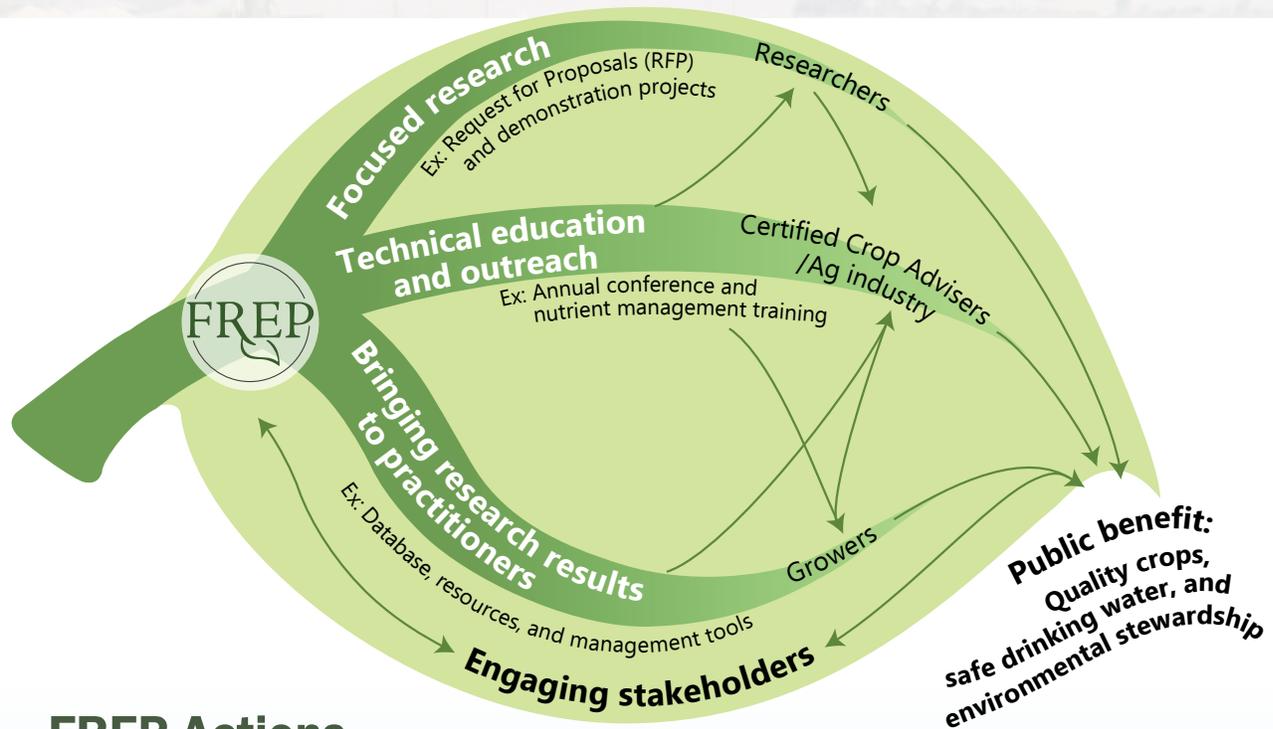
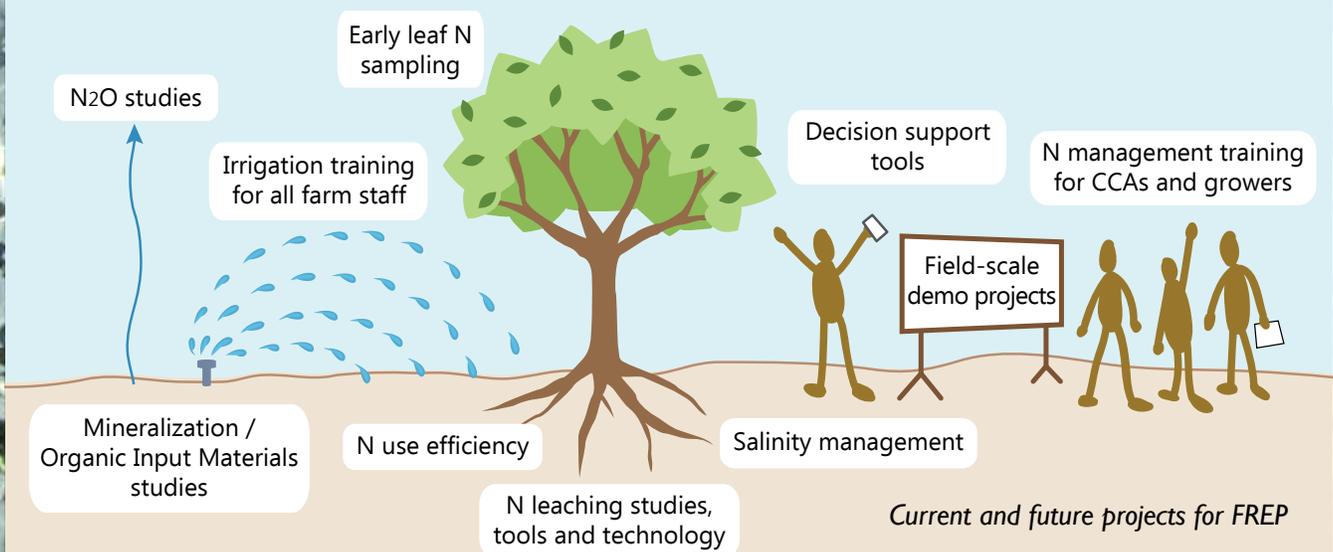


