

REVISED SCOPE OF WORK GRANT # 11-0485-SA

Assessment of Plant Fertility and Fertilizer Requirements for Agricultural Crops in California

Project number: 11-0485-SA

Project location: State of California

Project duration: Two Years 4/1/2012 through 4/30/2014

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CDFA Funding Request Amount/Other Funding

	Requested:	Other funding:
April 1, 2012 to March 31, 2013	\$ 69,050	\$0
April 1, 2013 to March 31, 2014	\$ 74,403	\$ 0
TOTAL	\$ 143,453	\$ 0

Executive Summary

The Department of Land, Air and Water Resources at the University of California Davis and the California Department of Food and Agriculture Fertilizer Research and Education Program (FREP) will work collaboratively in two distinct phases to synthesize FREP technical research data/findings and develop an information technology (IT) platform (Phase I), respectively, for scientific information collected over the past 20 years from final reports submitted through its grant program. A key product of Phase I collaboration is to make findings available to growers and crop advisors through a user-friendly, web-based, database platform developed by CDFA Information Technology Division (IT).

Phase II will develop fertilization guidelines for major crops grown in California. The guidelines will be based on results of FREP-funded projects as well as on other sources. The guidelines shall be made available to growers and crop advisors through a web-based platform on the FREP homepage, and be cross linked to the database created during the initial year of the project. **Activities for both phases will include:**

1. Synthesizing full technical reports in relation to crop/plant nutrient and water requirements, etc.

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2. Input synthesized findings into an electronic template developed by CDFA IT and FREP.
3. Assisting CDFA IT and FREP to develop the database (e.g, user interface, data delivery, etc).
4. Researching additional data for each report needed for databases (e.g., soil type using NRCS soil survey database).
5. Provide a concise written summary for each technical final report.
6. Enter key information of FREP-funded projects into the database when their final reports are submitted.
7. Add guidelines for potassium and phosphorus fertilization to crops for which nitrogen fertilization guidelines have been written during the initial year of the project.
8. Identify the crops for which the online publication of fertilization guidelines would be most beneficial to growers and farm advisors and would potentially have a high impact on fertilizer use efficiency in California.
9. Write nitrogen, phosphorus and potassium fertilization guidelines for the crops identified in Task 3.
10. In addition to the fertilization guidelines, documents about the following topics shall be written either crop-specific or for groups of crops:
 - Economic optimum fertilizer rates
 - Irrigation and cover crop management practices
 - History of the development of fertilization practices leading to present best fertilization practices
 - Future changes in agronomic management such as changes in irrigation management and tillage
11. Write final report with major conclusions and future directions for research.

Justification:

Over the past 20 years, the Fertilizer Research and Education Program (FREP) of the California Department of Food and Agriculture (CDFA) have funded approximately 160 projects. Project 11-0485-SA, which is a collaborative effort between the Department of Land, Air and Water Resources at the University of California, Davis and FREP aims to make the wealth of technical research data and findings from these projects readily available to growers and crop advisors through a user-friendly, web-based, database. Project 11-0485-SA received funding for eleven months through March 2013 to (i) read, comprehend, and understand the full technical reports as they relate to crop/plant nutrient and water requirement; (ii) summarize the results of each final report and inputting the answers to specific electronic fields on a template; (iii) research scientific background information for each technical report using other databases; (iv)

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provide a brief written summary for each technical final report; and to (v) write a final report with mayor conclusions and future directions for research.

Even though not explicitly mentioned as a task, an important component of the data entered into the database shall be fertilization recommendations obtained in the different projects. The inclusion of fertilization recommendations shall increase the value of the database for farm advisors and growers. The study of the final reports, however, revealed that the planned project database may not be the optimal platform for fertilization recommendations for the following reasons:

- In many projects, specific aspects of fertilization were investigated. In order to gain an overview of the many aspects of fertilization management of a crop, users would have to access and read a number of project summaries.
- The number of crops grown in California is large, a fact which is represented in the number of crops FREP-funded projects have been investigating. For many crops, only one or few studies have been carried out. For this reason, not all aspects of fertilization have been studied. Users would therefore need to consult other sources of information to gain an overview of nutrient management for specific crops.
- Final reports sometimes had to be submitted before all the results had been analyzed. In these cases, the results and discussion sections of final reports are based on preliminary data or datasets that do not include the final year of the study. For this reason, it was not always possible for the investigators to make well funded fertilization recommendations based on the data available at the time the final report was written.
- The complete results were often published after the submission of the final report in scientific journals or UCCE publications. However, in addition to results from the FREP-funded projects, these publications often also include results from closely related projects funded through other sources. Adding them to the database of FREP-funded research may look like an effort to overstate the importance of FREP-funded research and marginalize the contribution of other funding sources.

