

AES/CE MAR 84

Workgroup/Department: Walnut/Plant Sciences

University of California  
Division of Agricultural Sciences

**PROJECT PLAN/RESEARCH GRANT PROPOSAL**

Project Year 2009 Anticipated Duration of Project 1 year

Project Leader Bruce D. Lampinen Location Davis/Statewide

Cooperating Personnel Janet Caprille, Bill Coates, Carolyn DeBuse, David Doll, John Edstrom, Rachel Elkins, Joe Grant, Janine Hasey, Kathy Kelley, Bill Krueger, Bill Olson, Greg Browne, Gale McGranahan, Chuck Leslie, Sam Metcalf, Claudia Negron, Stan Cutter and Judy Sams

Project Title Walnut Orchard Management: Pilot projects, field testing, adaptive research and problem solving by CE Farm Advisors and Specialists

Keywords Applied/adaptive research, problem solving, site specific research, technology transfer, rootstock evaluation, cultivar evaluation, selection evaluation, training, pruning, hedgerow, mulch

**Problem and its Significance:**

The Walnut industry provides critically needed financial support for the conduct of many mission-oriented research projects. Aspects of that research and the application of research findings to specific problems and needs in the field is often dependent upon subsequent field testing and site specific adaptive research conducted by CE farm advisors and specialists. In addition, county-based-pomology farm advisors initiate and conduct a broad array of research projects to address local needs and problems. These projects, which typically are demonstration oriented or preliminary in nature, often are not of sufficient scale to warrant specific funding requests through the walnut marketing board, but instead have depended on support from the UC Davis Plant Sciences based support staff for the conduct of this work. Supplemental funding from the walnut industry is needed to augment this support of farm advisor and specialist research which includes a myriad of relatively small, often exploratory, but vital research projects that may vary from year to year according to local needs and interests. This project also includes a budget for annual uploading of the Walnut Research Reports into the online database.

**Objectives:**

The general objective of this proposal include specialist, staff research associate and general assistance to farm advisor research; covering some costs of tree propagation, tree hedging, plot harvest; data collection; and maintenance and repair of equipment used in harvesting, hulling, drying and other walnut related research activities for trials included in this project as well as other projects. Additional support is provided for staff research associate and specialist statewide travel in support of these activities. A brief description of projects planned for the coming season is provided under Plans and Procedures (See next page).

**Plans and Procedures:** The following is a listing of farm advisor/specialist research projects to be supported under this project in 2009-10.

<b>Farm Advisor/Specialist</b>	<b>Location</b>	<b>Project Description</b>
Caprile, Janet	Contra Costa	Field testing of CLRV-hypersensitive cultivars
Caprile, Janet	Contra Costa	Field testing of CLRV tolerant rootstocks
Coates, Bill	San Benito	Evaluation of walnut varieties in San Benito County- 2009
Coates, Bill	San Benito	Field testing of putatively CLRV-hypersensitive cultivars from the Paradox Diversity Study
Coates, Bill	San Benito	Walnut Husk Fly Biology and Varietal Susceptibility
Carolyn DeBuse, Bruce Lampinen and Sam Metcalf	Yolo/Solano	Walnut clonal rootstock trial
Carolyn DeBuse, John Edstrom, Janine Hasey, Bruce Lampinen and Stan Cutter	Nickels Soil Lab, Colusa	Walnut hedgerow training/pruning trial
Carolyn DeBuse, Bruce Lampinen and Sam Metcalf	Yolo/Solano	Kaolin particle clay film impacts on yield in walnut
David Doll, Greg Browne and Bruce Lampinen	Merced	Survey of diseases associated with the decline of walnut orchards in Merced County
Elkins, Rachel and Bruce Lampinen	Lake	Investigating potential role of soil/plant water management for Armillaria in walnut
Elkins, Rachel and Bruce Lampinen	Lake	Assessing irrigation related problems in hillside walnut orchards in Lake County
Elkins, Rachel and Bruce Lampinen	Lake	Using a pressure chamber to aid in irrigation scheduling for a drip irrigated hillside walnut orchard
Hasey, Janine, Joe Grant and Bruce Lampinen	Sutter/Yuba and San Joaquin	Growth and performance of own-rooted Chandler and Vina compared to Paradox rooted trees
Hasey, Janine and Bruce Lampinen Cooperator: Joe Conant	Sutter/Yuba	Comparison of different propagation methods of Chandler on Paradox rootstock and own-rooted trees.
Hasey, Janine, Bruce Lampinen and Samuel Metcalf	Sutter/Yuba	Field testing of putatively <i>Phytophthora</i> resistant rootstocks from the Paradox Diversity Study

