



Department of
LAND, AIR AND WATER RESOURCES
University of California, Davis
Climate Change • Sustainable Agriculture
Environmental Quality • Landscape Processes



Nutrient Management Guidelines for Major Crops in California

Daniel Geisseler, William R. Horwath

FREP / WPHA Conference 2013

Content



- Project Objectives
- FREP Database
- Fertilization Guidelines

Project Objectives



Make research data and findings from different sources available to growers and crop advisors.

- Searchable database of FREP-funded projects
- Fertilization guidelines for major crops

Criteria:

- Online
- User-friendly
- Flexible design
- Concise summary of research results

The FREP Database: Accessing the Database

<http://www.cdfa.ca.gov/is/frep/>



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FERTILIZER RESEARCH AND EDUCATION PROGRAM

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The Fertilizer Research and Education Program (FREP) funds and facilitates research to advance the environmentally safe and agronomically sound use and handling of fertilizing materials. FREP serves growers, agricultural supply and service professionals, extension personnel, public agencies, consultants, and other interested parties.

2013 FREP/WPHA CONFERENCE
Managing Agricultural Nutrients
Challenges, Opportunities, and the Future

UPCOMING DATES

- OCT 29-30: FREP Conference
- DEC 2: 2014 RFP Released
- [More events...](#)

QUICK LINKS

- [FREP Research Database](#)
- [Fertilization Guidelines](#)
- [Annual Conference](#)
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The FREP Database: Search Options



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FREP DATABASE

The Fertilizer Research and Education Program (FREP) funds and coordinates research to advance the environmentally safe and agronomically sound use and handling of fertilizer materials. Since 1990, FREP has funded research on many of California's important and environmentally sensitive cropping systems. This database aims to make the wealth of information contained in FREP research projects readily available, easily understandable, and convenient for growers to implement.

Please enter search criteria:

Keyword(s)	<input type="text"/>
Type of Crop	<input type="text" value="View All"/>
County	<input type="text" value="View All"/>
Date Range	<input type="text" value="View All"/>
<input type="button" value="Search"/>	




The FREP Database: Search Options

The screenshot displays the CDFA website's 'INSPECTION SERVICES DIVISION' page. The navigation bar includes links for 'CDFA Home', 'Inspection Home', 'Programs', 'Apply/Register', 'Laws & Regs', 'Meetings', and 'Contact Us'. A banner image shows a person in a field with the text '20 years OF FREP RESEARCH'. Below the banner, the breadcrumb trail reads 'CDFA Home > Inspection Services > FREP Database'. The main content area features a large magnifying glass graphic with the following search options listed inside it:

- Keyword(s)
- Type of Crop
- County
- Date Range

To the right of the magnifying glass, a grid of nine 'FREP Proceedings' book covers is visible, each featuring different agricultural products like pomegranates, avocados, and cherries.


The FREP Database: Search Options



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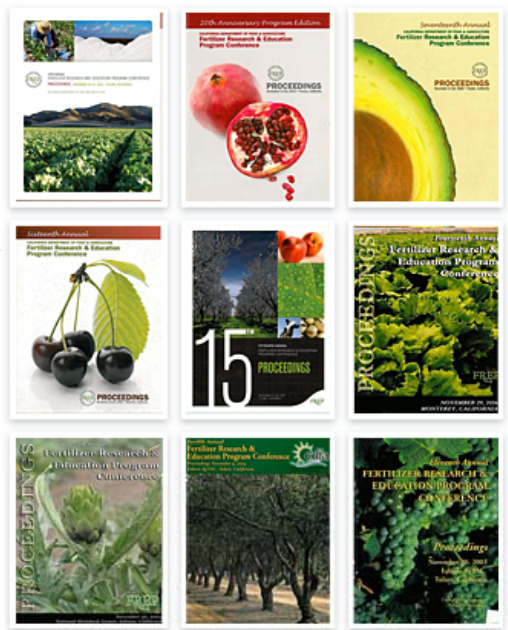
Please enter search criteria

Keyword(s)

