



UNIVERSITY OF CALIFORNIA
COOPERATIVE EXTENSION

Growing the Tree and Pest Control for the 'Golden Hills' and 'Lost Hills' Cultivars

Craig Kallsen, UCCE Farm Advisor, Kern County

The pistachio cultivars Golden Hills and Lost Hills (and the male 'Randy') were developed by Dr. Dan Parfitt (UC/Davis) and Farm Advisor Joseph Maranto in a project funded in part by the California Pistachio Commission.

Golden Hills and Lost Hills were released to the California pistachio industry in 2005.

The first limited commercial production of these cultivars occurred in 2010.

In this presentation I hope to share some of the information that we have learned, or think that we have learned, about how producing Golden Hills and Lost Hills differs from producing Kerman.

Please remember that we have been growing Kerman for decades, and we learn more about growing Kerman every year and we still have disagreements on the best way to grow it.

Rootstock Selection for Golden Hills and Lost Hills.

Nut yields and nut quality characteristics have not been consistently different between PG1 and UCB1 rootstocks for Golden Hills and Lost Hills at Madera (the only site where different rootstocks have been compared).

When differences have been found, the magnitude of the differences have been small.

However, replication has been limited at this site and the small number of replicates may hide small differences.

However, we may have some rootstock issues with new cultivars that do not exist for Kerman.



Kalehghouchi on *P. integerrima*

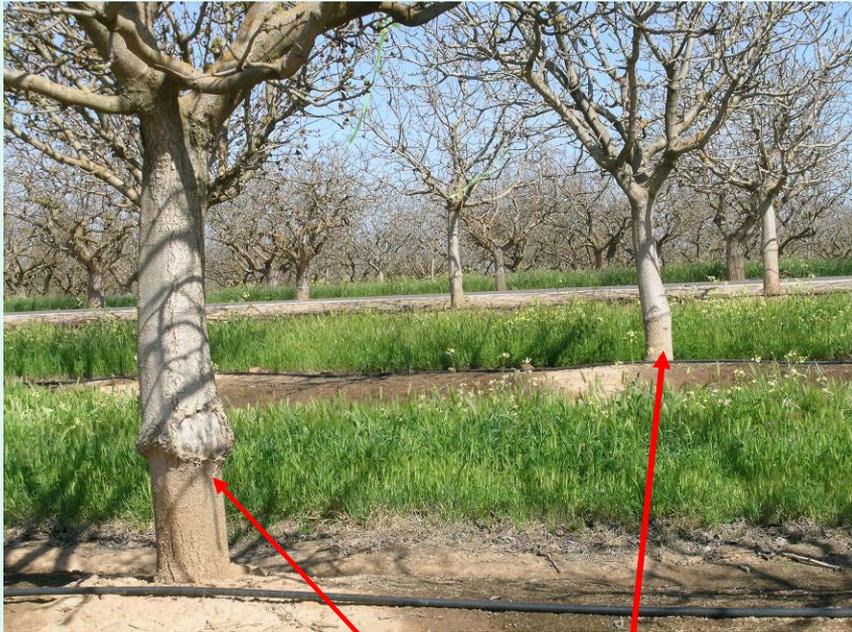


Kerman on *P. integerrima*

The concern is that for cultivars other than Kerman, tree barking increases with uneven trunk growth, and perhaps scion/rootstock incompatibility may become a problem as the trees grow old.

Golden Hills and Lost Hills trunks also increase in diameter faster than Kerman on PG1 and UCB1 (trees shown are 12th leaf). The trees pictured are all growing on PG1, but we see similar things with UCB1.





Golden Hills on PG1 foreground and UCB1 background.

Difference in scion/rootstock circumference ratio between Golden Hills and Lost Hills on PG1 and UCB1 rootstock at Twisselman (14th leaf) and Madera (12th leaf)

PG1	1.18 b
UCB1	1.12 a

Scion/rootstock circumference ratios averaged across PG1 and UCB1 rootstocks at Twisselman (14th leaf) and Madera (12th leaf)

Kerman	1.04 a
Golden Hills	1.17 b
Lost Hills	1.14 b

What should be done about the difference in growth rates between most existing cultivars other than Kerman and our existing rootstocks?

1. Nothing - it doesn't matter?
2. More work on new rootstock development?

What are the pros and cons of developing a more vigorous rootstock (if it, indeed, is possible)?

