

The California Walnut Industry

History, the Land Grant System and
Production Research

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Acknowledgements

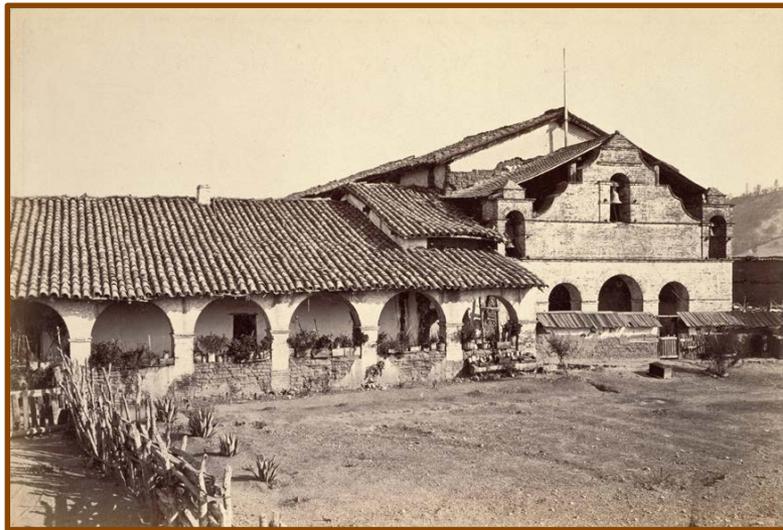
Farm Advisors: **Bob Beede (Emeritus, Kings Co.)**
 Janine Hasey (Sutter-Yuba Co.)
 Rick Buckner (Emeritus, Tehama Co.)

Diamond Walnut Growers, Inc.:

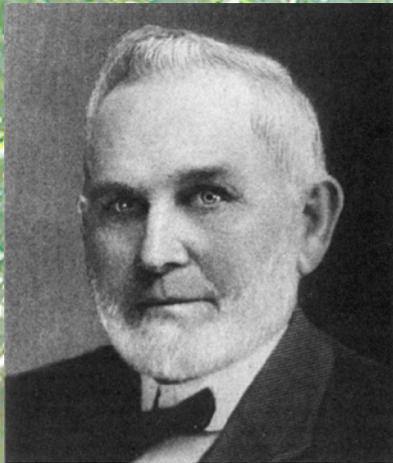
**Eighty Years of Excellence, A History of
Diamond Walnut Growers (1912-1992)
by Ann Foley Scheuring**

Earliest Introduction of English Walnuts

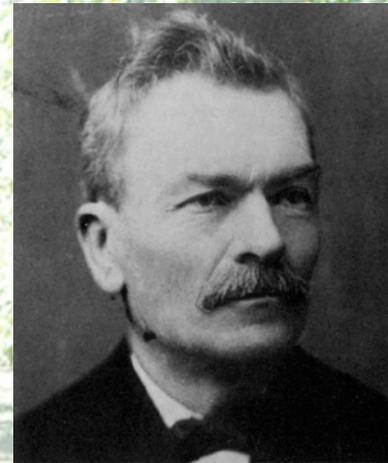
Historical accounts of English (*J.regia*) walnuts in California mention the hard-shelled walnuts brought in from South America by the Mission Fathers in the 1770's.



Origin of the California Walnut Industry



Joseph Sexton
Goleta, CA (1842-1917)
Originator of the Santa Barbara soft-shelled walnut in Southern CA



Felix Gillet
Nevada City, CA (1835-1908)
Introducer of the French varieties into Northern CA

Origin of the Southern CA Walnut Industry

In 1867, Joseph Sexton purchased a sack of walnuts (perhaps from Chile or China) at the dock in San Francisco and planted a thousand trees at his ranch in Goleta, California.

The selections from these trees gave rise to the so-called Santa Barbara soft-shells, such as Placentia



Origin of the Northern CA Walnut Industry

In 1871, Felix Gillet, a nurseryman in Nevada City, California, began importing scion wood and nursery stock from France. He is credited with introducing the French cultivars Franquette, Mayette, and others to California.



Early California Varieties

As a result of the introductions by Sexton and Gillet, California walnut growers found superior open-pollinated seedlings that led to the cultivars Eureka, Placentia, Concord, Payne, Hartley and others.

