



FREP 2011 Grant
Agreement # 11-0454-SA
Final Report

A. Project Information:

Final Report

Time Period: January 2012 – December 2013

Project Titles:

- 1) *How Much is Too Much? How Little is Too Little?* – 11 lesson unit on plant nutrients for 5th – 8th grade students
- 2) *Educator's Guide to Fun With the Plant Nutrient Team* – 7 lesson guide that will allow teachers to expand upon content from the K - 3rd grade *Fun With the Plant Nutrient Team* student activity book from the International Plant Nutrition Institute

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Project Leaders:

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B. Objectives:

- Update and align the already existing 11 lesson unit *How much is too much? How little is too little?* for grades 5-8.
- Develop an *Educator's Guide* aligning the International Plant Nutrition Institute's student activity book, *Fun with the Plant Nutrient Team* to K- 3rd grade Content Standards for California Public Schools with lesson ideas and extensions focusing on relationships between fertilizers, food, nutrition, and the environment.
- Build upon previous 2010 FREP award to create a consistent thread of fertilizer materials for grades K-12
- Increase student understanding of the essential role of plant nutrients in agriculture production.
- Build student appreciation of the agriculture industry's efforts to continually improve environmental stewardship.
- Encourage students to pursue a career in plant sciences.

C. Abstract:

California farmers continually investigate the solution to meeting the needs of a growing population with shrinking resources. With the development of new technology, today's farmers and ranchers are producing food, clothing, forest and floral products on less land for more people. Fertilizer plays a crucial role in improving agriculture efficiency, yet the general public has little knowledge of this topic.

To address this problem, the California Foundation for Agriculture in the Classroom (CFAITC) created agricultural education materials about the relationships between plant nutrient requirements, fertilizers, and the environment. These education materials are to be used by teachers in K-8th grades. *How Much is Too Much? How Little is Too Little?* is a 5th – 8th grade unit of 11 lessons and the *Educator's Guide to Fun With the Plant Nutrient Team* is a K-3rd grade booklet of 7 lessons. These educational resources are aligned to the most current Content Standards for California Public Schools including the Common Core and Next Generation Science Standards. Both resources include hands-on activities designed around topics to help students connect plant nutrients to their daily lives.

The development of the two education units began with curriculum meetings with CFAITC staff and classroom teachers. CFAITC then submitted drafts of lessons for technical review to contacts at the International Plant Nutrition Institute, the Nutrients for Life Foundation, Crop Production Services, Simplot, and Suterra. Edited lessons were piloted by classroom teachers who provided feedback on lesson strengths and areas for improvement. Lessons for each unit were revised based upon classroom pilot and

technical review and were graphically designed, printed and released to teachers at the end of December 2013. CFAITC will continue promoting the units to educators through CFAITC's monthly electronic newsletter, communication with county Farm Bureaus, and at teacher conferences and workshops.

Since the release of the units less than one month ago, 278 K-3rd grade teachers have requested printed copies of the *Educator's Guide to Fun With the Plant Nutrient Team*. The first 100 teachers who ordered *the Educator's Guide* also received a classroom set of *Fun With the Plant Nutrient Team* activity books. The Educator's Guide has also been downloaded from CFAITC's website 100 times in the first month of availability.

Since December 2013, *How Much is Too Much? How Little is Too Little?* has been downloaded 644 times from the CFAITC website and 230 copies have been mailed to 5th – 8th grade teachers.

- 874 = Total copies of *How Much is Too Much? How Little is Too Little?* either downloaded from the CFAITC website or distributed through mail in one month period from December 23rd, 2013 to January 21, 2013.
- 378 = Total copies of the *Educator's Guide to Fun With the Plant Nutrient Team* either downloaded from the CFAITC website or distributed through mail in the one month period from December 23rd, 2013 to January 21, 2013.

CFAITC plans to continue promoting and distributing both of these resources at education events on a continual basis. At the end of each year, CFAITC conducts an annual survey of teachers who are using CFAITC's curriculum. Data is compiled into a report with information on where and how the curriculum is used and how it is impacting students. At the time of this report, the two units developed for this FREP project had only been in distribution for one month. Additional data will be collected and compiled at the end of the year.

D. Introduction

The objective of this project was to create and implement educational lessons for elementary through middle school students that result in a better understanding of the purpose of fertilizer in food production and new technologies to manage fertilizer use. The project was developed to address public lack of knowledge and in some cases misinformation regarding plant nutrient requirements and how those requirements are met in order to feed a growing population with limited resources.

One unit of eleven lesson plans and one educator's guide with seven lessons to build upon concepts in a student activity book were created. Both of these resources are aligned to the most current Content Standards for California including the Common Core and Next Generation Science Standards. Lessons include background information

for teachers and detailed instructions to carry out hands-on labs and activities in the classroom. CFAITC has and will continue to hold teacher workshops at various conferences to train teachers in the use of the lessons with their students.