1. Will young trees grow faster producing yield sooner?
2. Will older trees grow so fast that they become unshakeable sooner?
3. Does difference in growth rate between scion and rootstock have anything at all to do with rootstock or scion vigor?

Budding the trees

Golden Hills has proven more difficult to bud than Kerman or Lost Hills.

The reason is not entirely clear. The area of the Golden Hill's branch that has flower buds, and which will eventually be the bud stick, tends to taper quickly. Buds on the stick are often too large at the base or too small at the end to match the girth of the rootstock. Bud maturity is also often quite variable along the bud stick, with the older buds being too large, and the smaller buds too green/immature. The period during the year when the wood is "slipping" easily on Golden Hills appears to be shorter than for Kerman or Lost Hills.

Suggestion: Have a nursery familiar with budding Golden Hills do the budding in a new planting. Another option is to plant trees that were pre-budded in the nursery.



Suggestions for training and pruning non-bearing and bearing Golden Hills pistachio trees

Lost Hills trees grow more similarly to Kerman, and training and pruning Lost Hills trees is more similar to pruning Kerman.

Before making suggestions on how to train and prune a Golden Hills tree, understanding how the growth of Kerman and Golden Hills differ will be helpful.

Golden Hills trees between third and fourth leaf



Note spindly upright growth pattern of trees when young.



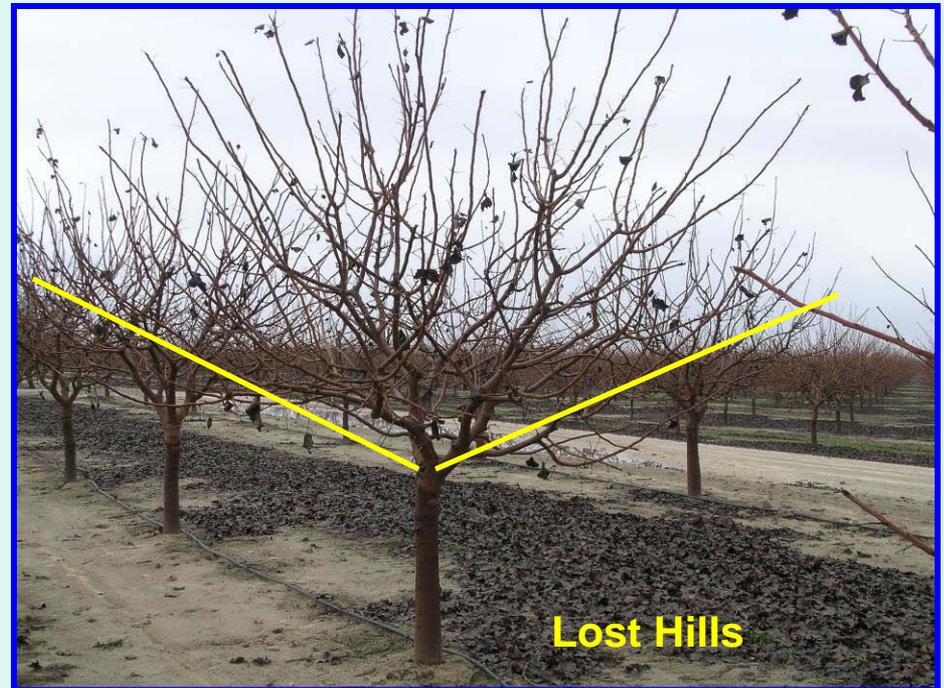
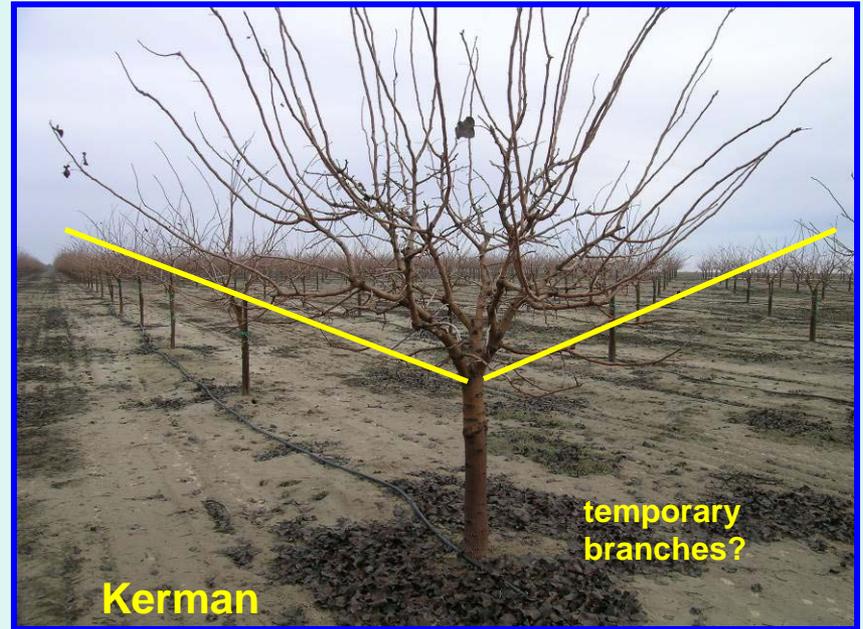
With Kerman, much of the training cuts involve removing sagging branches, that is branches that are growing too horizontally. We train Kerman to grow more upright. As we prune Kerman, we leave branches on the outer canopy that we designate as being temporary. They will produce yield when the trees are young; to be removed later when they flatten out and grow too horizontally.

