Project Title: Develop Nutrient Budget and Nutrient Demand Model for Nitrogen Management in Cherry

Location of the concept work: The project will be carried out in the major cherry growing regions of California.

Duration: 3 years

Project Leader(s):
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Problem
Increasing awareness of the environmental impact of excess nitrogen (N) and new N management regulations demand user-friendly tools to help growers make fertilization decisions. Currently, nutrient management decisions in cherries are based on leaf analysis and critical value interpretation which only indicates a deficiency or sufficiency and is performed too late to respond to deficiencies or plan N applications. In other high value crops such as Almond, Pistachio and Walnut, nutrient management is increasingly based on yield and vegetative growth estimated crop demand coupled with an understanding of seasonal nutrient demand dynamics. This approach has not been developed for cherry cultivars in California and hence cherry growers do not have improved fertilizer management decision tools to apply the right rate of fertilizer at right time, to optimize productivity and avoid environmental losses. Current approaches to nutrient management in cherries rely heavily on leaf sampling collected during late summer which is too late to respond to deficiencies or adjust fertilizer regimes. The concept of demand driven nitrogen management is not widely practiced but is essential to meet ILRP guidelines and achieve a high efficiency of N use. Critical data on N export rates, seasonality of N demand and differences between cultivars and practices in N dynamics, is not currently available from Californina cherry production.

Description of the target audience: The audiences of the project are the Cherry growers of California as well as other stakeholders such as Pest Control Advisors, Certified Crop Consultants, Regional Water Quality Coalitions, and the State and Regional Water Quality Control Boards.

Objectives, Approach and Evaluation

The objectives of the project are:

I. Develop nutrient demand curves to guide the quantity and time of fertilizer application in cherry. Repeat for most representative cultivar and production systems.
II. Develop and extend nutrient BMP for cherry cultivars.

Approach:
Activities 1. Develop nutrient demand curves that guide the quantity and time of fertilizer application in cherries (*Years 1 and 2*). Activity 1 will be achieved by intensive monitoring of highly productive groves of cherries in California Central Valley. Three replicated blocks of three different cultivars or production systems that are representative of broad acreage, will be selected for sampling. Replicate trees of each cultivar will be monitored for changes in nutrient concentrations in different plant organs (roots, trunk, scaffold, canopy branches, small branches, fruits and leaves) six times during the season for two seasons. This will be achieved by root digging, tissue coring and organ sampling. Three trees of each cultivar will also be excavated at the beginning and end of each season to determine total biomass accumulation during the growing seasons and also nutrient concentrations in tree organs. The samples will be analyzed for N, P, K, S, Ca, Mg, Zn, B, Fe, Mn and Cu. The changes in biomass of different organs will be examined during two seasons and yield data will be collected at harvest to develop seasonal demand curves for N and other nutrient elements based on yield and whole tree nutrient demand.

Activity 2. Develop and extend nutrient Best Management Practices for cherries (*Year 3*). The combination of nutrient budget, seasonal changes in tree N content and in-season prediction of tissue nutrient status will help in developing a robust new fertilizer management tools for cherries growers of California. The finding from the research will help in development of the 'Right Rate' and 'Right Time' to guide N applications. A computer based model will be developed that will be available for the grower to estimate their crop fertilizer needs based on phenology, plant age, environment, crop load and yield. Extensive outreach events will be conducted and online tools will be developed. This activity will define the required N removal values for cherry production and guide growers on methods to attain high NUE.

Evaluation:
Project success will be evaluated by the development of demand curves in cherries; availability of online information system for cherry growers which will guide the quantity and time of fertilizer application and in-season monitoring, and extension of result findings and improvements in nutrient use efficiency.

Collaboration
The CCB (California Cherry Board) has offered a 1:1 match ($50,000 per year) for CDFA-FREP funding.

Funding Request Amount from CDFA = $150,000 total over three years.