Legacy of the Payne Walnut



George C. Payne
Campbell, CA (1873-1945)

***Selected the Payne
Walnut in 1898***

UC Davis Walnut Breeding Program 1948-1978

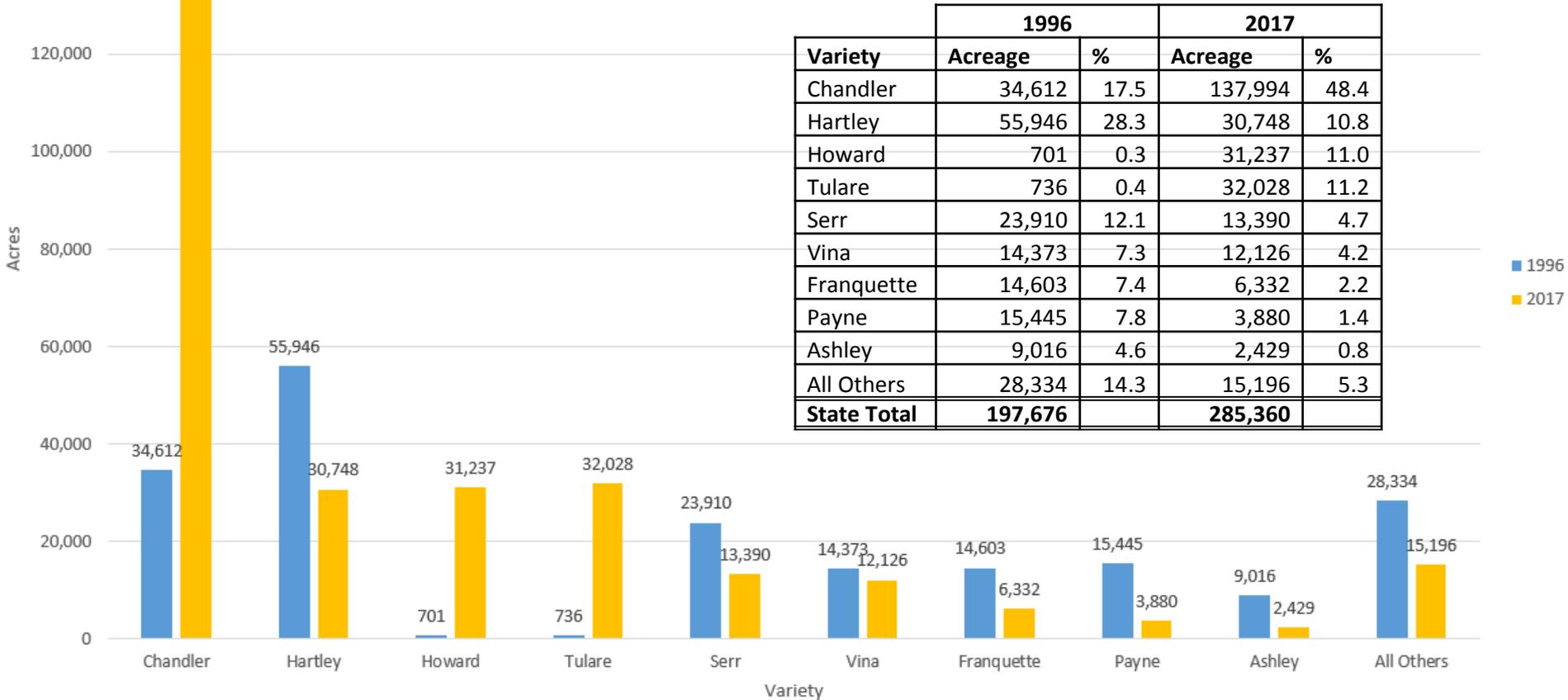


Eugene F. Serr



Harold I. Forde

Total Walnut Acreage in California by Variety 1996 vs. 2017



Development of the California Walnut Industry

1870's & 1880's – **Successive plantings of Sexton's Santa Barbara soft-shelled seedling trees**

1892 – **6,520 bearing acres, mostly in Los Angeles, Orange, Ventura & Santa Barbara counties (Placentia favored variety)**

1895-1905 – **Controversy over grafting vs. seedling selection**

1914 – **34,138 bearing acres, 95% in Southern CA**

1915 – **Seedling trees no longer planted. Northern CA Black Walnut (*J. Hindsii*) preferred rootstock**

Development of the California Walnut Industry (cont.)

1920 – 72,800 walnut bearing acres, 95% still in Southern CA

1928 – 363 walnut dehydrators in operation (half of state crop dehydrated, almost all of it a few years later)

1933 – 113,900 bearing acres, 60% in Southern CA. Significant acreage in San Joaquin, Stanislaus, Tulare & central coast

1950 – 115,500 bearing acres, 30% in Southern CA

Decline in Southern CA Acreage

- **Increased land values**
- **Competition with citrus**
- **Northern orchards were superior in yield and quality**
- **Water quality problems**
- **Lack of chilling**
- **Post WW2 housing demands (urbanization)**

