedades
- 4 Manejo de Plagas
- Y Manejo de Malezas
- 1 IPM Manejo Integrado de Plagas
- 1 Leyes y Regulaciones de Pesticidas
- 1 Conservación del Agua
- 2 Problemas de Calidad del Agua
- 5 Riego o Irrigación
- 1 Tecnología de Producción de Viveros e Invernaderos
- Y Aseguranza de Cultivos
- Y Manejo y distribución de Post-cosecha
- Y Mercadeo
- Y Prácticas Óptimas de Manejo
- Y Fertilizantes/Nutrición Vegetal
- 3 Aplicación de Pesticidas y Calibración de Aspersores
- 2 Seguridad de los Trabajadores con Pesticidas

Y Educación Bilingüe (Español). Especifique Tema(s) : **Plant Diseases in Spanish (3/7)**
Anything about Horticulture in Spanish
Water Management

Otros, por favor especifique temas: _____

¿En qué forma le gustaría recibir materiales educativos para los talleres futuros?

7/7 Documentos Impresos en una carpeta	Y Archivos digitales en una unidad portátil	Y Los archivos digitales disponibles para su descarga antes del taller	Y Cualquier formato
---	---	--	---------------------

¿Estaría interesado en asistir a las clases de educación continua en línea?

3/7 Sí, seminario en web en vivo	1/7 Sí, módulos de aprendizaje basados en texto disponible en cualquier momento	Y Sí, ambos formatos en línea	3/7 No
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¿Le gustaría recibir información sobre futuros programas vía e-mail? Si es así, por favor proporcione su información de contacto (por favor escriba claramente):

Melquíades Rojas Serrano, Altman Plants
Francisco Ruíz, Altman Plants
Eusebio Rojas, Altman Plants



Muchas Gracias por sus Comentarios

Presentation: University of California Nursery and Floriculture Alliance. Fertilizers and Plant Nutrition Program

Provided at the FREP WPHA Conference Seaside, CA October 24, 2018

This presentation is provided as the pdf file named **Oki FREP Seaside.pdf** due to the number of slides and is provided with this report.

Video Announcement



University of California Nursery and Floriculture Alliance

Fertilizers and Plant Nutrition in Nursery Production Education Program

Fertilizer use in nurseries and plant nitrogen, phosphorus,
and potassium nutrition videos in English and Spanish



Presented by
Dr. Don Merhaut, University of California, Riverside
and
Dr. Maria de la Fuente, University of California Cooperative
Extension, Monterey County

[Essential Plant Nutrients and Fertilization in Nursery Production](#)

Learn the fundamentals of plant nutrition and fertilization in nursery production systems, including macronutrient -- nitrogen, phosphorus, potassium -- and micronutrient requirements, nutrient uptake processes, and the allocation of mobile and immobile nutrients in the plant.

[Nitrogen in Plant Nutrition in Nursery Production](#)

Nitrogen is an essential plant nutrient. Learn about nitrogen uptake, metabolism and mobility in plants.

[Nitrogen Deficiency and Toxicity Issues in Nursery Production](#)

Learn how to identify and fix nitrogen deficiency and nitrogen toxicity problems in nursery production systems.

[Phosphorus in Plant Nutrition in Nursery Production](#)

Learn about phosphorus uptake and mobility in nursery production systems, and how to identify and address phosphorus deficiency and phosphorus toxicity problems.

[Potassium in Plant Nutrition in Nursery Production](#)

Learn about potassium uptake and mobility in nursery production systems, and how to identify and address potassium deficiency and potassium toxicity problems.

[Nutrientes Esenciales de las Plantas y Fertilización en la Producción de Viveros](#)

Conozca los fundamentos de la nutrición y la fertilización de las plantas en los sistemas de producción de viveros, incluidos los procesos de absorción de macronutrientes y micronutrientes, y la asignación de nutrientes móviles e inmóviles en la planta.

[Nitrógeno en la Nutrición de las Plantas en la Producción de Viveros](#)

El nitrógeno es un nutriente esencial para las plantas. Aprenda sobre la absorción de nitrógeno, su metabolismo y movilidad en las plantas.

