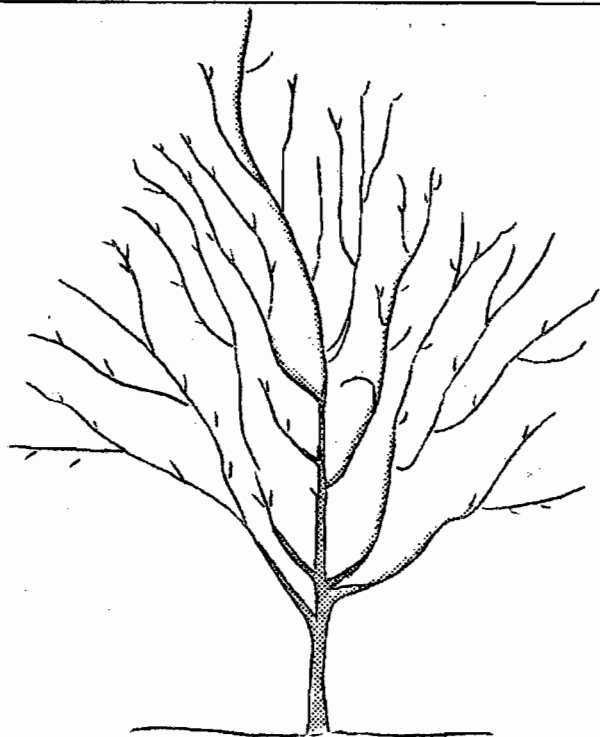


WALNUTS IN
TEHAMA COUNTY



UNIVERSITY OF CALIFORNIA
AGRICULTURAL EXTENSION SERVICE
TEHAMA COUNTY

UC Cooperative Extension

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WALNUTS IN TEHAMA COUNTY

The first commercial planting of English walnuts was started in California as early as 1854. In slightly more than a century, California's total walnut acreage has mushroomed to nearly 160,000 acres producing about 95 percent of the total U.S. walnut supply.

Tehama County is the twelfth largest walnut growing county in the state with a total of 4,157 acres consisting of 2,328 bearing and 1,829 nonbearing.*

CLIMATE

The chief climatic limitations of walnuts in Tehama County are spring frost, fall frosts, extreme summer heat and late spring rain.

Spring Frost: Historically cold locations should be avoided. A temperature of 29° - 30° for a period of one hour is enough to cause the death of flowers or young fruits. For this reason the most popular walnut varieties grown in the county are those which blossom late when frost danger is past.

Fall Frost: Fall frosts may cause dieback, especially on young trees. Growers can sometimes avoid fall frost damage on young trees by not irrigating during the period August 15 to November 15. If enough rain has fallen before November 15 to sufficiently wet the soil to a depth of four feet, no fall irrigation is necessary. (See pruning frost damaged trees.)

Heat: Temperatures of 100°-F. and above accompanied by low humidity will usually cause exposed nuts to burn. Most severe burning occurs on the south and west sides or tops of trees. Those trees growing on very sandy soil, near a roadway or some object which reflects the sun's rays are more subject to burning. Early hot spells (June) usually cause burned nuts to become blanks. Heat damage occurring in July and August will cause a high percent of the kernels to be shriveled. Heat damage near harvest time will cause kernels of affected nuts to be dark brown or black.

Late Spring Rains: Tehama County frequently has several late spring showers. While this is usually a blessing for range grasses and cover-crops it is detrimental to walnuts. Rains aid the spread of bacterial blight, an organism which attacks and may kill developing nuts. Walnut blight is controlled by the application of bactericides at a cost of \$25 to \$40 per acres per year.

While these climatic factors can be detrimental, they aren't in most years limiting to the production of walnuts in Tehama County.

SOIL:

Walnuts are most productive when grown on deep, well-drained silt loam. Very sandy soils produce slow growing trees which are moderately productive. Nutritional deficiencies are often magnified in trees grown in sandy soil. Trees grown on heavy clay soils grow slowly and produce small crops, and are more difficult to irrigate. Soils of Tehama County capable of producing good trees lie along either side of

the Sacramento River and its tributaries. Of the soil series found in Tehama County, Columbia, Los Robles, Vina and Yolo are examples of common soil types which are the best for walnuts.