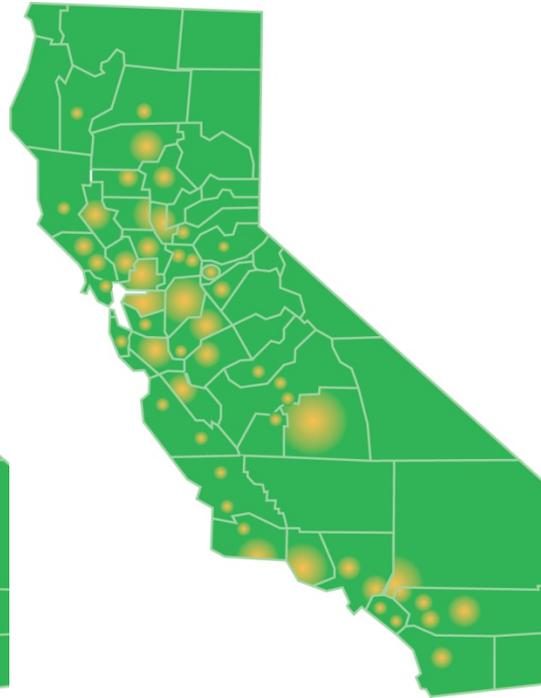
Walnut Acreage Distribution in California