The products of this project are:

- 1) *How Much is Too Much? How Little is Too Little?* –11 lesson unit on plant nutrients for 5th – 8th grade students
- 2) *Educator's Guide to Fun With the Plant Nutrient Team* – 7 lesson guide to build upon the K – 3rd grade student activity book, *Fun With the Plant Nutrient Team* by the International Plant Nutrition Institute.

E. Work Description:

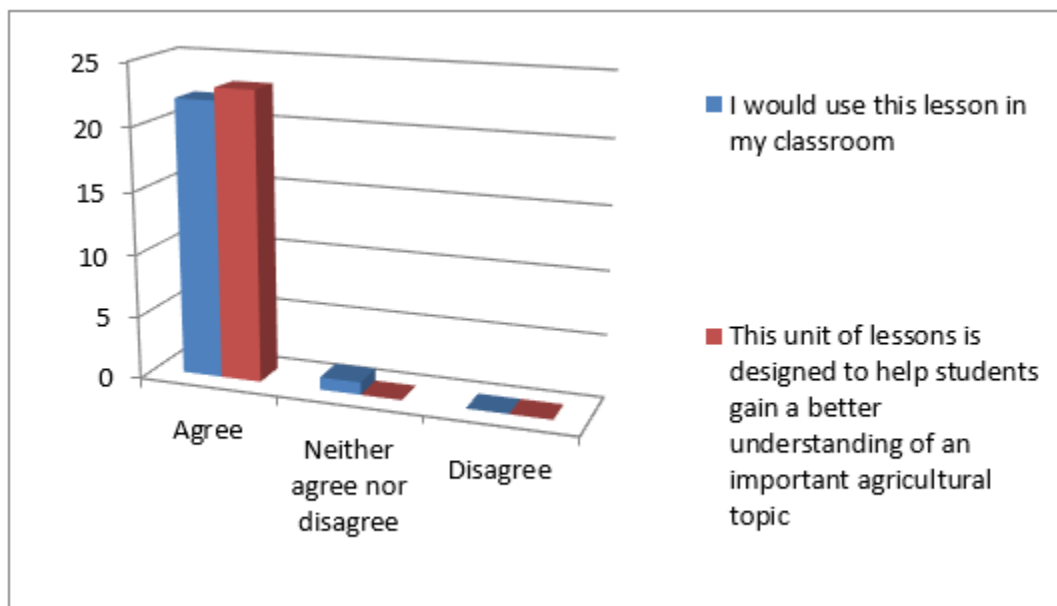
Project Task: <i>How Much is Too Much? How Little is Too Little?</i>	Completion Date
1. Plan <i>How Much is Too Much? How Little is Too Little?</i> 2-day update/writing meeting	February 2013
2. Facilitate <i>How Much is Too Much? How Little is Too Little?</i> 2-day update/ writing meeting	March 2013
3. Organize revision of <i>How Much is Too Much? How Little is Too Little?</i> and develop background information along with 11 lessons. Present a preview of the unit lessons at the National Agriculture in the Classroom Conference in Minnesota and at the California Foundation for Agriculture in the Classroom teacher conference in San Diego.	April 2013 – August 2013
4. Present <i>How Much is Too Much? How Little is Too Little?</i> to industry experts for review	September, 2013
5. Pilot <i>How Much is Too Much? How Little is Too Little?</i> in classrooms	September – October 2013
6. Align <i>How Much is Too Much? How Little is Too Little?</i> to CA Content Standards for Public Schools	April - November 2013
7. Layout, design and proof <i>How Much is Too Much? How Little is Too Little?</i>	November – December 2013
8. Print <i>How Much is Too Much? How Little is Too Little?</i>	December 2013
9. Add <i>How Much is Too Much? How Little is Too Little?</i> to lesson plan section of www.LearnAboutAg.org . Promote via social media & Cream of the Crop monthly e-newsletter	December 2013 – January 2014