Type of Crop

County


Date Range



The FREP Database: Search Results

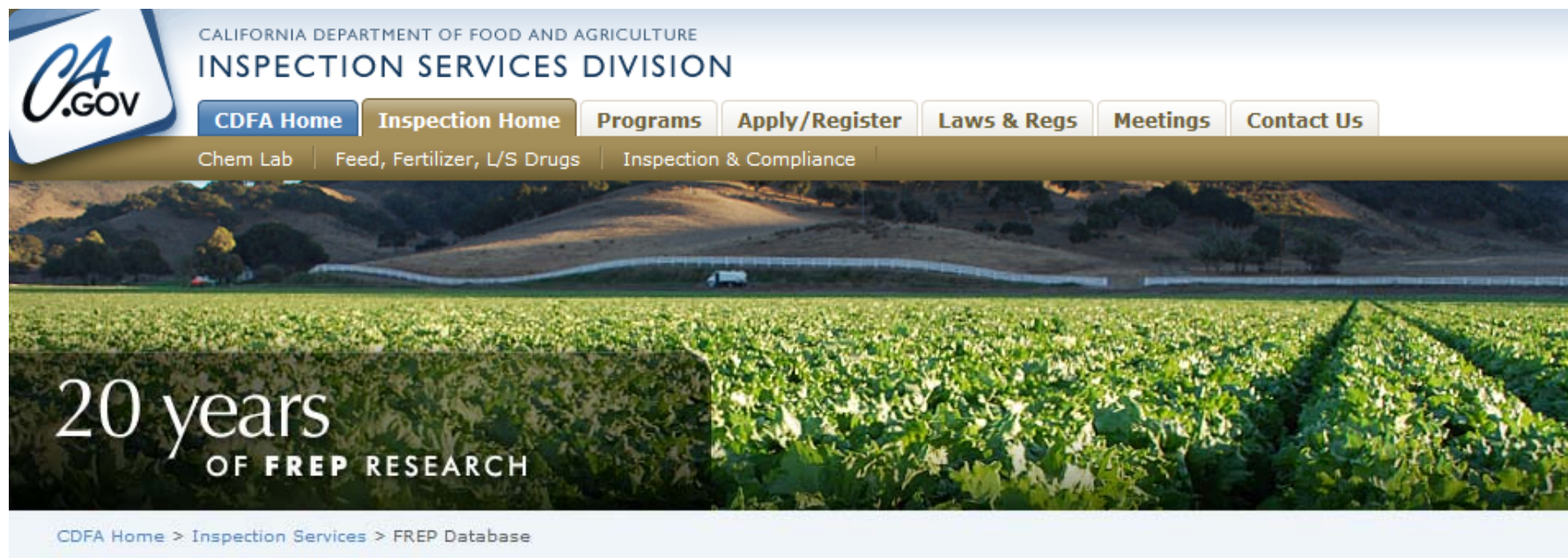
FREP DATABASE

Search results:



Study Title	Project County	Crop Type
Demonstration of Pre-Sidedress Soil Nitrate Testing as an N Management Tool	Monterey	Lettuce
Demonstration Program for Reducing Nitrate Leaching through Improvements to Irrigation Efficiency and Fertilizer/Cover Crop Management	Monterey	Lettuce
Determination of Best Nitrogen Management Practices for Broccoli Production in the San Joaquin Valley	Fresno	Broccoli
Development and Demonstration of Nitrogen Best Management Practices (BMP's) for Sweet Corn in the Low Desert	Riverside	Sweet Corn
Development and Promotion of Nitrogen Quick Tests for Determining Nitrogen Fertilizer Needs of Vegetables and Survey of Soil Residual Nitrate-Nitrogen Levels	San Benito, Monterey	Cabbage, Onion, Lettuce
Development of a Model System for Testing Foliar Fertilizers, Adjuvants and Growth Stimulants	Site independent	Arabidopsis used as model plant
Development of a Nitrogen Fertilizer Recommendation Model to Improve N-Use Efficiency and Alleviate Nitrate Pollution to	Yolo, Colusa	Almond

The FREP Database: Report Summaries



STUDY RECORD

Demonstration of Pre-Sidedress Soil Nitrate Testing as an N Management Tool

Hartz, T.K., Department of Vegetable Crops, University of California, Davis

Project Highlights

- Sidedressing to lettuce can be delayed as long as residual soil $\text{NO}_3\text{-N}$ in the top foot of soil exceeds 20 ppm.
- Maximum yields can be achieved in fields with lower soil $\text{NO}_3\text{-N}$ levels by sidedressing only enough to raise soil $\text{NO}_3\text{-N}$ concentration to 20 ppm.