IRRIGATION

While walnuts will grow and produce crops when dry farmed where annual average rainfall is 20 inches or more, irrigation is necessary under today's competition for quality and production. Mature walnuts may be expected to use 3½ - 4 acre feet of water per acre per year. In most years winter rains might be expected to supply one-third of this requirement. The remaining requirement must be satisfied by adequate irrigation through the summer. Walnut sizes can frequently be increased by maintaining an adequate supply of water between the period of bloom and tip hardening. English walnut shells harden from the tip or blossom end to the stem end. This process takes place from April through May, depending on the variety.

ROOTSTOCKS

Northern California black walnut, Southern California black walnut, Paradox hybrid, Royal and Persian have all been used as rootstocks through California walnut growing history. The most popular stocks now used are Northern California black and Paradox hybrid. The Northern California black root has considerable resistance to oak root fungus but is susceptible to root lesion nematode, crown rot and crown gall. Paradox hybrid root has special use in wet spots and slow growing areas due to its resistance to crown rot and its vigor. It grows more normally under attack by lesion nematode than black walnut. It is highly susceptible to crown gall.

In areas where nematodes are a problem the Chinese Wingnut is being tried. Its union with most English varieties except Eureka has not been satisfactory to date. Eureka usually grows well on Wingnut roots. Chinese Wingnut is highly susceptible to oak root fungus.

VARIETIES - Franquette, Conway-Mayette, Hartley, Eureka, Payne, Concord and several other varieties including some which to date are still experimental are grown in Tehama County. Of these, Franquette, Conway-Mayette, and Hartley are the most popular.

Franquette was imported from France in the 1870's by Felix Gillet of Nevada City. Its popularity in Northern California can be attributed to: 1) its late leafing, and 2) late bloom which makes it less susceptible to frost injury and walnut blight attack. The variety is very vigorous and shades its nuts well, thus preventing much sunburn. Franquette comes into production late. The nuts are borne entirely on shoots growing from terminal and sub-terminal buds, an undesirable characteristic. The tree is usually very large when mature which makes it more difficult to spray, prune and shake for harvest. The nuts tend to be small when trees are mature and whenever good crops are borne, but kernel quality is high.

Conway-Mayette is native to Tehama County, being first found by Earl Lindauer, Sr., in about 1930 on the Conway Ranch. Like Franquette, it blooms quite late and thus has the same frost and blight resistance advantages. The trees grow quite large but have more of a spreading growth habit than Franquette. The poor seal of Mayette nuts makes them subject to breakage when handled mechanically.

Hartley originated in 1892 from walnuts originally imported from France. It was sold with a group of seeds by Felix Gillet of Grass Valley to Mr. Hunter of Napa who planted and grew the first tree. The ranch with the selection was subsequently sold to John Hartley. Its increasing popularity is due to its partial lateral bearing habit, moderately early production and moderate tree size. The nut is large, fairly well sealed and of good quality. It blooms earlier than Franquette or Mayette and is usually more susceptible to frost and blight damage.

Experimental varieties produced by a University of California breeding program under the direction of E. F. Serr have been grown in test plots in Tehama County for several years. Most of the new University of California varieties are the results of attempts to combine the late blooming advantages of Mayette and Franquette and the fruitfulness of a variety such as Payne. Other characteristics looked for are high percent kernel, kernel quality, shell quality, nut size and tree growth characteristics. None of these are yet recommended for permanent planting in Tehama County but several might be used as fillers in multiple plantings with standard varieties.

TREE SPACING

In most of the existing mature plantings of Franquette and Mayette the trees are spaced from 50 to 60 feet apart. Many of these spaced at 50 feet on deep fertile soils will crowd before the trees reach 20 years of age. To prevent tying up large amounts of valuable land for long periods with a permanent planting of 60 feet, it is presently being recommended that new orchards be quadruple planted

with trees 25 to 30 feet apart. The interplant most desirable would be one which produces heavily early in life thus moving ahead the date when the orchard is self-sustaining. When crowding results, one-half of the trees can be reduced in spread and finally removed after three to four years to allow growing room for the more permanent trees. When trees crowd again one-half of the remaining trees can be removed in a similar manner. There is a three variety planting plan which allows the most possible freedom in making the final variety choice and also makes for early commercial production. Walnuts are favored over interplants of almonds, peaches, or prunes because of conflicting orchard operations, especially irrigation and spray program conflicts.