Project Task: Educator's Guide with the Plant Nutrient Team	Completion Date
10. Plan <i>Educator's Guide to "Fun w/ Team Plant Nutrient Team"</i> 1-day development meeting	March 2013
11. Facilitate <i>Educator's Guide to "Fun w/ Team Plant Nutrient Team"</i> 1-day development meeting	April 2013
12. Align <i>Educator's Guide to "Fun w/ Team Plant Nutrient Team"</i> to CA Content Standards for Public Schools. Present a preview of the lessons at the National Agriculture in the Classroom Conference in Minnesota and at the California Foundation for Agriculture in the Classroom teacher conference in San Diego.	May-September 2013
13. Present <i>Educator's Guide to "Fun w/ Team Plant Nutrient Team"</i> to industry experts for review and pilot teach in classrooms.	September 2013
14. Layout and design <i>Educator's Guide to "Fun w/ Team Plant Nutrient Team"</i>	September – November 2013
15. Promote new/updated resources through social media	December 2013 – January 2014
16. Promote new/updated resources through monthly <i>Cream of the Crop</i> e-newsletter	December 2013 January 2014
17. Present new/updated resources at national educator's conference (ex: National Agriculture in the Classroom Conference)	June 2014
18. Promote FREP materials through Postcard Promotional Mailing. Mailed approximately 40,000 postcards to educators throughout the state.	December 2013 – January 2014
19. Present new/updated resources at state educators conference (ex: California Science Teachers Conference)	December 2014
20. Project evaluation	January 2014 – January 2015
22. Project promotion and dissemination	Ongoing

F. Data/Results

Although *How Much is Too Much? How Little is Too Little?* and the *Educators Guide* were not yet complete, preview lessons were presented to educators at the National Agriculture in the Classroom Conference in June 2013 in Minneapolis MN and at the California Foundation for Agriculture in the Classroom teacher conference in July 2013 in San Diego.

Educators had an overall positive response to the lesson previews and indicated that the lessons would support normal classroom instruction and would engage students through active learning.



Below are comments from surveys distributed at the National Agriculture in the Classroom Conference and at the California Foundation for Agriculture in the Classroom Conferences:

- *Absolutely love the soil activities and will use this fall with our rock cycle/soil unit.*
- *I will definitely share this resource with my upper grade colleagues – using our new greenhouse!*
- *I enjoyed the hands-on experience and the analogies between familiar items to compare it to unfamiliar items.*
- *Although these units are designed for elementary and middle school, I would use them in a high school class as an introductory lesson.*
- *Excited to use lessons with my students!*

Comments from teachers who piloted the draft lessons in their classrooms included:

- *The students and I enjoyed the lessons. I could tell it had piqued their interest when they were disappointed that it was over, and they wanted another plant lesson. In order to fulfill their request, we made posters of plants grown in California with the Ag in the Classroom commodity sheets as our information source. The students will be sharing these with the 4th graders who are also studying plants.*
- *This lesson was a real eye opener for students about how many people, products and processes are involved in producing a simple meal such as a hamburger.*
- *Lessons were informative and well written. Students were engaged and I was able to use them as Common Core reading and note taking assignments.*
- *We watched the chloroplast video from the photosynthesis lesson repeatedly and the students were fascinated each time.*

CFAITC will continue to hold workshops to train teachers in the use of these two educational units. Presentations have been scheduled for the 2014 National Agriculture in the Classroom Conference and the 2014 California Science Teachers Conference. The completed units were released to teachers less than one month ago. We expect to gather further information from teachers who have used the units once they have had time to implement them in their classrooms.

G. Discussion and Conclusions

Grant project objectives were met. One 5th- 8th grade unit, *How Much is Too Much? How Little is Too Little?* was updated to include current agricultural and education concepts. This unit is comprised of eleven lessons. These lessons teach students about: plant parts and functions, soil properties, how plant nutrients affect plant growth, how to read a fertilizer label, solutes and solvents, how to identify plant nutrient deficiencies, vermicomposting, how political decisions affect people and the environment, and best management practices regarding plant nutrient management.

One new resource, the *Educator's Guide to Fun With the Plant Nutrient Team* was developed for use in K-3rd grade classrooms. This resource includes seven lessons that allow teachers to build upon concepts that students learn about in the *Fun With the Plant Nutrient Team* activity booklet. The lessons in this unit teach students about: the nutrients that plants and people need to be healthy, soil components, how plants make their own food through photosynthesis, how modern farming technology like GPS helps farmers ensure plants get the right amount of nutrients, the water cycle, which crops are suited to different climates, and how to trace the components of a meal back to plants.

Both of these educational units are aligned to the most recent Content Standards for California Public Schools. Lessons are designed to engage students through hands-on

activities that allow them to explore the types of activities carried out by farmers and plant scientists to produce our food and fiber while practicing environmental stewardship. After participating in the lessons, students will have a better understanding of what plant nutrients are, why they are important, and how farmers and scientists are continually improving methods to provide crops with the right plant nutrients in the right amounts, at the right time and in the right place.

The lessons from each unit were pilot tested in classrooms, reviewed by experts in the plant nutrient field, and presented to teachers at workshops. Workshop participants gave overall positive reviews of the lessons as seen in the “Results” section of the report.

At the time of this report, the units had only been available to teachers for less than one month. CFAITC will collect feedback from teachers once they have had ample time to implement the lessons in their classrooms. This data will be collected as part of CFAITC’s annual survey sent to thousands of teachers in CFAITC’s database at the beginning of each year.