With Golden Hills, the focus appears to be on encouraging more horizontal growth, since the tree tends to grow so upright naturally. The outer branches of Golden Hills can be considered more permanent than is the case with Kerman since they resist growing horizontally.

Non-bearing 'Golden Hills' should be pruned harder than 'Kerman' to encourage more outward growth. The use of 'spreaders' inserted between branches to increase distance between primary and secondary scaffolds might also be useful.

Circle tying Golden Hills branches, as is done with Kerman to encourage more upright growth, is probably unnecessary.

6th leaf pistachio trees



6th leaf pistachio trees



Branch Architecture



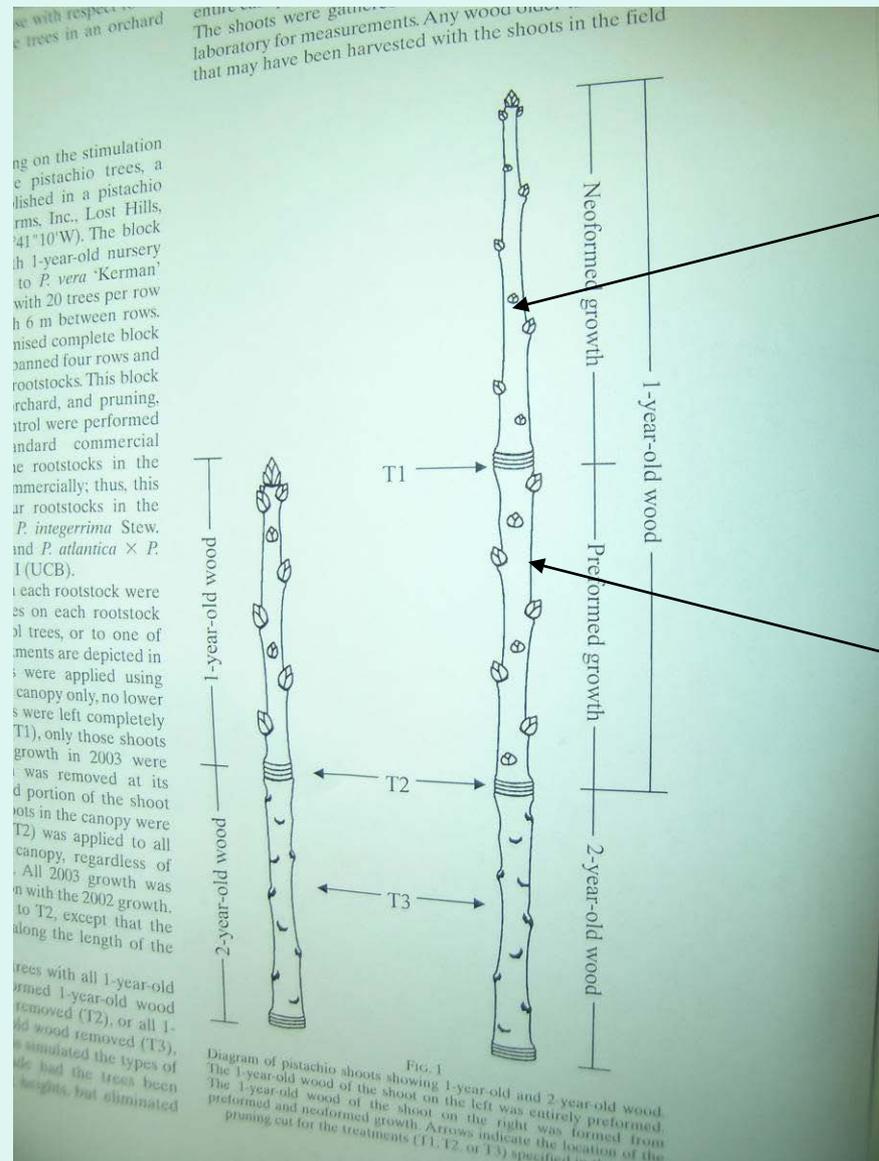
Golden Hills



Kalehghouchi

In general, a more upright growth pattern is probably an advantage during harvest in effectively transferring shaking energy supplied by the harvesting equipment up to the nuts for better removal. The more upright growth of Golden Hills, also reduces pruning costs.

Another growth difference:



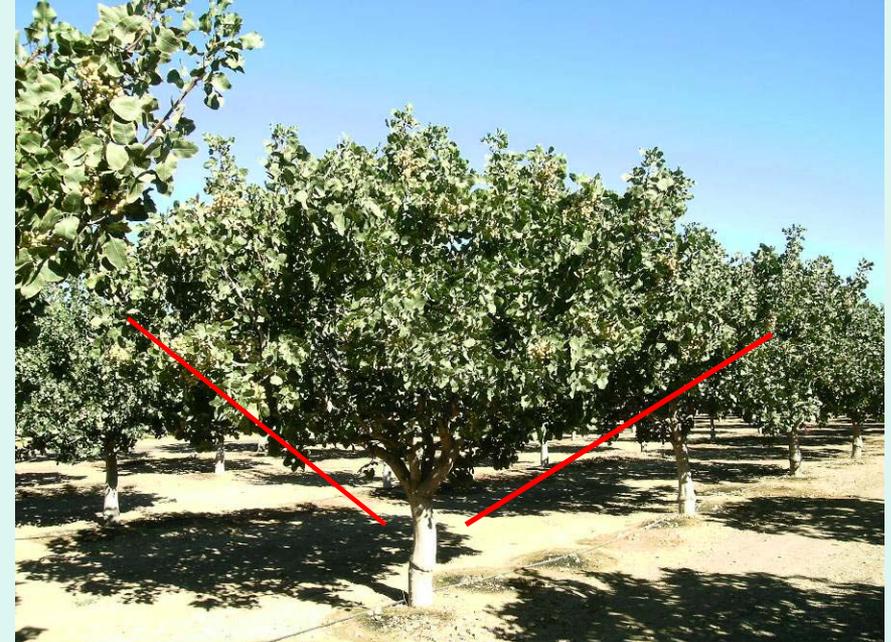
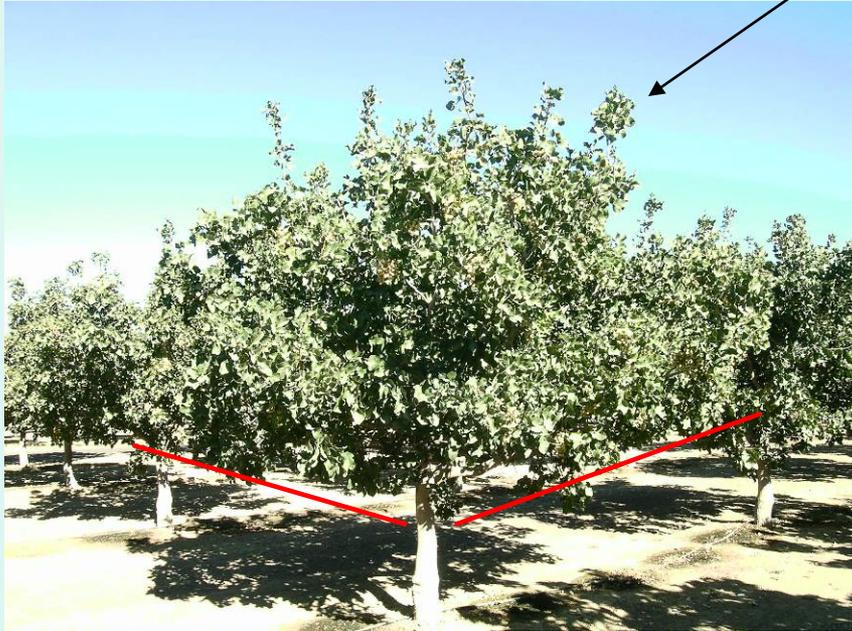
As Golden Hills reaches bearing age, it appears to produce less neoformed growth, which results in a tree of shorter stature and width.