The Fertilizer Research and Education Program (FREP) was established in 1990 through legislative action to provide funding for basic and applied research, education and outreach for understanding, developing, and improving nutrient and water management practices in California agriculture. FREP is funded through a mill assessment (\$0.001 per dollar) on fertilizer sales.



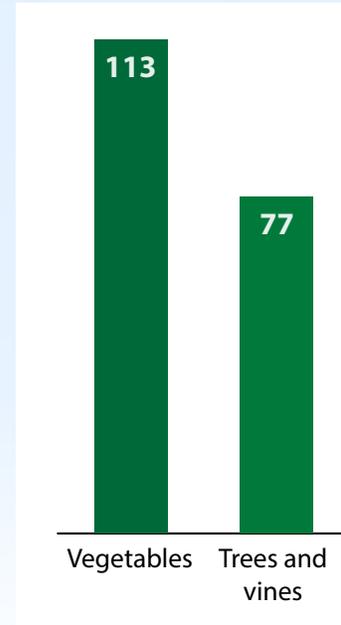
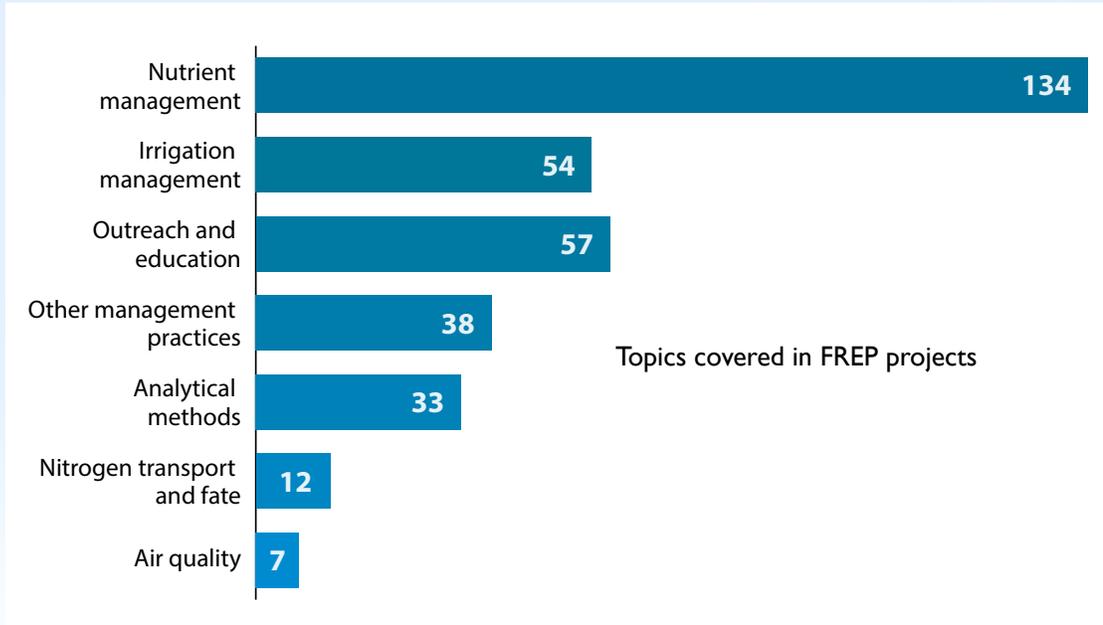
FREP Actions

- Focused Research** – With over 220 projects funded for more than \$17 million, FREP has developed a baseline for efficient nitrogen fertilization of various crops and established management practices, which improve the performance of nitrogen fertilizers while minimizing their environmental impact.
- Technical Education and Outreach** – FREP provides growers and crop advisors with timely, technical education, such as nitrogen management training, and a discussion forum at the annual conference.
- Bringing Research Results to Practitioners** – FREP has developed an online searchable database, a growing number of crop fertilization guidelines, and many decision-making tools that assist growers and advisors with their nutrient and irrigation management decisions.
- Engaging with all stakeholders** – FREP continues to work closely with those impacted by the nitrate issue and facilitating improvements in management practices that maximize irrigation and nutrient efficiency.