1912 - 1992

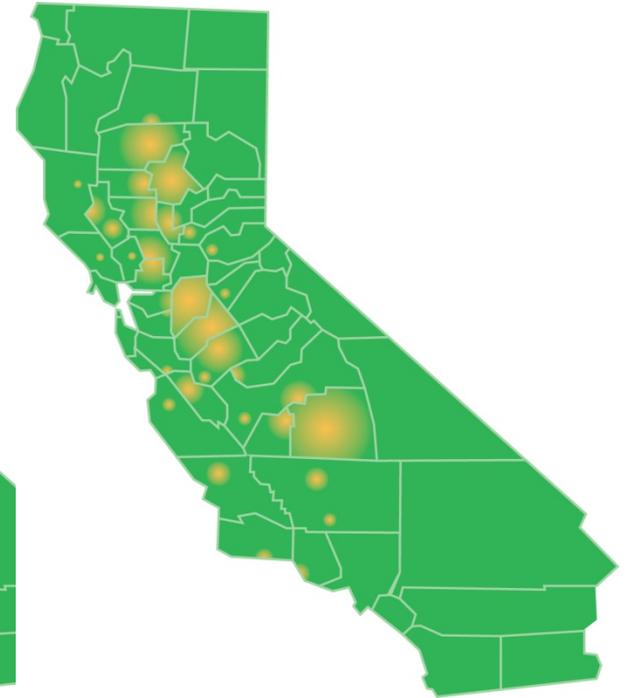
1912



1952

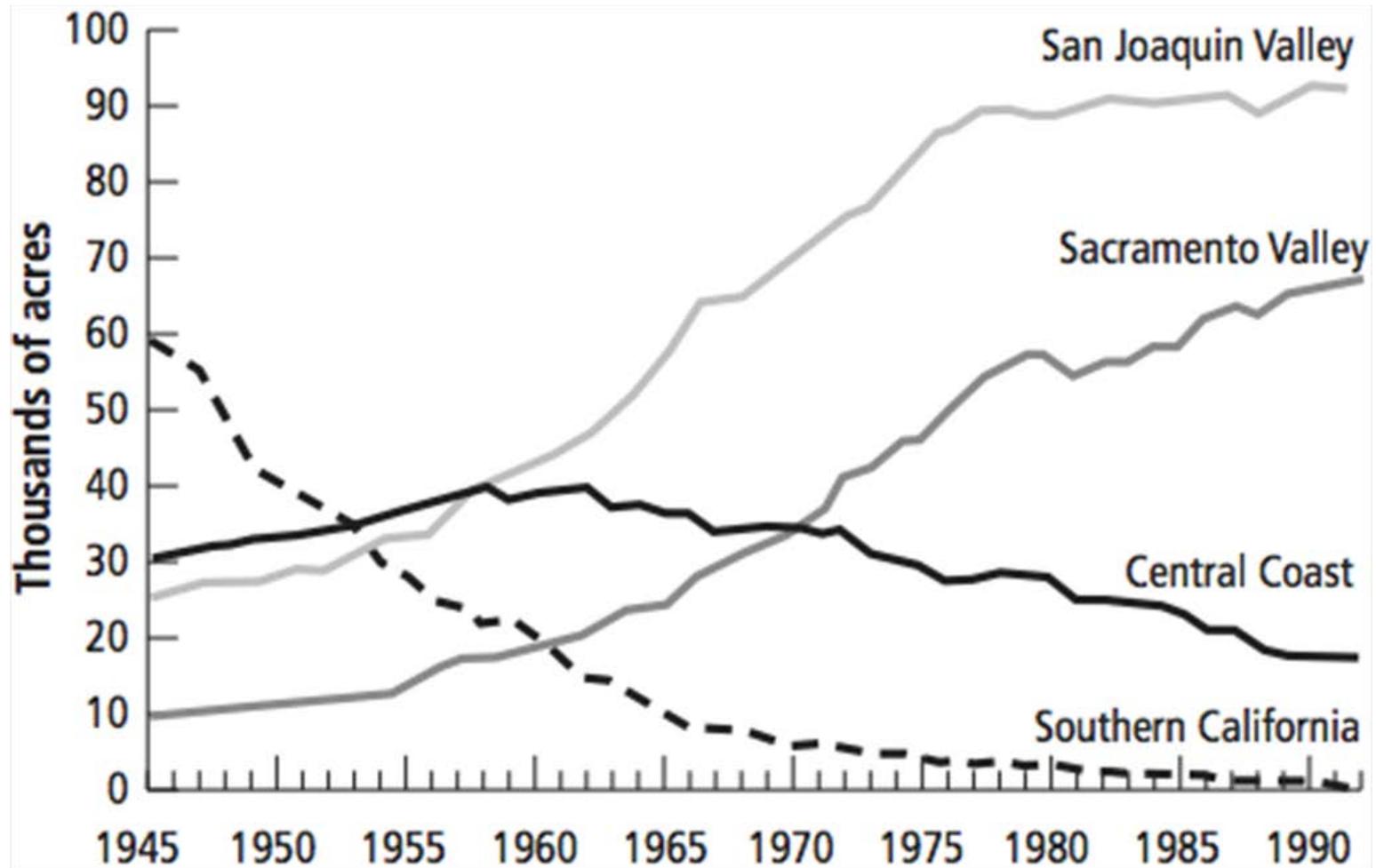


1992

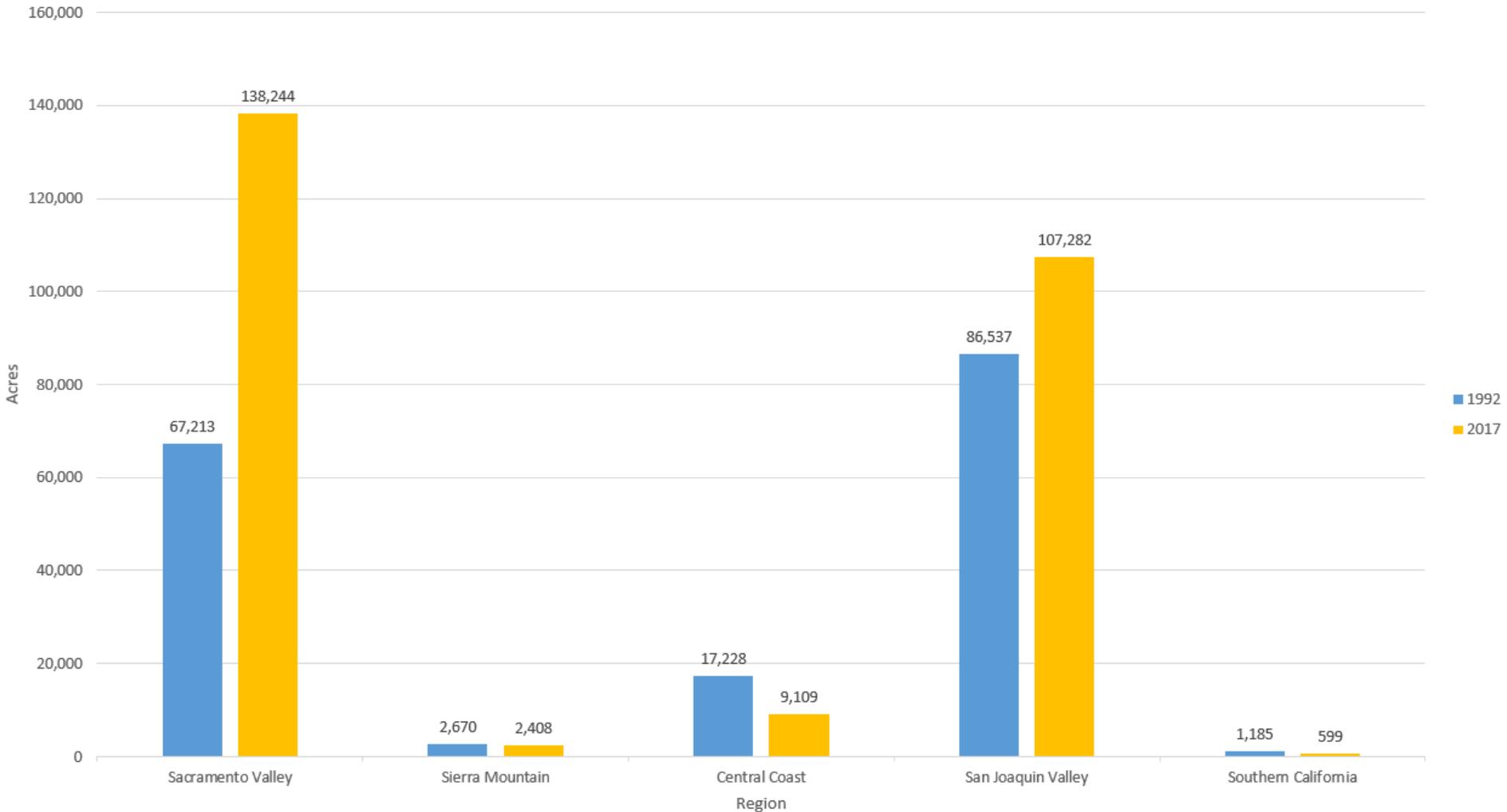


 Active Growing Regions

Statewide Trends in Bearing Walnut Acreage by Region from 1945 - 1992



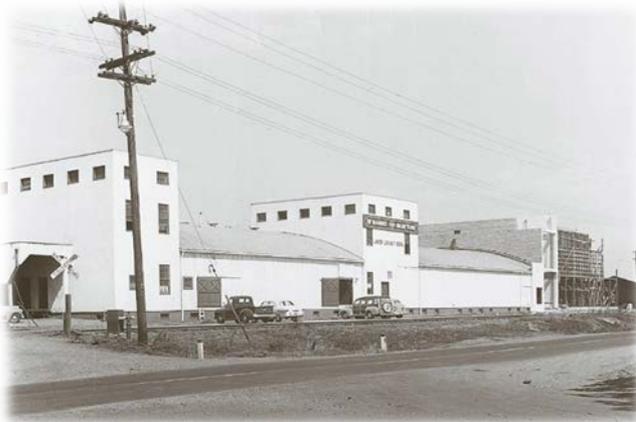
Bearing Walnut Acreage in CA by Region 1992 vs. 2017



The Start of Cooperatives

- **First local cooperative formed by 20 growers in Los Angeles Co. in 1887**