For these reasons, it was decided to split the work of the project into two phases:

Phase one includes the development of the searchable database and data entry into the database. The data entered is taken from final reports and contributions to the proceedings of the annual FREP conference. The data is entered into fields, such as project title, principal investigators, crops, years of study and project summary. In addition, project highlights provide the users with a quick overview, making the search for a specific topic fast and very user-friendly. When fertilization recommendations are made in the final report or the FREP proceedings by the investigators, they are included in the highlights. The summaries of all projects for which a final report has been submitted shall be entered into the database and made available online until March 2013.

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In a second phase, crop-specific fertilization guidelines shall be written to complement the project-specific information of phase one. Results from FREP-funded research as well as data from the scientific literature shall be included to provide users with an overview of the fertilization management of a specific crop, including the use and interpretation of soil and crop tissue samples. References will be added to clearly identify the sources of information. Links between the database and the fertilization guidelines shall allow for easy access of the guidelines from the database and vice versa. It is expected that nitrogen fertilization guidelines for three to four crops can be completed until March 2013. The format of the guidelines shall allow the addition of other nutrients or management practices.

During the proposed extension of the project, the data will be further synthesized and combined with data from the scientific literature to create crop-specific fertilization guidelines. In addition, irrigation practices will be included into the guidelines to highlight the close links between soil nutrient dynamics and losses and water management. Other topics, such as economic optimum fertilizer rates, cover crop management, history of the development of fertilization practices, and future changes in agronomic management, will also be addressed. The database and guidelines will serve to make the 20 years of research report available to users including farmers, students, industry, government agencies and other entities and to link results from FREP projects with results from other studies. Finally, a final report synthesizing the research results will present major conclusions and offer directions for future research.

Objectives:

1. Synthesizing full technical reports in relation to crop/plant nutrient and water requirements, etc.
2. Assisting CDFA IT and FREP to develop the database by inputting synthesized research data into a template for the database.
3. Researching additional data for each report needed for databases (e.g., soil type using NRCS soil survey database).
4. Provide a concise written summary for each technical final report.
5. Enter key information of FREP-funded projects into the database when their final reports are submitted.
6. Identify the crops for which the online publication of fertilization guidelines would be most beneficial to growers and farm advisors.
7. Develop web-based nutrient (nitrogen, phosphorus, and potassium) and irrigation management guidelines for major crops grown in California. By the end of the proposed extension, guidelines for at least ten major crops shall be available online.
8. Write final report with major conclusions and future directions for research.

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Work plans and Methods - Tasks to be completed by March 31, 2014

Year 1:

- Task 1. Reading, comprehending, and understanding the full technical reports as they relate to crop/plant nutrient and water requirements. FREP technical final reports can be found here;
http://www.cdfr.ca.gov/is/ffldrs/completed_projects.html
- Task 2. Summarizing the results of each final report and inputting the answers to specific electronic fields on a form/template (e.g., crop type, experimental location, soil type, fertilizer type used, application rate of fertilizer).
- Task 3. Research scientific background information for each technical report using other databases (e.g., soil type using NRCS soil survey database)
- Task 4. Provide a brief written summary for each technical final report.

Year 2:

- Task 1: Enter key information of FREP-funded projects into the database when their final reports are submitted. The database has been developed during the initial year of the project.
- Task 2: During the initial year of the project, nitrogen fertilization guidelines have been written for several crops. During the extension, guidelines for potassium and phosphorus fertilization shall be added.
- Task 3: Identify the crops for which the online publication of fertilization guidelines would be most beneficial to growers and farm advisors and would potentially have a high impact on fertilizer use efficiency in California.
- Task 4: Write nitrogen, phosphorus and potassium fertilization guidelines for the crops identified in Task 3.
- Task 5: In addition to the fertilization guidelines, documents about the following topics shall be written either crop-specific or for groups of crops:
- Economic optimum fertilizer rates
 - Irrigation and cover crop management practices
 - History of the development of fertilization practices leading to present best fertilization practices
 - Future changes in agronomic management such as changes in irrigation management and tillage
- Task 6. Write final report with major conclusions and future directions for research.

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Budget justification (Total Budget: APRIL 1, 2012 To MARCH 31, 2014)

Category A. Personnel Expenses

D. Geisseler will perform the necessary review and synthesis of the 20 years of FREP technical reports. He will be responsible to entering the synthesized information accurately into the electronic database for use by growers and others at the field level. He will work with FREP IT staff to assemble the database and website described in the project description. He will also write the individual report for each project and the ancillary review of soil database and literature to complete all reporting activity. He is expected to recommend where future FREP funds need to be allocated by identifying research gaps.

Category B. Operating Expenses

Travel is requested between UC Davis and CDFA FREP in Sacramento for D. Geisseler to work with FREP IT staff.

We request money to pay for publishing fees so that the results of this research can be published in peer reviewed journals.

Category C. Operating Expenses

No request

Category D. Operating Expenses

No request

Total request \$ 143,453

Total Budget \$ 143,453