Nitrogen Budgeting Workshops

FREP Contract # 99-0757

Project Leaders
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Introduction

Efficient fertilizer management is vital to the production and profitability of almonds in California. Almond growers statewide are seeking information and guidance on the optimal timing and quantity of nitrogen needed to maximize their crop. Nitrogen budgeting is a tool that growers can use to maximize fertilizer use efficiency and minimize the amount of fertilizer that is unintentionally released into the environment. This project conducted nitrogen budgeting workshops in three almond-producing counties in the Central Valley of California.

Objectives

1. The primary objective was to hold workshops in three counties using the Nitrogen Budgeting Worksheet as a tool to evaluate fertilization practices. The workshops provided a forum for participants to discuss innovative management techniques being used by growers. The events were an opportunity for interaction between farmers, farm advisors and independent farm consultants who have experience in optimizing nitrogen fertilizer applications.
2. Distribute the Nitrogen Budgeting Worksheet. Calculation of a nitrogen budget can help optimize fertilizer use efficiency and minimize excessive nitrate fertilizer released into the environment. The Nitrogen Budgeting Worksheet provides growers with an independent resource for the evaluation of annual nitrogen applications. Growers who attended the workshops received the worksheet, the URL to access nitrogen budgeting software available on the Internet and a disk with a copy of the nitrogen budgeting software. They also received *Fruits of Their Labor*, a manual produced by the California Department of Food and Agriculture's Fertilizer Research and Education Program and the video of the same title.

Summary

In order to assist almond and walnut growers with formulating a nitrogen budget, CAFF's Biologically Integrated Orchard Systems (BIOS) Program developed a Nitrogen Budgeting Worksheet based on an earlier worksheet for peaches. Values for the nitrogen contribution from cover crops and compost were added at this time. Dr. Max Stevenson further refined the worksheet in 1998 in consultation with University of California researchers, crop consultants, Pest Control Advisors (PCAs) and farmers. The current worksheet has been tested by over 40 farmers, and their comments have

been integrated.

Following harvest in the year 2000, the Community Alliance with Family Farmers held Nitrogen Budgeting Workshops in Madera, Merced and Yolo/Solano counties. The workshops focused on the methods and calculations used to determine nitrogen needs for almond and walnut trees as well as the best timing for nitrogen fertilization. In less than two hours, growers learned how to modify the nitrogen fertilization programs to meet their orchard's needs using data from soil, water and leaf tissue analysis, and other measurements.

During the workshops, the instructor explained the Nitrogen Budgeting Worksheet and introduced to growers the process of formulating their own nitrogen budget calculations. Growers were informed about the inefficiency of post-harvest fertilization and the best time to make nitrogen applications. The worksheet offers an assessment of the nitrogen available from manure, compost and cover crops in relation to the accumulation of nitrogen currently in the water and soil. The workshops also featured a demonstration of another means of calculating the amount of nitrogen available from the cover crop using the Rule of 16. The calculation allows the growers to effectively make fertilization rate decisions based on the total number of pounds of nitrogen from all sources.

The workshops also provided an opportunity to promote past and present projects funded by FREP. At the workshops, copies of the manual and video "Fruits of Their Labor" were distributed to all those in attendance. In addition, there was a demonstration of the computerized spreadsheet version of the Nitrogen Budgeting Worksheet developed by Patrick Brown and his lab at the University of California, Davis. BIOS is a cooperator on the project and has assisted in the development and testing of the spreadsheet version of the Nitrogen Budgeting Worksheet. Attendees received a copy of this software on disk. The current form of the software is only applicable to almond growers, but future projects will make the software relevant to walnut and pistachio growers.

Evaluations conducted following the workshops indicated that the attendees found the information presented "very useful." Based on discussion after the presentations, it appears there is a great deal of interest in the program. Several recommendations were made to modify the program and there will probably be a follow up meeting next year.

Work Description

Task 1: Produce Nitrogen Budgeting Worksheet

Subtask 1.1: A final version of the worksheet was revised with input from UC researchers, FREP staff and industry experts. See attached worksheet.

Subtask 1.2: A computerized format of the worksheet was prepared on disk for distribution at the grower workshops. See attached computer disk.

Task 2: Hold Nitrogen Budgeting Workshops

Subtask 2.1: Three workshops for almond growers on the use of the Nitrogen

Budgeting Worksheet were planned and publicized. A promotional flier publicizing each of the workshops was created and distributed to county nut growers, PCAs, and farm advisors. Topic presenters were coordinated, course materials prepared, and workshop supplies provided. See attached postcards and agendas.

Subtask 2.2: Three workshops were hosted in the following counties: Madera, Merced and Yolo/Solano. The workshops instructed growers on how to determine optimal fertilizer rates. Each participant received a copy of the Fertilizer Education Research Handbook *The Fruits of Their Labor,* Nitrogen Budgeting Worksheets, and a pocket calculator for use in workshop exercises. Through this analysis growers were instructed on how to calculate nitrogen use efficiency. See attached sign-in sheets.