<b>Farm Advisor/Specialist</b>	<b>Location</b>	<b>Project Description</b>
Hasey, Janine, Bruce Lampinen and Samuel Metcalf	Sutter/Yuba	Water management in a young Chandler orchard and a mature Howard orchard with soil variability associated growth problems
Hasey, Janine, Bruce Lampinen and Sam Metcalf	Sutter/Yuba	Survivability of mechanically planted trees (using GPS) versus hand planted trees
Kelley, Kathy, Bruce Lampinen and Sam Metcalf	Stanislaus	Evaluation of walnut rootstocks at Modesto Junior College
Lampinen, Bruce, John Edstrom, Sam Metcalf, Claudia Negrón and Stan Cutter	Colusa	Comparison of pruned and unpruned Howard walnut trees as impacted by crop load
Lampinen, Bruce, Sam Metcalf and Claudia Negrón	Solano	Field testing of putatively <i>Phytophthora</i> resistant rootstocks from the Paradox Diversity Study
Lampinen, Bruce, Joe Grant and Sam Metcalf	San Joaquin	Walnut production and quality as influenced by orchard and within tree canopy environment
Joe Connell, Bill Olson, and Gale McGranahan	Butte	Walnut rootstock trial
Judy Sams	UC Davis	Annual update of Walnut Research Reports to online database

#### New Projects

#### **Walnut production and quality as influenced by orchard and within tree canopy environment**

Bruce Lampinen, Joe Grant and Sam Metcalf

Walnut quality can vary within the tree canopy. The differences are likely related to both water relations and light distribution. Outer, exposed nuts can be susceptible to sunburn related damage. In addition to these more easily visible, outer canopy nuts, many walnut quality problems also occur in inner canopy, shaded positions. The authors have observed that these problems tend to be most severe in productive orchards with a high percentage of midday

canopy light interception. Examples of the problems that have been observed in these inner canopy shaded positions include shriveled kernels, oilless nuts, the black Chandler problem and more recently kernels with yellow pellicles. All of these problems can have significant impacts on walnut yield and/or quality. This project will continue a project funded for the last 2 years by the California Walnut Board. In 2009, conditions that created the various quality problems observed in the inner canopy shaded positions will be created artificially by removing leaves at various times during the season.

### **Survivability and growth of GPS guided, mechanical planted trees versus hand planted trees**

Janine Hasey, Bruce Lampinen and Sam Metcalf

A comparison will be made between survivability and growth of trees planted mechanically using a GPS guided tractor mounted mechanical planter versus trees planted by hand. Tree growth will be followed using trunk circumference measurements as well as canopy light interception.

### **Cultural practices to mitigate the effects of Armillaria infection in walnut**

Rachel Elkins, Kendra Baumgartner and Bruce Lampinen

DESCRIPTION: Crown and root rot caused by the fungus *Armillaria mellea* is a persistent problem in walnut orchards throughout the state, especially those planted in sites (formerly) habited by oak trees. There is no known chemical cure for existing infections, and pre-plant fumigation has become difficult and very expensive due to increasing regulation. Previous work in pears, and now in peaches (another species), has suggested that decline can be slowed or suspended by exposing upper roots and crowns to air, thereby "drying up" the fungus. Vigor ratings improved for pear trees excavated after shoot growth slowed but before dieback began. In South Carolina, young trees are being planted in fabric pots on raised mounds, thereby avoiding direct root and crown exposure to rhizomorph-laden soil. Another tactic is preventative ("prophylactic") applications of propiconazole and the biological antagonist *Trichoderma* sp. to prevent initial infection.

This project will use GIS to map existing infection and utilize the above tactics, as well as using the pressure bomb and emitter placement to irrigate properly in order to avoid over-irrigating near the crown of the trees.

### **Koalin particle clay film impacts on yield in walnuts**

Carolyn DeBuse, Bruce Lampinen and Sam Metcalf

Studies of koalin particle clay sprayed as a foliar cover on walnuts show that it can reduce leaf temperature and nut temperature while preventing sunburn. In a study for using kaolin to reduce husk fly damage, the results showed that nut quality and size were improved with a kaolin application. This nut quality improvement was not due to the reduction of husk fly damage but may have been due to the reduction of temperature of the nuts and leaves. In our study, we would test the theory that kaolin reduces the temperature of the leaves increasing the length of time that photosynthesis can occur on hot days. This increase in photosynthesis may improve yield and quality of the walnut. The treatments of the experiment would be sprayed and unsprayed. We would collect temperature of the orchard, leaf surface temperature, nut surface temperature, yield and quality.