- **Southern California Walnut Growers Association (SCWGA) organized in 1896 - a central association with 9 locals**
- **SCWGA reorganizes as a new corporation called California Walnut Growers Association (CWGA) in 1912 with 18 locals & adopts the Diamond brand**
- **Seven new local associations join CWGA in 1920, including Santa Clara, Contra Costa, Linden**

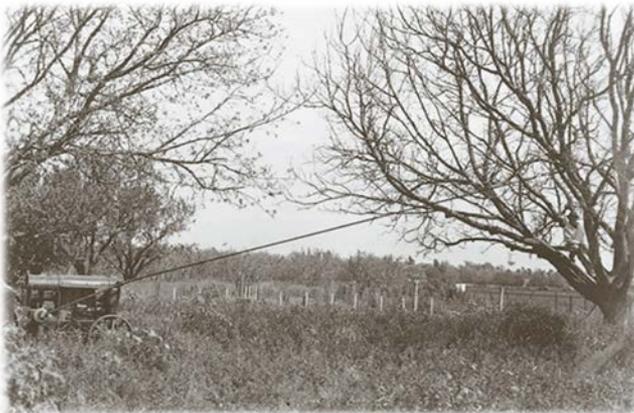
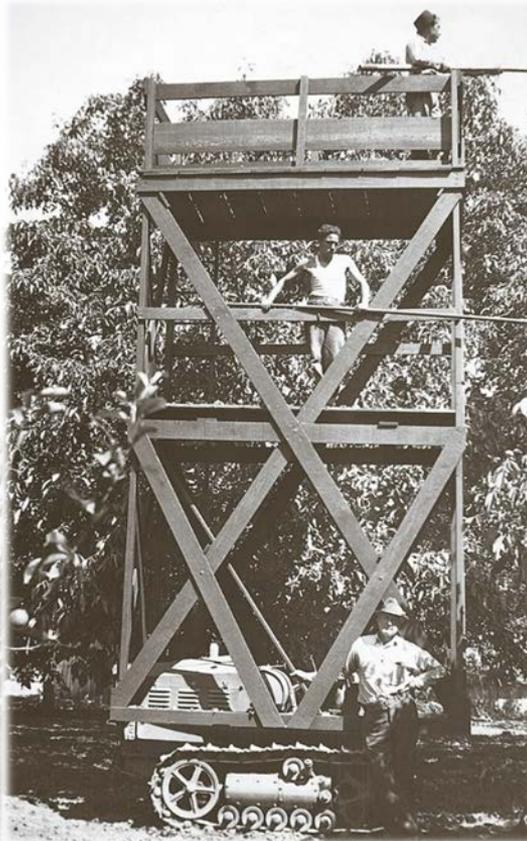
Three of the Local Walnut Growers Associations Affiliated with CWGA