Successful Projects Making a Difference

Grants from FREP have supported a wide variety of research and education projects. Two-hundred nine projects have been funded by FREP. In both of the charts below, some projects represent multiple categories.

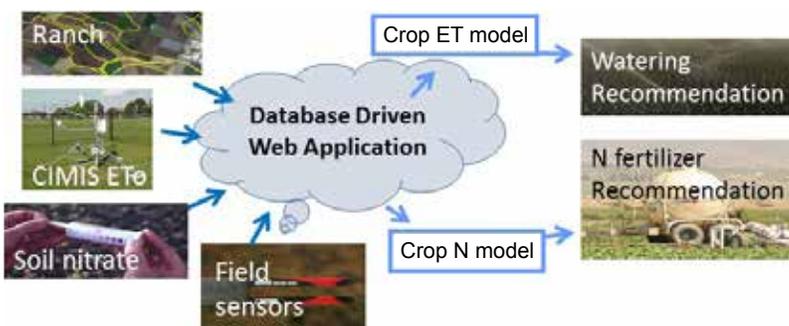


CropManage

A great example of FREP-funded projects making a difference is the CropManage decision-making tool developed by UC Cooperative Extension.

Integrating publically available soil and climate data with in-field measurements, growers can create efficient irrigation and fertilization schedules based on crop demand. (See chart below.) There are approximately 900 registered users of CropManage who have received more than 6,000 fertilizer recommendations and 10,000 irrigation recommendations. CropManage currently supports recommendations for eight major Central Coast crops. Studies show that growers using this software reduced average nitrogen use by 33% and water use by 20% in lettuce without yield penalty.

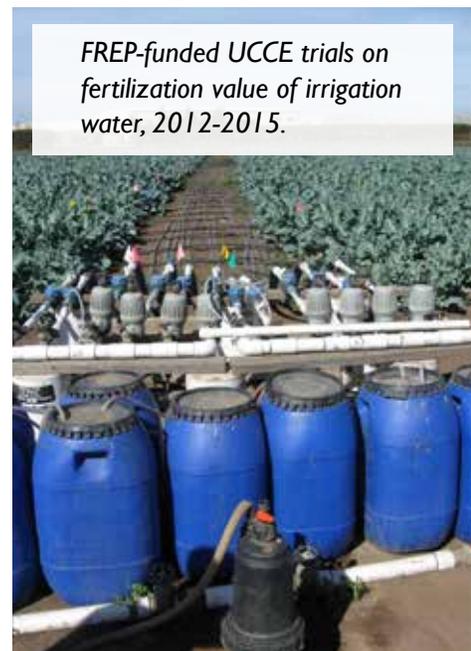
While FREP is the original funding source for CropManage, the software is receiving increasing interest and matching funds from industry for further development. An additional 11 crops are being researched as expansions to the software.



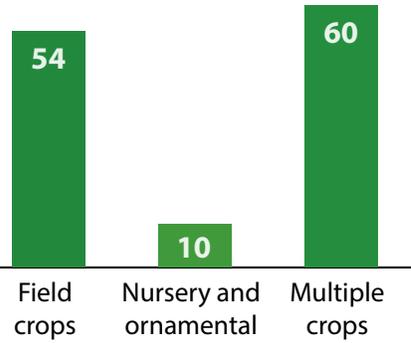
Fertilizer Value of Irrigation Water

Another FREP research project explores taking advantage of the nitrate in irrigation water as a plant nutrient. Accounting for this nitrogen reduces inputs from other sources and losses of nitrogen to groundwater.

Research results show that crops can take up nitrate from irrigation water even at small concentrations, and a pound of nitrogen from irrigation water nitrate is equivalent in its plant nutrient efficiency to a pound of nitrogen from a synthetic fertilizer. In some cases, growers can save 37 to 55 pounds of nitrogen per acre by accounting for the nutrient in irrigation water.