### **Walnut hedgerow training and pruning trial**

Carolyn DeBuse, John Edstrom, Janine Hasey, Bruce Lampinen and Stan Cutter

Hedgerow walnut orchards have been studied since the 1970s as a high density system to reduce pruning costs and to benefit early production. At the present, the common pruning methods are similar to the methods used to establish regularly spaced orchards with some differences to height of first scaffold and amount of wood removed in the early years. This trial will look at ways to improve on this pruning method to gain a better structured tree for the life of the orchard, improve the amount of fruit wood, decrease wind damage and reduce the need for early hedging of the orchard. Using the Nickel's 2008 planted orchard of Chandler, Forde, Gillet, and Tulare, the trial would contain 3 pruning treatments in replicated randomized design: 1) traditional training, with the 1yr tree headed at around 5-6 feet and the scaffolds and central leader being selected in the 2<sup>nd</sup> and 3<sup>rd</sup> year and headed; 2) minimal heading training, with the 1yr tree topped at around 5-6 feet and the scaffolds and central leader are selected in the 2<sup>nd</sup> and 3<sup>rd</sup> year but no heading cuts of the scaffolds are done past the first year; and 3) no heading training, no heading of

the 1yr. tree with scaffolds and central leader selected in the 2<sup>nd</sup> and 3<sup>rd</sup> year but no heading is done at any time in the training years. Data would be collected on tree growth, time of first bearing, and yield.

### **Walnut clonal rootstock trial**

Carolyn DeBuse, Bruce Lampinen and Sam Metcalf

Walnut clonal rootstocks development has been moving forward. The selection of superior clonal rootstock varieties has been a collaborative effort between the UC Walnut Improvement Program, UC plant pathology, county farm advisor trials, and the walnut nursery industry. At this time, three promising rootstocks, Vlatch, RX1, and VX211 have been identified. This trial will test these rootstocks against the industry standard Paradox seedling. A fourth older selection, Burbank, will be included in the trial to evaluate its value. The trial will be placed into a newly planted Solano County commercial orchard. Tree vigor, tree yield, and natural disease susceptibility will be evaluated.

### **Survey of diseases associated with the decline of walnut orchards in Merced County.**

David Doll, Greg Browne, and Bruce Lampinen.

Merced County contains over 100 different soil series, possessing known infested areas of Phytophthora root and crown rot, Armillaria Root Rot, Black Line, Nematodes (Root-knot, Ring, and Lesion), and Crown Gall. The intent of this survey is not to determine pathogenicity of the isolates sampled, but to determine if disease pressures have changed due to walnuts being planted on replanted ground, ground previously farmed with agronomic crops, or soils that were previously planted to other perennial crops. Furthermore, surveying a historical walnut producing county may find emerging diseases within walnut orchards. Through conversations with pest control advisors, walnut field representatives, and growers, as well as aerial photographs, declining blocks of walnuts will be located and surveyed. Orchards will be rated by overall orchard block health and analyzed for the following attributes: soil type, irrigation practices, occurrence of diseases, and grower practices. Samples to identify suspected pathogens will be collected from soil and visually diseased trees. It is our hope that the results from the survey will aid in targeting research efforts within the county and provide state-wide assistance with the development of disease resistant Paradox rootstocks.

**Budget Request**

Budget Year 2009- 10

Funding Source California Walnut Board

Salaries and Benefits

Postdocs/RA's

SRA's

SRA II (37.5% time)

\$19,712

Lab/Field Assistance

\$1,500

Fruit and Nut Center

\$1,250

Subtotal

Sub 2

\$22,462

Employee benefits- SRA II

Sub 6

\$5,717

Employee benefits- Fruit and Nut Center staff

\$250

Supplies and Expenses

Sub 3

\$4000

Includes \$1000 for water purchases at Nickels Soil Lab

Equipment

Sub 4

0

Operating Expenses and Equipment Travel

Sub 5

Travel

Sub 7

\$9,000

Total

\$41,429

Department account number \_\_\_\_\_

\_\_\_\_\_ Date \_\_\_\_\_

Originator's Signature

COOPERATIVE EXTENSION County Director \_\_\_\_\_ Date \_\_\_\_\_

Program Director \_\_\_\_\_ Date \_\_\_\_\_

AGRICULTURAL EXPERIMENT STATION Department Chair \_\_\_\_\_ Date \_\_\_\_\_

LIAISON OFFICER \_\_\_\_\_ Date \_\_\_\_\_

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