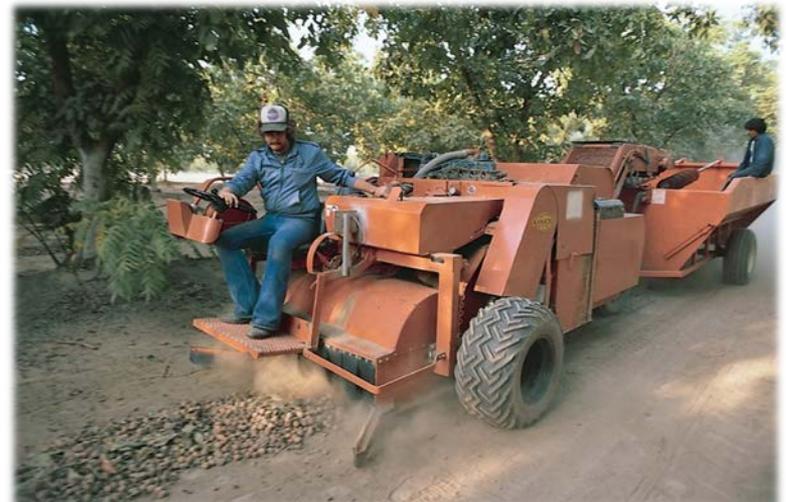
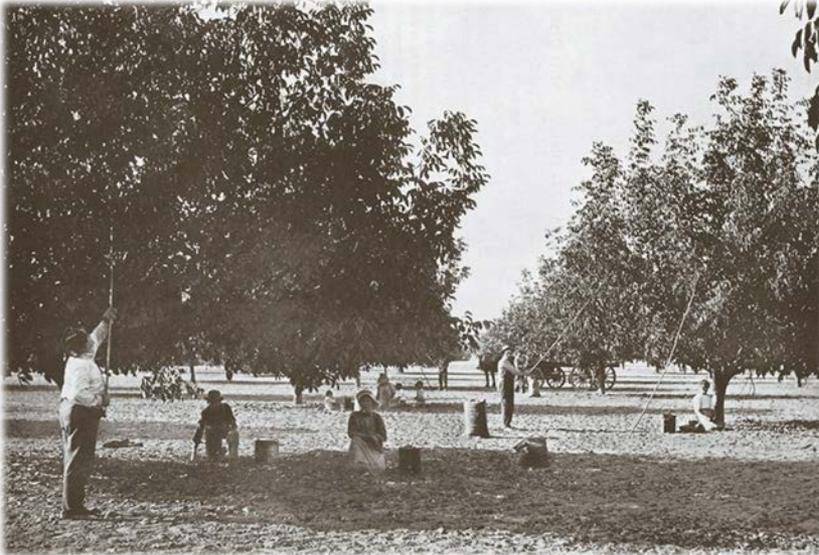
The Start of Cooperatives (cont.)

- **By 1932, CWGA membership includes 6,626 members in 27 locals accounting for 85% of State's walnut crop**
- **CWGA relocates its facilities to Stockton in 1956. Name changed to Diamond Walnut Growers, Inc.**
- **In 2005, Diamond Walnut Growers, Inc. changes from an agricultural cooperative to a stock-holder owned corporation, Diamond Foods, Inc.**
- **CWGA-UC/USDA partnership: research and technical developments in the field and in post harvest handling (1920's–1960's)**

Harvesting: from Hand-held poles to Mechanical Shakers



Hand Harvest to Mechanical Pick-up Machines



University of California: The Land Grant System

- **The Morrill Act (1862) founded UC (Berkeley) in 1868 as the land grant institution (College of Agriculture) in California**
- **The Hatch Act (1887) established annual federal funding for Agricultural Experiment Stations (AES) on land grant campuses**
- **The Smith-Lever Act (1914) provided funds for the Agricultural Extension Service/Cooperative Extension (CE) at the state land grant colleges**
- **The university farm is established in Davisville, CA & Riverside selected as site for the citrus experiment station (1906)**