Remember that flower buds are located on preformed growth.

Diagram from Spann, Beede and Dejong, 2008

August, 2006. 10th leaf, West side of Kern County

More neoformed growth in Kerman



Kerman

Golden Hills

Golden Hills appears to produce more nuts in the middle, interior of the canopy than Kerman, which also results in less drooping of the branches. This character also makes yield estimation more difficult.



Laying down of Kerman branches near harvest.
Ninth leaf trees at Little Creek.

How to prune Golden Hills when it comes into bearing:

Once Golden Hills comes into bearing, pruning crews should be instructed not to prune Golden Hills hard to make it grow more like Kerman.

Again, - Prune Golden Hills hard during training (i.e non-bearing) to encourage more branching and greater outward spread of branches.

Reduce pruning, compared to Kerman, once it comes into bearing. A small Golden Hills tree can produce large yields.

Severely pruned Golden Hills on left,
Selection on right was not pruned.



Do not push growth on Golden Hills once it is bearing. A small tree can produce excellent yields.

Trying to make a Golden Hills tree grow like a Kerman tree is a mistake.

The less vigorous summer growth of Golden Hills could mean that pruning costs will be less with this cultivar and that in-row tree spacing could be reduced, increasing the number of trees per acre and per acre yield.

Golden Hills has produced excellent yields as a smaller tree and hard pruning after 6th or 7th leaf will simply reduce yields.



Golden Hills, April, 11th leaf



Lost Hills, April, 13th leaf

Designing the Orchard – Tree spacing

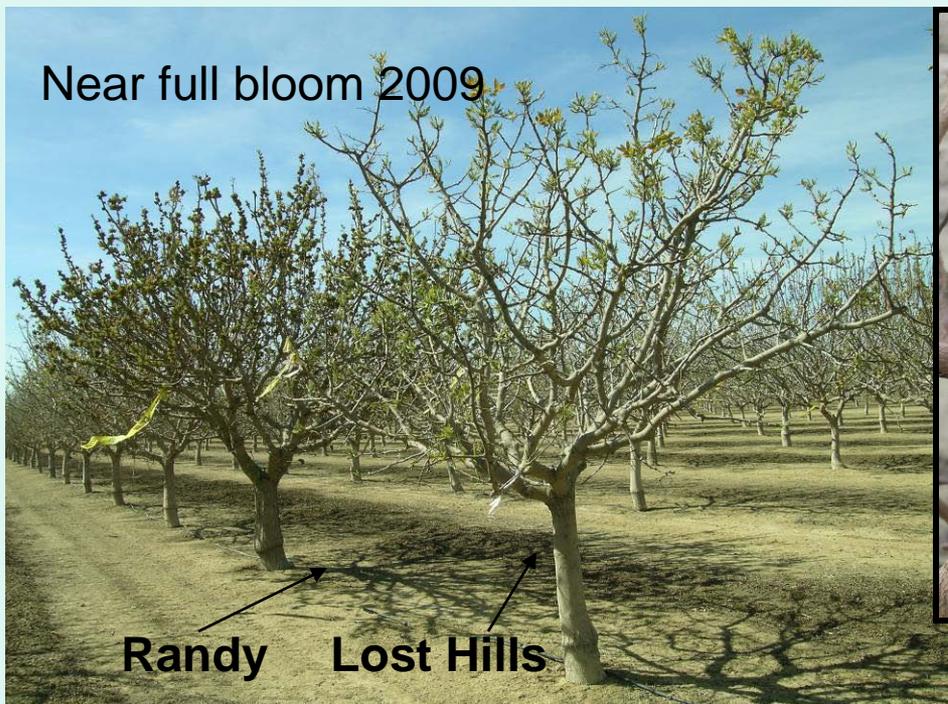
On the deep, clay-loam, calcareous, and boric soils of the west side of the San Joaquin Valley, a tree spacing of 18 ft between trees and 20 feet between rows is appropriate for Golden Hills compared to 20 feet x 20 feet for Kerman and Lost Hills.