Task 3: Workshop Evaluation

Subtask 3.1: Workshop and worksheet effectiveness were evaluated through written evaluations.

Subtask 3.2: An interim report invoice and interpretive summary on the progress of workshops and worksheet evaluations implemented by 6/2000 was submitted.

Subtask 3.3: A final report on the effectiveness of the Nitrogen Budgeting worksheets as determined through evaluations is being submitted as a part of this report.

Task 4: Insure continued use of Nitrogen Budgeting Worksheet

Subtask 4.1: A computerized version of the worksheet created by Dr. Patrick Brown is available on the World Wide Web through the UC SAREP Web site. The Web location was included on the postcard publicizing the December 13 meeting in Woodland. CAFF's monthly technical publication*, Farmer to Farmer,* distributed to over 1300 interested growers across the state, featured write-ups on both the October Madera meeting and the December meeting in Ceres. Press releases for the workshops are attached.

Results, Discussion and Conclusions

Three workshops were held throughout California in Madera, Merced and Yolo counties. Fliers advertising the workshops were mailed to growers in those counties as well as surrounding counties. All of the workshops were well attended by growers and PCAs. The meetings were structured to be informational and interactive with ample opportunity for questions and discussion.

There was a panel of speakers at each workshop that included university researchers and pest control advisors experienced in determining nutrient demands of trees and timing application to match uptake. Several concepts based on university research were presented that included:

1. Nutrient demand and uptake occur from late January through harvest. Uptake requires active trees and roots. Nothing happens during dormancy. This goes counter to the historical practice of applying nitrogen fertilizer during the dormant period.

2. From February to March there is very little nitrogen uptake; it comes from storage in the trunk and canopy.

3. In the period March to May, most of the nitrogen that is taken up goes to the nuts.

4. August to September is when the majority of nitrogen uptake occurs for the subsequent year's bud formation.

5. After September there is very little nutrient uptake.

6. 90% of nitrogen is found in the fruit, not the leaves, trunk or branches.

This information formed the basis for an easy-to-use nitrogen budgeting computer program. Using this program and information from their farms, growers should be able to accurately predict the nitrogen needs of their orchards.

The grower who would like to use this program will need to input certain bits of information from their farm, such as yield information from the past three years, nitrogen levels in irrigation water and leaf samples. The program then calculates the entries and provides a recommendation for the timing and amounts of nitrogen to be applied.

Project Evaluation

Several critical factors are necessary in order for nitrogen budgeting and the use of the worksheet and the software to become a widespread practice. It is important to continue research to validate the accuracy of the worksheet and the software at estimating the amount of nitrogen that should be applied. In addition, farm advisor acceptance of the worksheet and software as an effective tool for estimating nitrogen demand is key to dissemination. Farm advisors will not promote this information if they do not perceive it to be accurate and effective. Growers will also need to feel comfortable that they can safely reduce nitrogen inputs without negative effects on crop yield or tree health. This confidence will come from promotion by farm advisors, pest control advisors, as well as hearing from other growers who have been able to successfully reduce nitrogen inputs.

The cost benefit of adopting this tool is realized by growers and others. At the workshop in Merced, independent pest control advisor Gary Gliddon spoke about his experience using this program with his clients. He has been experimenting with one-fourth of his growers and has been able to reduce nitrogen inputs for all those growers, some as much as 60%. This represents a significant cost savings to growers who are able to reduce the amount of nitrogen applied to their orchard without sacrificing their yields.

They also benefit from an improvement in general orchard health as a result of not overfertilizing. It has been observed that pest and disease incidence increase as a

result of applying too much nitrogen. California as a whole benefits because the amount of fertilizer unintentionally released into the environment is minimized.

Evaluation forms were distributed and collected following the workshop. The majority of the forms indicated that the attendees found the information presented to be “very useful.” One pest control advisor commented that she was pleased to have this information available in such a clear, concise and practical format. She thought the worksheet and the software were useful tools that she would utilize in her daily work. Based on discussion after the presentations, it appears there is a great deal of interest in this program. Several recommendations were made to modify the program and there will probably be follow-up meetings next year.

Outreach Activities

10/26/00 “Nitrogen Budgeting in Grapes,” Madera Lighthouse Farm Network Meeting, Madera, CA; 7 participants, growers, PCAs

12/8/00 “Proper Nitrogen Use for Maximum Almond Production,” BIOS Field Day, Ceres, CA; 29 participants, growers, PCAs, agency and CAFF staff

12/13/00 “Almond and Walnut Nutrient Management and Winter Monitoring,” BIOS Field Day, Woodland, CA; 20 participants, growers, PCAs, agency and CAFF staff

Extensive write-ups of the October 26 and December 8 workshops were distributed in CAFF’s *Farmer to Farmer* monthly publication (December and January editions) reaching over 1300 interested and active growers across the state.