COMING INTO PRODUCTION

Walnut varieties having a lateral bearing habit (Payne and similar types) may be expected to produce nuts very early in life. Early production usually reduces vigor. Unless the ends of the main framework branches are pruned (headed back) these varieties may make unsatisfactory growth, the result being that maximum productivity is never attained.

Payne and similar lateral bearing varieties may be expected to be self-sustaining at about six to eight years depending on suitability of soil and other environmental factors, planting distances, and management.

Franquette and Mayette which bear primarily on terminals produce no nuts for several years after planting. The trees are vigorous and become good sized before production begins. These varieties should bear self-sustaining crops at 10 to 12 years.

INTERCROPS

Intercrops which have proven most successful in Tehama County are beans and milo. Crowding the trees by row cropping close to them is not recommended. Six feet should be left between the tree and cropped area to prevent competition and allow the operator room to manage irrigation, fertilization and cultivation of the orchard. The advisability of an intercrop would depend on available equipment, yield and price data, tree spacing and grower ability.

COVERCROPS

Covercrops can consist primarily of native weed growth. Since little or no increase in nitrogen or organic matter can be maintained under normal California orchard conditions, the principal function of a cover crop is to loosen the soil by root action. This reduces compaction and increases water penetration. It is becoming a common practice to allow native weed growth all spring and summer. The weeds are chopped periodically to reduce competition. This sod further reduces compaction and improves water penetration. It must be remembered that weeds use nitrogen and water as do the trees so that increased supplies of these must be added to offset this competition.

YIELDS

The state average yield is less than 1,500 pounds per acre per year of hulled, dried nuts. Growers should strive to exceed 2,000 pounds per acre in the future in order to cope with increased costs of production. This can be done by careful management

and more intense land use. Some California growers produce 1 1/2 to 2 tons per acre.

TREE LIFE EXPECTANCY

The oldest walnut orchards in California are approaching 100 years old. There are several productive orchards 50 or more years old. To date we have no data on the expected productive life of a walnut tree where it has been properly cared for.

PESTS AND DISEASES

Insect Pests: Walnut aphid, scale insects, spider mites and red-humped caterpillar are common pests of walnuts in Tehama County. Walnut aphid is the single most destructive walnut insect pest. Hot weather (110°) and aphid predators frequently keep populations from building up and making chemical control necessary. While scale insects are highly parasitized and seldom require chemical control, they should be watched closely. Spider mites build up very rapidly. When present they usually require chemical control. Red-humped caterpillars are usually found in great numbers on one or two leaves of a tree. Where they can be reached on young trees, picking the leaf and squashing the caterpillars is often the best and most economical control.

Disease: Diseases which commonly cause trouble here are walnut blight, crown rot, crown gall, bark canker and branch wilt.

Blight: Walnut blight causes heavy crop losses in years when there are frequent late spring rains. Copper sprays properly timed and applied will reduce blight losses but not eliminate them.

Crown Rot: Crown rot is a fungus disease which kills the bark around the tree trunk, usually 4 to 18 inches below the ground level. It can be avoided to a degree by maintaining a relatively dry soil about the crown. Where the disease has already begun, growers can usually save the tree by permanently removing the soil to a depth of 12 to 18 inches in a circle around the trunk. Inarching may be employed and works well on small trees but is not a common practice here.

Crown Gall: Works slowly and can usually be controlled by surgery and elgetol treatment. Young trees should be examined carefully to a depth of 18 inches when they are about three years old and galls removed. In some lots of Paradox seedlings this is especially important.

Bark Canker: Occurs in some orchards. The young cankers will dry up if the diseased bark is shaved off to clean tissue with a carpenter's draw knife.