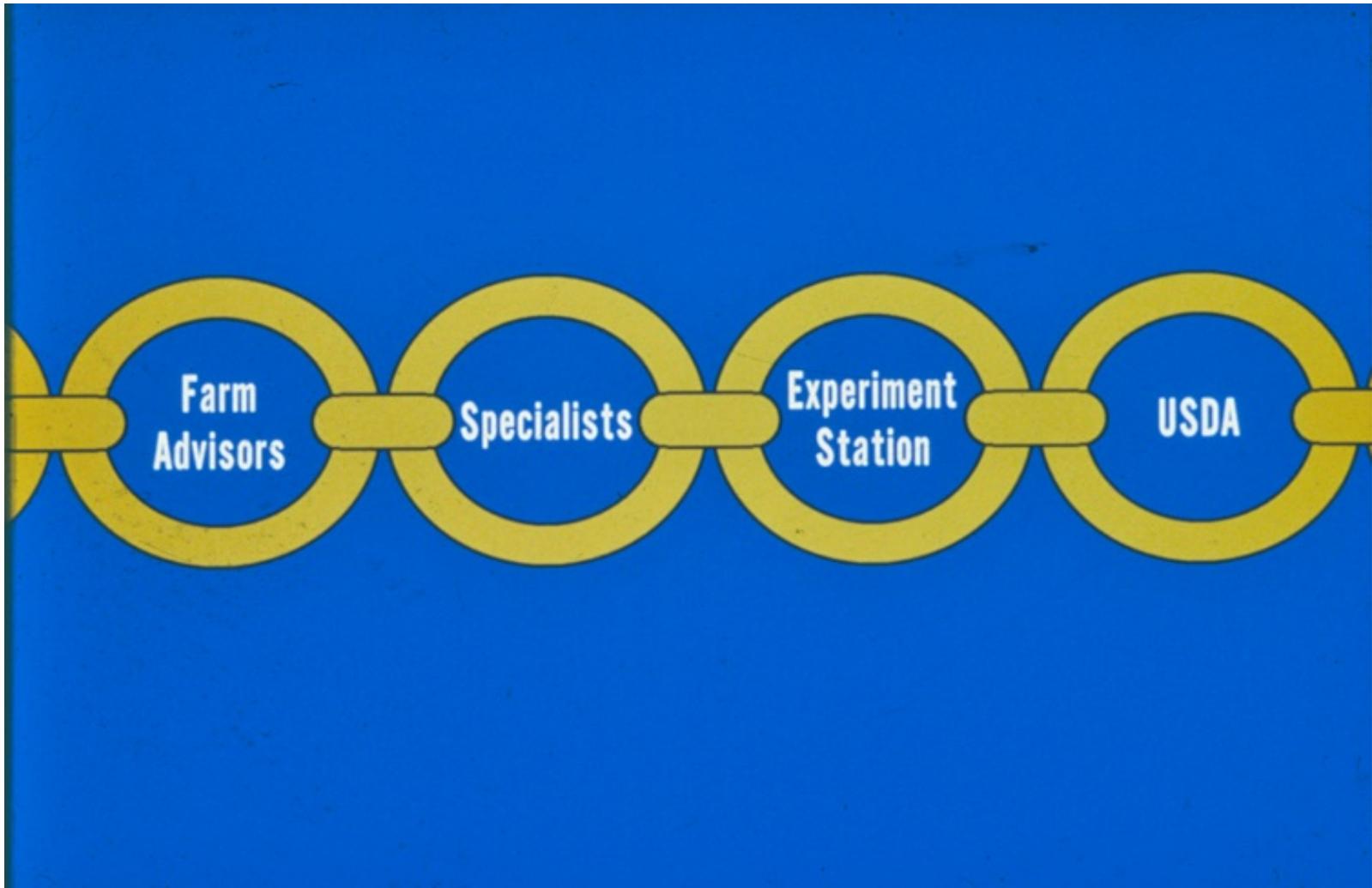
UC Campuses & the Agricultural Experiment Station



The UC's Land Grant Mission



The UC Walnut Research & Extension Program



PESTS AND DISEASES OF ENGLISH WALNUT IN CALIFORNIA

A CHRONOLOGY



1890-1920

- 1891 Walnut blight (*bacteriosis*) first observed in Los Angeles County. By 1903, half the crop affected. Causal organism isolated in 1896.
- 1892 Crown gall reported as important disease attacking a wide range of plant hosts including walnut.
- 1908 Walnut aphid first recognized as a serious pest; until introduction of the parasitic wasp, *Trioxys pallidus*, in 1969, it was considered the most important walnut pest.
- 1909 Codling moth first observed to attack walnuts near pear packing sheds in Concord, Northern California; first record for Southern California was 1913.
- 1912 *Phytophthora* root and crown rot first reported on walnut trees; eight different *Phytophthora* species identified as cause in 1977.
- 1918 Spider mites first reported as serious walnut pest.

1920-Present

- 1926 Walnut husk fly first occurred near Chino, San Bernardino County.
- 1929 Blackline first noted in Contra Costa County; first observed in Oregon in 1924; disease shown to be caused by cherry leafroll virus in 1975.
- 1943 Navel orangeworm first collected from walnut in Orange County.
- 1967 Deep bark canker first identified on Hartley.
- 2008 Thousand Cankers Disease (TCD) first confirmed in Yolo County.
- 2012 *Botryosphaeria* determined pathogenic on walnuts.