Crop

Lettuce

County

Monterey

Fertilization Guidelines: Start Page



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Fertilization Guidelines for Major Crops Grown in California

These guidelines are based on research results from studies carried out in California and elsewhere. For an optimal fertilization program, site-specific information on soil type, climate and crop management need also to be take in into account.

After choosing a crop from the list below, detailed information can be accessed by moving the mouse over any shape with the symbol ⓘ.

Cotton



Under Review!

Almonds



Processing Tomatoes



Soil and Plant Tissue Sampling

- [Soil Test Sampling Instructions](#)
- [Sampling for Soil Nitrate Determination](#)
- [Soil Sampling in Orchards](#)
- [Plant Tissue Sampling](#)

Corn

Rice

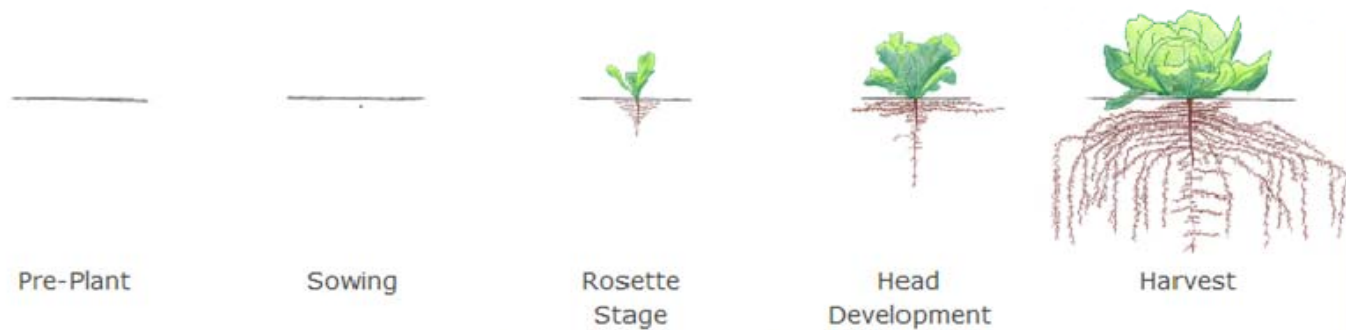
link

next

Fertilization Guidelines: Some Screenshots

Lettuce Fertilization Guidelines

Funding provided by:



Nitrogen (N) ⓘ

Pre-Plant N ⓘ

Starter N ⓘ

Soil Test ⓘ

Leaf Analysis ⓘ

Sidedress N ⓘ

Phosphorus (P_2O_5) ⓘ

Soil Test ⓘ

Pre-Plant P ⓘ

Starter P ⓘ

Leaf Analysis ⓘ

Potassium (K_2O) ⓘ

Soil Test ⓘ

Pre-Plant K ⓘ

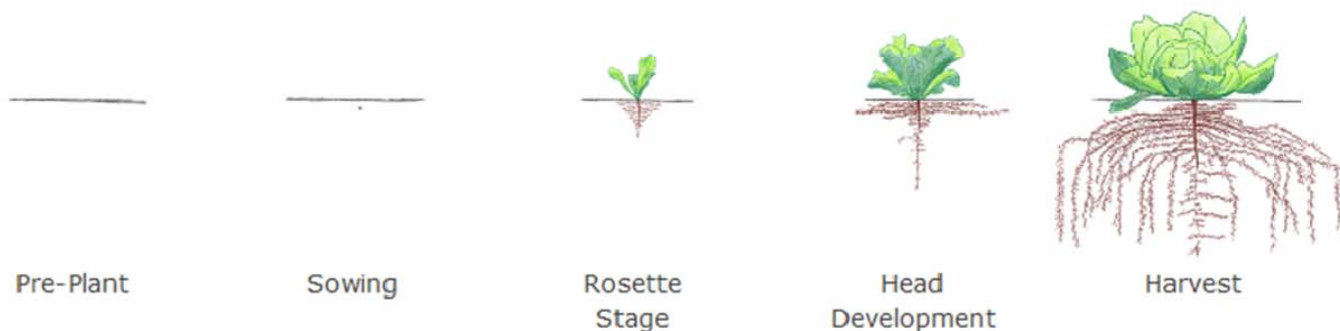
Leaf Analysis ⓘ

K Fertigation ⓘ

Fertilization Guidelines: Some Screenshots

Lettuce Fertilization Guidelines

Funding provided by:



Nitrogen (N) ⓘ

Pre-Plant N ⓘ

Starter N ⓘ

Soil Test ⓘ

Leaf Analysis ⓘ

Sidedress N ⓘ

Phosphorus (P_2O_5) ⓘ

Soil Test ⓘ

Pre-Plant P ⓘ

Starter P ⓘ

Potassium (K_2O) ⓘ

Soil Test ⓘ

Pre-Plant K ⓘ

Acknowledgments ⓘ

Additional Information:

1. [Lettuce Production in California](#)

Sidedress N

Between heading and harvest, the N demand of lettuce is high, reaching 3-4 lbs N/acre per day ^[N13, N32, N33]. During this period, which is generally the last month before harvest, 70-80% of the total N is taken up ^[N21, N30, N33, N41]. A sufficient N supply between heading and harvest is crucial for obtaining a high yield.

Application Rate ⓘ

Site Specific Fertilization Management ⓘ

Mode of Application ⓘ

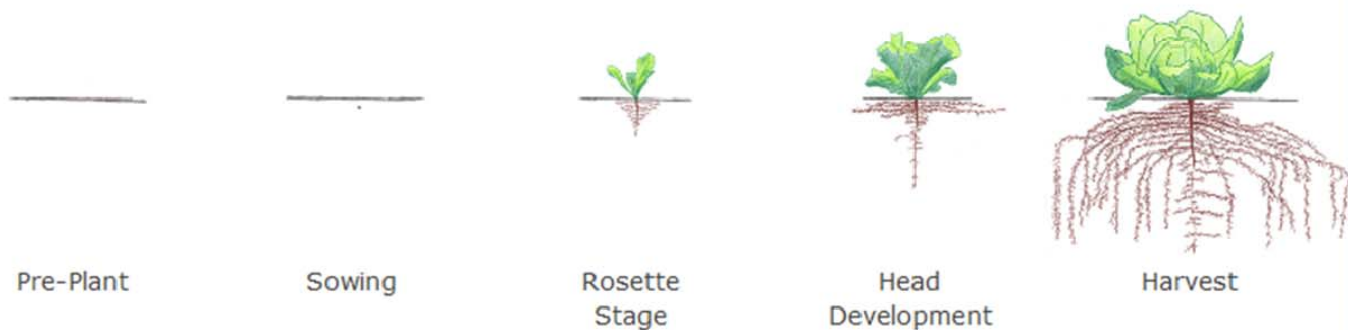
Fertilizer Type ⓘ

Time of Application ⓘ

Fertilization Guidelines: Some Screenshots

Lettuce Fertilization Guidelines

Funding provided by:



Nitrogen (N) ⓘ

Pre-Plant N ⓘ

Starter N ⓘ

Soil Test ⓘ

Leaf Analysis ⓘ

Phosphorus (P_2O_5) ⓘ

Soil Test ⓘ

Pre-Plant P ⓘ

Starter P ⓘ

Potassium (K_2O) ⓘ

Soil Test ⓘ

Pre-Plant K ⓘ

Acknowledgments ⓘ

Soil Nitrate Test

Samples are taken from the top foot of the soil profile, which is the major rooting zone ^[N20, N21]. Zones of recently banded fertilizer applications should be avoided so that the N availability is not over-estimated ^[N11]. For more information on sampling procedure see [Sampling for Soil Nitrate Determination](#).

Young lettuce plants require little N, as approximately 70% of the total N is taken up between heading and harvest ^[N21, N30, N33, N41]. Therefore, taking a soil sample after thinning, prior to the first in-season N application, and a second 2-3 weeks later provides sufficient information to schedule N applications throughout the season ^[N13].

Soil Nitrate Quick Test ⓘ

Interpretation of Test Results ⓘ

Additional Information:

Links:

Fertilization Guidelines: Summary

The guidelines ...

- ... are a summary of research results
- ... include general information for crops grown in California
- ... provide a basis for in-depth discussions with local farm advisors or fertilization experts about site-specific adjustments
- ... can easily be expanded and updated
- ... include a list of references

Conclusions



- Data from completed projects has been entered into database
- The database is accessible online:
www.cdfa.ca.gov/is/frep/
- Fertilization guidelines for major crops are added on a flow basis
- The guidelines are accessible online:
<http://apps.cdfa.ca.gov/frep/docs/guidelines.html>

Acknowledgements



- FREP
- Asif Maan, Ph.D., Environmental Program Manager II
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- FREP team
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