Branch Wilt: Causes extensive losses of limbs when left untreated. This fungus disease enters a wound area usually caused by sunburn. After entrance, the disease moves down the limb toward larger scaffolds. After the disease is present, cutting out is the only treatment. Trees which are well fertilized, have adequate water, with control of red spider and red-humped caterpillar seldom contract branch wilt.

FERTILIZATION

Nitrogen is the nutrient most commonly deficient. Annual applications of 100 to 150 pounds of nitrogen per acre are frequently advisable for maintenance in mature orchards. The adequacy of nitrogen treatment

can be measured in terms of shoot growth. Six to eight inches is adequate for mature trees.

Zinc deficiency may occur at old corral sites, Indian mounds and in some naturally zinc deficient soils such as Columbia fine sandy loam or other sandy soils and soils of volcanic origin. At present the corrective treatment is to drive zinc coated strips or nails into limbs ten inches in diameter or smaller.

Other deficiencies which reduce vigor or yield may occur under certain conditions and growers should watch for them.

CULTIVATION

Cultivation is carried on for four reasons (1) to eliminate weed competition for water and nutrients, (2) to eliminate noxious weeds, (3) to obtain loose soil for irrigation operations (furfrowing or checking), (4) to prepare the ground surface for harvest. Excessive cultivation or cultivation when the soil is too wet can create severe compaction. Water and roots penetrate compacted soil slowly if at all. This condition can severely affect tree productivity.

PRUNING

Pruning and training should be started at the time the tree is planted and under normal conditions should be carried out yearly for the life of the orchard. Proper training in the formative years will make severe pruning in late years unnecessary and can reduce the amount of breakage to a great extent. It will make shaking effective and economical.

It is advisable to delay pruning of young trees until spring, at which time the extent of frost injury can be determined, if there is any possibility of their having been injured by fall frosts. When limbs of young trees are frozen in fall or in spring, they should not be removed until mid-summer or fall after the damage occurred. Often apparently frozen limbs recover. Little if any training is advisable the first year after freezing. This will help prevent lush growth response which is again easily frozen.

Pruning of mature trees should be severe enough to permit sunlight infiltration to the lowest limbs. Fruit wood on lower inside limbs will soon die if totally shaded. This condition is common in older orchards in the county.

HARVESTING AND PROCESSING FOR THE BUYER

Harvest begins when the nuts are mature and will hull. Kernels are normally mature when the packing tissue (between kernel and shell) has turned brown, but harvest is not usually started until 95-98% of the nuts are hullable without special treatment. Before the buyer will take possession, the nuts must be hulled, culled and dried.

If harvest is prompt, many nuts will be shaken from the trees with hulls still attached. The hulling process will remove most hulls but some will stick tight and have to be handled separately. They can be water treated in sacks or bins. Continuous sprinkling with cool water is preferable to maintain good color. Treatment with ethylene gas is another method used in removing tight hulls.

The standards, to which a grower's nuts must be culled, should be laid out by the buyer. The buyer may be able to cull more cheaply than the grower, reflecting a saving to the grower. The drying process is important in that it (1) arrests molding and darkening, (2) gives the product a stable weight, (3) permits effective bleaching. Nuts may be considered dry when the septum snaps when bent. As the kernels become dry they lose their rubbery texture.

WALNUT LOGS AND BURLS

The value of walnut logs and burls should be taken into consideration when planting a new orchard or removing an old one. These valuable walnut by-products are used in the manufacture of expensive furniture, gunstocks and paneling. There is no proven method of stimulating the formation of burls. (A burl is an enlarged area around the crown above and below ground having wood with a very curly grain.) One can, however, topwork black walnuts and rootstocks at four to six feet above the ground in anticipation of their future log value regardless of whether or not a burl forms.

Growers who sell their walnut trees for logs and burls should contact several buyers and arrive at a price on a competitive bid basis. The disposal of debris, filling of holes, etc. should be agreed on before work starts.

Walnut log and burl buyers:

1. Floyd Barrows
223 W. Seventh Avenue
Chico, California
2. Ed. B. Bears
1355 E. Lindo Avenue
Chico, California
3. Oakley and Merkley
P. O. Box 2446
Sacramento, California
4. Timberline, Inc.
525 Terminal Sales Building
Portland 5, Oregon
5. C. T. Garrett
601 E. Washington Street
Petaluma, California

LIST OF MAJOR NUT BUYERS.