WALNUT MARKETING BOARD & INDUSTRY FUNDING FOR RESEARCH

- Walnut Control Board formed as a federal marketing order (1933)
- Walnut Control Board reactivated (1948). In 1975, name changed to Walnut Marketing Board (today's California Walnut Board)
- Joint Industry–UC Walnut Research Task Group Report establishing critical need for industry financial support (1972)
- Proposed amendment to marketing order to provide for establishment of production research projects (1974)
- Walnut Marketing Board established, and formation of WMB Research Committee and initial funding of three projects for \$25,763 (1975)

**Fifty Years of
WALNUT RESEARCH
ACCOMPLISHMENTS
(1968 - 2018)**



Walnut Research Accomplishments 1968 - 1974

- 1968 Ten new walnut varieties released (e.g. 'Serr', 'Vina')
– Serr, Forde
- 1969 Walnut aphid parasite *Trioxys pallidus* introduced
– van den Bosch, Sibbett, Davis, et al (1969-1980)
- 1971 Zinc Deficiency Correction by foliar sprays – Uriu,
et al
- 1971 Early/prompt harvest and foliar applied ethephon
to optimize nut quality – Martin, Sibbett, et al (1971-78)
- 1972 Pheromone developed to monitor codling moth
populations – Barnes, Davis, et al
- 1974 First orchard established utilizing hedgerow planting
system – Ramos, Olson, Osgood, Ryugo, et al (1974-1991)

Walnut Research Accomplishments 1975 - 1990

- 1975 Discovery of pollen-transmitted blackline virus (CLRv) – Mircetich
- 1976 Improved walnut drying and energy efficiency – Thompson, Rumsey, et al (1976-1997)
- 1977 Identification and mitigation of *Phytophthora* species causing walnut root/crown rot – Mircetich
- 1978 'Chandler' and 'Howard' released – Forde
- 1983 Development of somatic embryogenesis system for regeneration of walnut plants from tissue culture – Tulecke, McGranahan, Leslie (1983-1986)
- 1986 Hedgerow walnuts established on marginal soils with drip irrigation – Krueger, Edstrom, Reil (1986-2000)

Walnut Research Accomplishments 1991 - 1995

- 1991 Discovery of the role of excess pollen, ethylene and Retain® in 'Serr' pistillate flower abscission (PFA) – McGranahan, Catlin, Polito, Beede, et al (1991-2003)
- 1992 Mechanical hedging for walnut canopy Management – Olson, et al (1992-2003)
- 1993 'Tulare' released – McGranahan, Forde
- 1993 Walnut Husk Fly Management – Opp, Coates, VanSteenwyk, et al (1993-2016)
- 1994 Manex Section 18 emergency registration for walnut blight control – Olson, Buchner, Adaskaveg, Lindow, Teviotdale (1994-2013)
- 1995 Endowment of \$1 million established for walnut breeding – Walnut Marketing Board

Walnut Research Accomplishments 1996 - 2006

- 1996 Paradox Genetic Diversity Study – McGranahan, et al (1996-2007)
- 1998 Walnut Pest Management Alliance (PMA) formed with DPR to demonstrate pheromone mating disruption of codling moth – Pickel, Welter, Light, et al (1998-2014)
- 1999 Clonal propagation of walnut rootstocks – Hackett, Leslie, McGranahan, et al (1999-2012)
- 2001 Irrigation management using midday stem water potential –Fulton, et al (2001-2016)
- 2004 Non-pruning tree training system for walnuts – Lampinen, et al (2004-2010)

Walnut Research Accomplishments 2007 - 2012

- 2007 Clonal Paradox rootstocks VX211 and RX1 released – McGranahan, Leslie, Hackett, McKenry, Browne
- 2007 Mapping of the walnut genome initiated – Dvorak, Lao, Aradhaya, Dandekar, et al (2007-2011)
- 2008 Thousand cankers disease confirmed in California – Fichtner, Hasey, Bostock, Seybold (2008-2016)
- 2009 Development of canopy light interception and yield relationship for walnut – Lampinen, et al (2009-2016)
- 2012 *Botryosphaeria* shown to be pathogenic on walnuts – Michailides, et al (2012-2016)
- 2012 Walnut Rootstock SCRI project funded by USDA-NIFA at \$1.14 million for two years – Kluepfel, et al (2013-2014)

Walnut Research Accomplishments 2013 - 2017

- 2013 Mancozeb receives full registration for walnut blight control – Adaskaveg, et al (2013-2016)
- 2013 Additional \$1M endowed to walnut breeding Program – California Walnut Board
- 2014 Walnut Rootstock SCRI project funded by USDA-NIFA at \$2.87M for additional three years – Kluepfel, et al (2015-2017)
- 2014 Five-year strategic plan started to develop marker breeding of walnuts – Neale, et al (2014-2018)
- 2015 'Chandler' walnut genome sequenced (first reference genome sequence for a nut crop) – Neale, et al

Looking Back on the 50 Years...