[Problemas de Deficiencia y Toxicidad de Nitrógeno en la Producción de Viveros](#)

Aprenda a identificar y corregir los problemas de deficiencia y toxicidad de nitrógeno en los sistemas de producción de viveros.

[Fósforo en la Nutrición de las Plantas en la Producción de Viveros](#)

Aprenda sobre la absorción de fósforo y la movilidad en los sistemas de producción de viveros, y cómo identificar y abordar los problemas de deficiencia de fósforo y toxicidad de fósforo.

[El Potasio en la Nutrición Vegetal en la Producción de Viveros](#)

Aprenda sobre la absorción y la movilidad del potasio en los sistemas de producción de viveros, y cómo identificar y abordar los problemas de deficiencia de potasio y toxicidad de potasio.

These videos were produced with grant funds from the Fertilizers Research and Education Program of the California Department of Food and Agriculture.

M. Factsheet/Database Template: Grantees are required to complete a factsheet template (no more than two pages). The information entered in the template should provide a summary of the work performed by the grantee, demonstrating the significance of the research and its contribution towards advancing the environmentally safe and agronomically sound use of fertilizing materials. Information should be written as a practical guide with growers and certified crop advisors in mind. Please include the following sections:

M. Factsheet

2. **Project Title** University of California Nursery and Floriculture Alliance Fertilizers and Plant Nutrition Education Program
3. **Grant Agreement Number** 16-0678-000-SA
4. **Project Leaders**
 - Lorence R. Oki, UC Davis
 - Dave Fujino, UC Davis
 - Don Merhaut, UC Riverside
 - Maria de la Fuente, UCCE Monterey County
5. **Start Year/End Year** 2017/2020
6. **Location** UC Davis, Salinas, Fresno, San Marcos
7. **County** Yolo, Monterey, Fresno, San Diego
8. **Highlights**
 - a. 12 workshops were provided in English and Spanish (6 each) targeting greenhouse and nursery growers
 - b. Workshops were provided on Fertilizers: Plant Nutrition & the Nursery Infrastructure and Fertilizers & Monitoring Crop Fertility Status
 - c. From the workshop content, 10 videos were produced, 5 each in English and Spanish
 - d. Videos focus on fertilizer use in nurseries and plant nitrogen, phosphorus, and potassium nutrition

9. Introduction

The California 2018-19 Agriculture Statistics Review lists the combined value of Nursery and Floral Products at \$3.84 billion and, combined, places them as the 4th largest agricultural commodity in the state. The majority of greenhouse and nursery crop production is in containers, although there is some field production of specific nursery and floricultural crops. Since these crops are grown in highly intensive systems at high plant densities and compressed crop times, they have high demands for water, energy, labor, and nutrients.

Crops in these production systems are grown in substrates that are “synthetic” in that they contain very little or no natural mineral soils, so nutrition must be provided by fertilizers for healthy and productive growth. In these intensive production systems, fertilization rates of some nursery and floricultural crops can be very high compared to other agronomic crops. For example, a liquid feed program for poinsettia typically provides nitrogen at 250 ppm but can be as high as 400 ppm. Improper management of plant nutrition can affect crop health and result in poor crop quality. Poor management may also have negative economic impacts, waste fertilizer products, and potentially pollute surface and ground water.

The overall project objective was to provide greenhouse and nursery growers (including owners, managers, supervisors, and foremen) with knowledge to improve crop plant nutrition and fertilizer management. To achieve this, the project developed an educational program for greenhouse and nursery growers on the proper and efficient use of fertilizers. Previous outreach programs on the topics were reviewed, assessed, revised, and adapted into Spanish. Specific

topics were selected from the revised programs and short “YouTube” videos were produced in both English and Spanish and made available online to growers for viewing at the University of California Nursery and Floriculture Alliance website at: <http://ucnfa.ucanr.edu>.