- Diamond Walnut Growers, Inc., Stockton
- Continental Nut Company, Chico
- T. M. Duche and Sons, Orland
- Mayfair Packing Company, San Jose

A GUIDE TO WALNUT PRODUCTION COSTS

The following is a guide designed to give

Assume:

1955
 100 bushels
 100 acres

Cultural Operation	Man Hours Per Acre	Labor	Cash Equipment
Prune	24.00	\$36.00	
Brush Disposal	2.0	3.00	\$2.00
Fertilize	0.37	.45	.30
Chop cover crop	0.37	.45	.30
Spray 3 times	2.10	3.15	7.35
Disc 2 times	1.00	1.50	1.00
Irrigate 3 times	9.0	13.50	1.50
Spray	7.7	11.05	2.45
Taxes, Ins. & Misc.			
Total cultural and miscellaneous costs	39.4	59.10	14.90

HARVEST:

Disc 2 times	1.00	1.50	1.00
Land plane	.6	.90	1.00
Roll	.7	1.05	.65
Shake	3.0	4.50	8.00
Sweep	1.0	1.50	1.00
Pickup	1.0	1.50	4.50
Clean	1.0	1.50	
Haul to huller	.3	.45	.50
Hull and dry (contract rate)			
Haul to market			
	8.6	12.90	16.65

Per Acre Cash Costs-----

IN TEHAMA COUNTY -- 1961

an idea of expected costs per acre

1. 50 acres
2. Labor \$1.50 per hour

and Labor Costs

Materials		Cost Per Acre
		\$36.00
100# N -	\$ 12.50	5.00
3 x copper A	20.25)	13.25
1 x B.H.C.	2.00)	.75
		32.75
2.5 acre ft. water	10.00	2.50
Miticide	8.00	25.00
	30.00	11.50
		30.00
	82.75	156.75
		2.50
		1.90
		1.70
		12.50
		2.50
		6.00
		1.50
		.95
	30.00	30.00
Contract	5.00	5.00
	35.00	64.55
		\$221.30

CAPITAL

Investment	Cost
Land, 50 acres	\$50,000
Trees, 48 per acre	75,000
Irrigation	6,000
Buildings	8,750
Shop and Misc. Equipment	3,000
2-wheel tractors	8,000
Pickup truck	2,000
Pickup machine	3,800
Sweeper	1,500
Sprayer	6,000
Shaker	2,500
Chopper	450
Disc, 12'	1,500
Cultipacker, 12'	400
Roller	250
	\$169,150

Per Acre Fixed Costs-----
 Per Acre Cash Costs-----
 Total Annual Per Acre Costs-----
 @2000# - 22.6¢

INVESTMENT

Per Acre	Annual Cost Per Acre	
	Interest	Depreciation
\$1,000	\$60.00	None
1,500	45.00	40 yrs. \$37.50
120	3.60	40 yrs. 3.00
175	5.25	40 yrs. 4.35
60	1.80	20 yrs. 3.00
160	4.80	10 yrs. 16.00
40	1.20	10 yrs. 4.00
76	2.30	10 yrs. 7.60
30	.90	10 yrs. 3.00
120	3.60	10 yrs. 12.00
50	1.50	10 yrs. 5.00
9	.25	10 yrs. .90
30	.90	15 yrs. 2.00
18	.25	20 yrs. .40
5	.15	20 yrs. .25
\$3,383	\$131.50	\$99.00 \$230.50

 \$230.50

 221.30

 \$451.80

ACKNOWLEDGMENTS

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E. F. Serr, Pomologist in the Experiment Station, and A. D. Reed, Extension Economist,			
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In order that the information in our publications may be more intelligible it is sometimes necessary to use trade names of products or equipment rather than complicated descriptive or chemical identifications. In so doing it is unavoidable in some cases that similar products which are on the market under other trade names may not be cited. No endorsement of named products is intended nor is criticism implied of similar products which are not mentioned.

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