H. Project Impacts

The impacts of this project apply to teachers and students and will also be passed on to parents as students share information learned in class and carry out homework assignments. The educational materials created for this project are designed to increase student understanding of the importance of plant nutrients in growing our food supply and how those nutrients are carefully managed by farmers with the latest technology. Lessons will not only focus on nutrients in food production but will also teach students what they can do at home to build healthy soil and responsibly manage plant nutrients.

These educational materials are being promoted to teachers on continual basis. Feedback from surveys and discussions with teachers will be used to improve support materials for teachers and students who are using the lessons.

I. Outreach Activities Summary

- June, 2013: Presented lesson previews from *How Much is Too Much? How Little is Too Little?* and *the Educator’s Guide to Fun With the Plant Nutrient Team* at the National Agriculture in the Classroom conference in Minneapolis, MN.
- July 2013: Presented lesson previews from *How Much is Too Much? How Little is Too Little?* and *the Educator’s Guide to Fun With the Plant Nutrient Team* at the California Foundation for Agriculture in the Classroom conference in San Diego, CA. Teachers received training to implement the lessons in their classroom and also provided ideas on how lessons could be improved in the development process.

- June 2014 and December 2014: CFAITC is registered to present the completed units, *How Much is Too Much? How Little is Too Little?* and *the Educator's Guide to Fun With the Plant Nutrient Team* at the National Agriculture in the Classroom conference in Pennsylvania and at the California Science Teachers Conference in Long Beach, California.
- Teacher contact information is collected at all events attended by CFAITC and will be used to send CFAITC's annual survey to teachers at the beginning of each year. This timeframe will provide teachers with a chance to implement the final drafts of the unit lessons in their classrooms prior to answering survey questions about the educational value of the lessons.

J. Factsheet

Project Title: Educational Resources for Teaching Elementary – Middle School Students about Plant Nutrients

- 1) *How Much is Too Much? How Little is Too Little?* – 11 lesson unit on plant nutrients for 5th - 8th grade students.
- 2) *Educator's Guide to Fun With the Plant Nutrient Team* – 7 lesson unit to teach K-3rd grade students about plant nutrients.

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Start Year: 2012

End Year: 2013

Location: Project design was developed with a team of educators and plant nutrient experts from California. Printed copies of the products are being distributed to teachers throughout California. Online copies of the products may be downloaded by teachers throughout the U.S.

County: Project was developed in Sacramento County.

Highlights:

Two educational units were developed for this project. *How Much is Too Much? How Little is Too Little?* is an eleven-lesson unit for 5th – 8th grade students and the *Educator's Guide to Fun With the Plant Nutrient Team* is a K – 3rd grade unit comprised of seven lessons. Lessons teach students about the importance of plant nutrients in growing healthy crops to provide healthy food for people as well as lessons on plant structure and functions and the components of healthy soil.

Lessons were pilot taught in classrooms as part of the development process. Previews of the unit lessons were presented at teacher workshops in 2013 and the completed units were released to teachers at the end of December 2013. Teacher workshops featuring the units have been scheduled for 2014. Comments from teachers who piloted the draft lessons in their classrooms included:

- *The students and I enjoyed the lessons. I could tell it had piqued their interest when they were disappointed that it was over, and they wanted another plant lesson. In order to fulfill their request, we made posters of plants grown in California with the Ag in the Classroom commodity sheets as our information source. The students will be sharing these with the 4th graders who are also studying plants.*
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Introduction:

The project was developed to address the public's lack of knowledge and in some cases misinformation regarding plant nutrient requirements and how those requirements are met in order to feed a growing population with limited resources.

Methods/Management:

The project began with curriculum development meetings attended by CFAITC staff and classroom teachers. Core concepts were drafted, and lessons were sent for review by experts at the International Plant Nutrition Institute, the Nutrients for Life Foundation, Crop Production Services, Simplot, and Suterra. Lessons were pilot tested in classrooms and aligned to California Content Standards. Lessons are now being promoted through newsletters and social media and are being presented at teacher workshops.

Findings:

Both units are aligned to the Next Generation Science Standards which were adopted by the California Department of Education in 2013. There are few resources that are aligned to these new standards and CFAITC is helping teachers gain access to up-to-date science curriculum with engaging hands-on activities that can be completed with basic classroom science equipment.

K. Copy of the Product/Result: Attached

- a. *How Much is Too Much? How Little is Too Little?* 5th -8th Grade Unit of Lessons
www.learnaboutag.org/lessonplans/?details=402
- b. *Educator's Guide to Fun With the Plant Nutrient Team* K-3rd Grade Unit of Lessons
www.learnaboutag.org/lessonplans/?details=plantnutrient