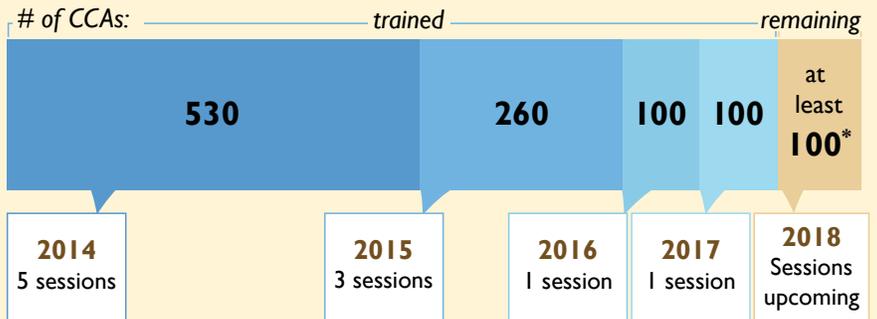


Crops covered in FREP projects



Certified Crop Adviser (CCA) Training

There are over 1,100 CCAs in California. Since 2014, 990 have been trained through 10 one-and-a-half-day sessions held in various locations throughout the state.



Early Leaf Sampling

Currently, leaf samples for perennials are collected in mid-summer to evaluate the nitrogen status of trees. A FREP-funded project examined and developed a new protocol for the use of early-season (Spring) leaf sampling which allows growers to better anticipate crop demand and adjust fertilizer application accordingly. This technique increases fertilizer efficiency and is being practiced for almonds and pistachios. FREP is extending this technique to pears, walnuts, and prunes.

CCA and Grower Training

Recognizing a need for good nitrogen management training opportunities for Certified Crop Advisors (CCAs) and for growers, FREP has supported several projects that address this need.

In California, the Central Valley Water Quality Control Board's Irrigated Lands Regulatory Program requires growers in high-vulnerability areas to have their Nitrogen Management Plans (NMPs) certified by an expert, such as a CCA who has completed CDFA's nitrogen management training. Alternatively, growers are able to self-certify their own NMPs upon passing the certification exam. See *infographic on right*.

Grower Training



32 CCAs trained to lead the sessions



2,922 grower certification exams graded*



* As of March 2017.

Sources: University of California Agriculture and Natural Resources (UC ANR), Coalition for Urban/Rural Environmental Stewardship (Cures), and California Association of Pest Control Advisers (CAPCA). Funding provided by FREP.

Crop Fertilization Guidelines

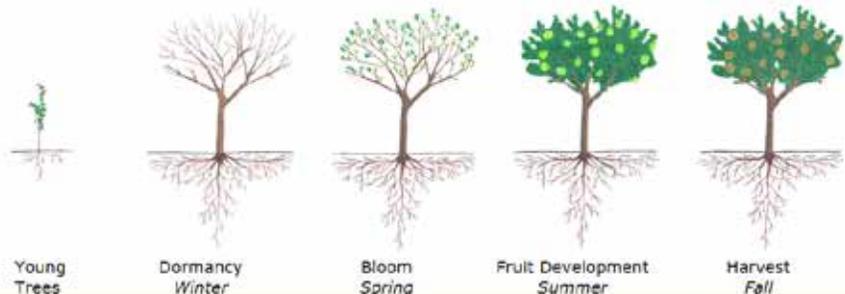
Online crop fertilization guidelines give growers and advisors access to information on how much, when and the method to best apply fertilizers.

There are guidelines for nearly 30 crops on the CDFA website, representing 73% of irrigated acres in California.

Since December 2014, the Fertilization Guidelines have been viewed over 4,000 times, with more than 80% of those hits originating in major agricultural regions in California.

A collaboration between   

California Fertilization Guidelines Pistachio



Nitrogen (N)

- Soil Test
- Leaf Analysis
- Soil Applied N
- Foliar N

Phosphorus (P₂O₅)

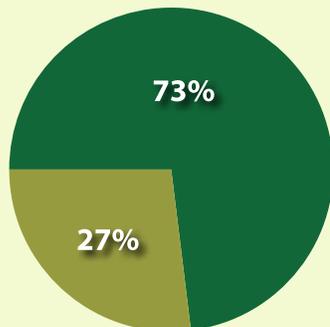
- Soil Test
- Leaf Analysis
- Soil Applied P

Potassium (K₂O)

- Soil Test
- Leaf Analysis
- Soil Applied K
- Foliar K

Acres of California Irrigated Crops Represented by FREP Fertilization Guidelines

-  Guidelines acreage (28 crops)
-  Remaining irrigated acreage



Based on the online guidelines, FREP has produced a series of Nitrogen Fertilization Guideline brochures to provide quick references in a convenient printed format.

More than 9,000 copies of these publications have been distributed to growers and crop advisors in various regions of California.



www.cdfa.ca.gov/go/FREPguide