Designing the Orchard

The Randy male was selected to pollinate Golden Hills and Lost Hills. The Randy male produces many flowers with large quantities of durable pollen with a high germination rate. Randy has an extended bloom period and often produces numerous flower buds in the fourth leaf.

The large numbers and size of the Randy flowers may increase the risk of *Botryosphaeria* and *Alternaria* infections in wetter climates compared to Peters.



Fourth leaf Randy male.

What about any observed differences in disease resistance between Golden Hills, Lost Hills and Kerman?

Alternaria Blight

Golden Hills at Little Creek – 2010.

Similar problems at Madera – several years.



All else being equal, Golden Hills and Lost Hills will demonstrate more Alternaria infections than Kerman later in the season on leaves, and if late harvested such as in 2010, on nuts.

Golden Hills and Lost Hills may require a fungicidal spray in the wetter areas of the southern San Joaquin Valley when Kerman does not.

Golden Hills and Lost Hills are harvested earlier, and the leaves begin drying earlier, providing Alternaria a great place to grow later in the season in some years and locations.

Suggestion:

In more humid areas or if rain falls during harvest, do not delay harvesting Golden Hills and Lost Hills.

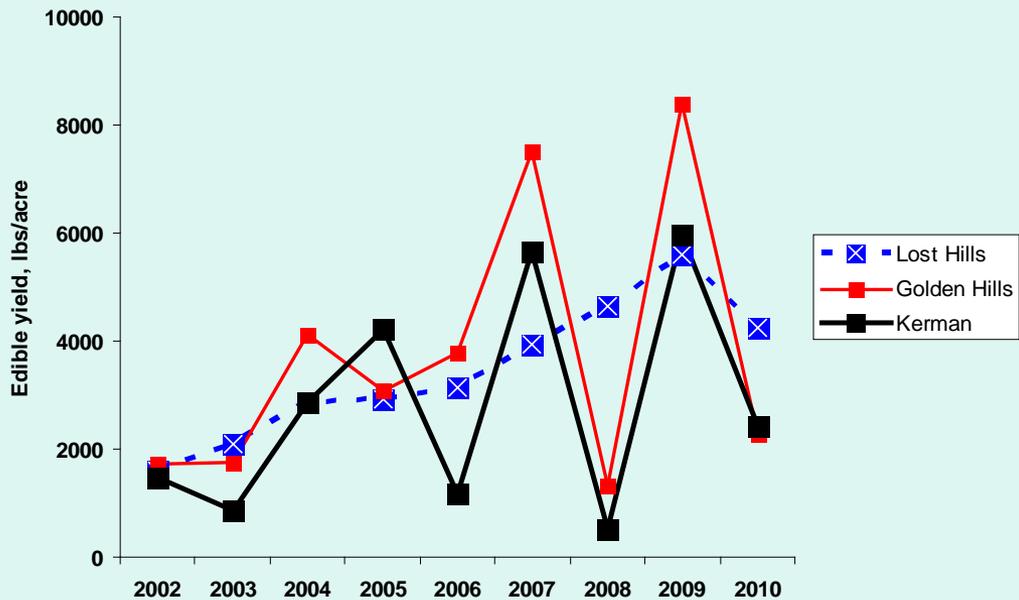
In wetter locations, additional fungicidal sprays may be necessary compared to Kerman.

Alternaria has not been a problem in low-humidity breezy locations such as the west side of Kern County or at the extreme southern end of the San Joaquin Valley.

What about differences in alternate bearing?

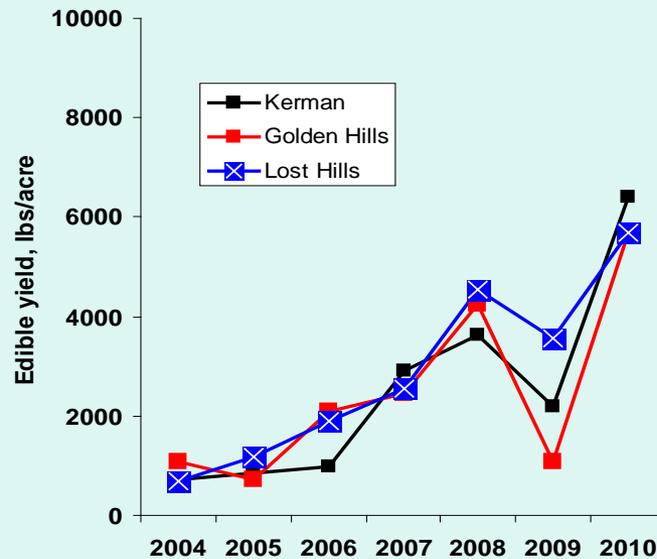
Difference in alternate bearing pattern among Kerman, Golden Hills and Lost Hills

