Mechanical Hedging to Manage Mature Almond Orchards

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Introduction:

Density of California almond planting has been seeing a linear increase from 1986 to 2012. The average orchard in 2012 has 112 trees per acre which corresponds to a spacing of approximately 15 x 21 feet. However, when you consider that there are still many traditional planted orchards embedded in those statistics, the average new orchard is likely being planted at even higher densities than 15 x 21 feet. Although orchards at these close spacings tend to come into production earlier than those at more traditional spacings, there are often problems with lower canopy shading and difficulty with getting adequate sunlight to the orchard floor to dry the nuts at harvest as they mature. This likely results in increased food safety risk suggesting there is a tradeoff between maximum production and food safety risk in almond (Danyluk et.al, 2007). Lampinen et.al (2012) suggested that almond orchards should be designed to intercept about 80% of the total incoming photosynthetically active radiation at maturity which should result in a yield potential of about 4000 kernel pounds per acre. This is substantially higher than the statewide average per acre yield of about 2500 kernel pounds per acre in 2012.

The current study is designed to look at what almond planting configurations result in an acceptable pattern of midday canopy light interception by analyzing existing data sets from our light bar study as well as to investigation hedging regimes to manage existing orchards that are planted at densities and configurations such that the average a midday canopy light interception level is higher than desired.

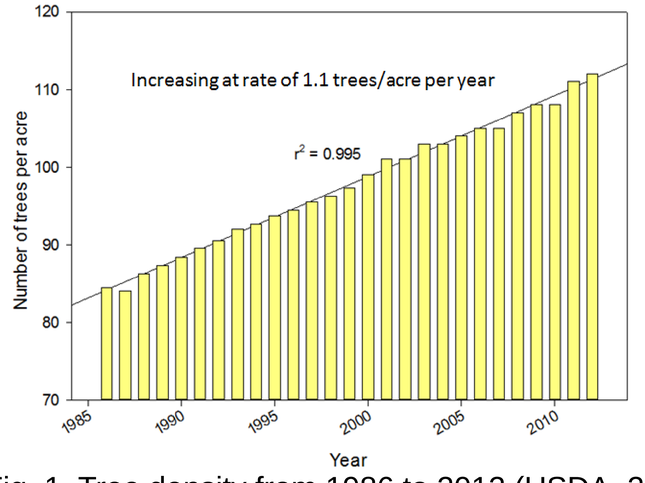

Fig. 1. Tree density from 1986 to 2012 (USDA, 2012)

Materials and methods

An almond orchard site was selected for the hedging trial in Kern County. The orchard was planted in 2000 and has 50% Monterey, 25% Nonpareil and 25% Wood Colony.. The orchard had not been hedged until the time the trial was initiated.

Photo 1. Typical view from mobile platform mounted GoPro camera on July 20, 2013

Mobile platform light bar- Pretreatment conditions will be assessed by running the mobile platform light bar in the orchard in July 2013. Following treatment imposition in the Fall of 2013, the mobile platform light bar will be run through the orchard in late spring and mid-summer to assess canopy regrowth.

Harvest- The plots will be harvested each year to assess pre-treatment and post-treatment yields. Samples will be taken for drying and cracking to assess kernel yield and quality impacts of treatments.

Variability of quality by position on tree- If quality appears to be impacted, more detailed quality assessments will be done on the samples. In walnut, we have found that mechanical hedging tends to lead to increased variability in nut size low in the canopy due to exposing positions that formed in low light the previous year to high light in the current year. Even though those positions are now well lit, they still produce small nuts due to low carbohydrate reserves from the previous year. To investigate this in almond, we will sample 100 nuts from low in the drive row and high on the tree in fully sun lit positions and measure individual kernel weights on the samples in each replication.

Results and Discussion

The results for the trial before treatments were imposed showed that there were no significant differences in midday canopy PAR interception, yield, or yield per unit PAR intercepted (Table 1).

Table 1. Midday canopy photosynthetically active radiation (PAR) interception, kernel pounds per acre yield, and yield per unit PAR intercepted for trial before treatments were imposed in the Fall of 2013. Light interception was measured on July 20, 2013.

Hedging Treatment	PAR interception (%)	Yield (kernel lb/ac)	Yield per unit PAR intercepted
Unhedged control	78.8 a	3226 a	40.9 a
2 feet	78.9 a	3178 a	40.3 a
3 feet	78.1 a	3351 a	42.9 a
4 feet	77.5 a	3192 a	41.2 a

The simulated hedging results suggest that yield losses for the 2, 3 and 4 foot hedging widths would be 5, 15 and 26% respectively (Table 2).

Table 2. Simulated hedging results for unhedged control versus 2, 3 and 4 foot hedge.

Hedging Treatment	PAR interception (%)	Yield potential (kernel lb/ac)	Yield loss (%)
Unhedged control	78.3 a	3915	0
2 feet	74.5 b	3725	5
3 feet	66.5 c	3325	15
4 feet	58.2 d	2910	26

The hedging treatments will be imposed in mid-December 2013.

References

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Acknowledgements

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