10. Methods/Management (Summarize project activities, methods, and materials)

- a. Assess current workshop program
 - i. Initial workshops in Salinas were provided on February 11 and February 20, 2018 and evaluated and assessed.
 - ii. These workshops were improved and reorganized for future presentations.
 - iii. Improved workshops were delivered in Fresno on September 25 and October 25 2018 and in San Marcos on August 21, 2019 and September 18, 2019.
- b. Identify specific topics that could be produced into videos (YouTube, ≤10 minutes) and select best topics
 - i. Outlines of the workshops were developed and used to identify specific topics to be developed into videos.
 - ii. Video topics were selected
 - iii. Scripts developed for each topic.
 - iv. Shoot video
 - v. Produce graphics
 - vi. Scripts were adapted into Spanish
 - vii. Record voice-over in English and Spanish
 - viii. Produce draft videos
 - ix. Finalize videos
- c. Release (post) videos and announce
- d. Assess usage via analytics
- e. Evaluate impact

11. Findings (Discuss results and conclusions, including advice and resulting practice methods)

- a. All objectives were achieved except for obtaining video usage analytics and impacts since final post-production was delayed.
- b. Video production is time intensive and requires extensive and detailed planning and organization. Storyboards are key to successful video production.
- c. Videos need to be kept short (10 to 15 minutes or less) to retain viewer interest. For crop production topics, this may mean that MANY videos are necessary to fully cover a management practice. It was estimated that a total of 25 separate videos would be needed to fully cover plant fertility and nutrition including a brief section(s) on irrigation management. These would also need to be adapted into Spanish.
- d. Feedback from testing with growers indicated high impact with videos used as training for mid-level growers.

N. Copy of the Product/Result:

Products are included in Section L. Appendix and as separate files submitted with this report. Following is a list of files and their descriptions:

Handouts for workshops 1 and 2

These are provided as pdfs due to the number of pages of each document and are provided with this report.

Filename	Title
W1 English Part 1 Handout	Fertilizers: Plant Nutrition and the Nursery Infrastructure
W2 English Part 2 Handout	Fertilizers and Monitoring Crop Fertility Status
W1 Spanish Part 1 Handout	Nutrición Vegetal y Manejo de Fertilizantes en Operaciones de Viveros
W2 Spanish Part 2 Handout	Fertilizantes y Monitoreo del Estado Fertilidad del Cultivo
PourThru 123s Handout	1,2,3's of PourThru
Pour Thru 123s Handout Spanish	Método de Verter-a-Través

Content for workshops 3, 4, 5, & 6

These are provided as pdf files due to the number slides in each presentation and are provided with this report.

Filename	Title
W3 English Part 1	Fertilizers: Plant Nutrition and the Nursery Infrastructure
W4 English Part 2	Fertilizers and Monitoring Crop Fertility Status
W3 Spanish Part 1	Nutrición Vegetal y Manejo de Fertilizantes en Operaciones de Viveros
W4 Spanish Part 2	Fertilizantes y Monitoreo del Estado Fertilidad del Cultivo

Presentation provided at the FREP WPHA Conference, Seaside, CA October 24, 2018

Filename	Title
Oki FREP Seaside.pdf	University of California Nursery and Floriculture Alliance. Fertilizers and Plant Nutrition Program

Videos

Ten videos were produced and posted in YouTube. Following are links and titles:

https://youtu.be/3yo7N3S66tQ	Essential Plant Nutrients and Fertilization in Nursery Production
https://youtu.be/wM_TtzPL65Q	Nitrogen in Plant Nutrition in Nursery Production
https://youtu.be/eiBSk6nw1-A	Nitrogen Deficiency and Toxicity Issues in Nursery Production
https://youtu.be/gxpyVzElz3l	Phosphorus in Plant Nutrition in Nursery Production
https://youtu.be/gxpyVzElz3l	Potassium in Plant Nutrition in Nursery Production
https://youtu.be/Hrn5vACT9Y8	Nutrientes Esenciales de las Plantas y Fertilización en la Producción de Viveros
https://youtu.be/icDG4CwSjWA	Nitrógeno en la Nutrición de las Plantas en la Producción de Viveros
https://youtu.be/g78fgZCz6ms	Problemas de Deficiencia y Toxicidad de Nitrógeno en la Producción de Viveros
https://youtu.be/azm6ho2YSIq	Fósforo en la Nutrición de las Plantas en la Producción de Viveros
https://youtu.be/eatqulsxyeo	El Potasio en la Nutrición Vegetal en la Producción de Viveros