Western Kern County



2005 was 9th leaf

Madera County



2007 was 9th leaf

Regulated Deficit Irrigation (RDI)

Remember that the work done by Dr. Goldhamer, Bob Beede and others with the timing of regulated deficit irrigation in pistachio was based in large part on developmental stages of the nut.

Regulated deficit irrigation (50% of ET) was timed for Stage 2. Stage 2 normally begins about May 15 and continues to end of June with Kerman. It ends with the beginning of shell hardening and filling.

Since both Golden Hills and Lost Hills, are at full bloom about 3-5 days earlier than Kerman and are harvestable 2 weeks earlier, Stage 2 will occur earlier in the year. For Golden Hills and Lost Hills, RDI for Stage 2 should end by mid-June.

By withholding irrigation to Golden Hills and Lost Hills in the last half of June, nut-filling and shell splitting could be adversely affected.

The objective of RDI is to save water by finding discreet time intervals during the growing season when irrigation can be reduced below full Et while maintaining yield and nut quality.

Post Harvest Irrigation

Remember also that yield and nut quality data for Golden Hills and Lost Hills were obtained in small trials within larger blocks of Kerman. Lost Hills and Golden Hills were irrigated based on the full irrigation requirements for Kerman.

Thus, Golden Hills and Lost Hills received generous post-harvest irrigation, since Kerman had not yet been harvested.

Attempting to institute post-harvest regulated deficit irrigation on Golden Hills and Lost Hills may produce yield and nut quality results quite different from the fully-irrigated post-harvest trees in our small experimental trials.

Fertilizer Requirements

At the current time I am not aware of any differences in fertilizer requirement among Lost Hills, Golden Hills and Kerman.

Salinity Tolerance

The same is true for tolerance to salinity.

Insect Sampling

Since Golden Hills and Lost Hills mature earlier than Kerman, growers and pest control advisors may have to make adjustments on when monitoring for certain insect pests begin and ends (i.e. NOW, small bugs, large bugs).

For example, early nut split will occur earlier in the season in these new cultivars, and nut monitoring for navel orangeworm (NOW) may have to begin somewhat earlier. The observation that these new cultivars are harvested earlier, may reduce late-season NOW stress, when worm populations can explode.

Monitoring the small bugs (i.e. phytocoris, lygus) and large bugs (stink bugs, leaf-footed bugs) will probably begin and end sooner in the season, but roughly at the same developmental stage of the nut.



Harvesting and Hulling Issues

Ensure that you have harvest equipment ready for an earlier harvest.

Ensure that you have a huller/processor that is open and ready to accept nuts from an earlier harvest.

Scheduling a harvest in advance for Golden Hills is normally easier than with Kerman. Nut maturation across the tree is, generally, more uniform than for Kerman and Lost Hills. The nuts normally split as the hulls loosen and start to slip.

Maturation usually occurs in the heat of summer, without cool periods to slow and complicate harvest timing.

In cooler areas, the maturation of Lost Hills' nuts may be more uneven than Kerman, as a result of an extended bloom period. Lost Hills harvests may require double shakes, in much the same way as Kerman does some years.

Chilling requirement of Golden Hills and Lost Hills compared to Kerman

Generally, cultivars that have a dormancy period and that flower earlier than other cultivars, are thought to have less of a chilling requirement.

However, flowering in the spring is dependent on both the chilling requirement, and the number of heat units required once the amount of required chilling has been attained.

In years or areas with low chilling, Golden Hills, Lost Hills and Kerman, all demonstrated symptoms of inadequate chilling, which included extended bloom periods with delayed flowering on the south sides of the trees and poorer nut set.

The learning curve for Golden Hills and Lost Hills will continue, now at a much faster rate with increasing planted acres and the first large-scale commercial harvesting.

I'm sure that there will be much more to talk about the next time I have the opportunity to speak on this subject.

Note also that growers that are actually producing these new cultivars will quickly become the true experts as they work with them daily and from year to year.