

2008 Full Report

Circle-tying of pistachio in comparison to mechanical hedging

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Introduction

The effect of mechanical hedging of pistachio has been well documented as an economical method of pruning that can open up a shaded canopy, stimulate fruit wood development, and reduce alternate bearing. Mechanical hedging is indiscriminate and its repeated use to stimulate new fruit-wood often requires a more severe hedging cut than what was previously performed. Repeated mechanical hedging can leave undesirable 'crows feet' branching and dead wood. Many growers prefer to individually hand prune their trees in order to selectively develop fruit-wood. These growers obviously believe that selective pruning will ultimately result in better tree structure, more fruit-wood, and higher yields.

As mature pistachios produce heavy yields in 'on years' their structural limbs can bend downwards and lose their original upright structure, ultimately causing limbs to interfere with harvest. Limbs that interfere with harvest must be removed and their removal could ultimately reduce yields. Circle-tying, the process of circling branches of a tree with rope pulled taut, has been used on young pistachio trees in order to develop upright tree structure before trees come into production. The same circle-tying principal has been applied to mature trees ranging from 12-20 years of age. This 'second tier' circle-tying of mature bearing trees is performed with 5/8 inch "one-ton" rope that won't break under the pressure of a heavy crop. Circle-tying has been effective in keeping branches upright in an on production year. Growers who have invested in circle tying are hoping their investment ultimately pays off in enhanced tree structure, improved harvest shake, less subsequent hand pruning, and ultimately higher yields and economic returns. We have undertaken this study to compare circle-tying, hand pruning, and mechanical hedging in order to determine if circle tying is economically feasible under the less than ideal conditions of eastern Madera County.

Procedures

Two pruning trials were performed. In the large-scale grower trial circle tying was compared to mechanical hedging in three 50 acre blocks. The middle block was circle tied while the two blocks on either side were mechanically hedged. Per acre yields, costs, and grade sheets were compared using grower and processor data. In the second trial, mechanical hedging, circle tying with hand pruning, and hand pruning alone were performed in a replicated block design experiment with five replications of each treatment down a single row. Each replication consisted of 5 trees. Thus, 25 trees were mechanically hedged, 25 were circle tied and hand pruned, and 25 were just hand pruned and not circle tied or hedged. Yield data was recorded for each five-tree replication.

Randomized Block Trial Results

In the replicated block trial the mechanically hedged treatment had the highest yield, averaging 168.22 lbs CPC dry weight per 5 tree plot (33.64 lbs/tree), followed by the hand pruned trees, averaging 145.15 lbs per plot (29.03 lbs/tree), while the circle tied trees averaged 130.37 lbs per plot (26.07 lbs/tree) (figure 1). When cumulative yields from 2006-2008 were examined, mechanical hedging has the highest average weight of 635.91 lbs CPC dry weight per plot (127.18 lbs/tree), followed by hand pruning at 585.24 lbs per plot (117.05 lbs/tree), and circling tying with 549.51 lbs per plot (109.90 lbs/tree) (figure 2).

Initial circle tying averaged \$425 per acre while the hand pruning averaged \$150 per acre, bringing the combined cost of circle tying and hand pruning up to \$575. The mechanical hedging and topping averaged \$170 per acre and was done in conjunction with hand pruning that averaged \$150 per acre, bringing the combined cost of mechanical hedging and minimal hand pruning up to \$320 per acre (figure 3). Cumulative 2005-2008 pruning expenses have circle tying combined with hand pruning at \$982 per acre, while mechanical pruning (hedging and topping) and hand pruning totaling \$771 per acre, with hand pruning alone at \$525 per acre (figure 4).

Grower Trial Results

Initial circle tying averaged \$425 per acre while the hand pruning averaged \$150 per acre, bringing the combined cost of circle tying and hand pruning up to \$575. The mechanical hedging and topping averaged \$170 per acre and was done in conjunction with minimal hand pruning that averaged \$12 per acre, bringing the combined cost of mechanical hedging and minimal hand pruning up to \$182 per acre (figure 5). In 2006 and 2007 hand pruning averaged \$135 per acre and \$150 per acre respectively, in the circle tied block. In the mechanically pruned block hand pruning averaged \$63 per acre in 2006 and \$100 per acre in 2007. In addition, heavy chain saw cuts were made in the mechanically hedged block that also had to be shredded resulting in an expense of \$370 per acre. Total pruning expenses from 2005-2007 for the grower comparison blocks are shown in figure 6. Further comparison of the large grower blocks were abandoned in 2008 because the hand pruned block was mechanically hedged and topped while large chain saw and pruning cuts were made to the mechanically hedged block in 2007.

Conclusions and Practical Applications

Circle-tying of mature trees with 5/8 inch one-ton rope in 2005 resulted in an additional expense to the grower of \$425 per acre when compared to hand pruning alone. Circle-tying and hand pruning resulted in an additional expense of \$255 per acre when compared to mechanical hedging and minimal hand pruning. Cumulative yield differences from 2006-2008 show mechanical pruning currently out yielding circle-tying. Circle-tying appears effective in keeping branches upright in on production years, but growers who have invested in circle tying are hoping their investment ultimately pays off in enhanced tree structure, improved harvest shake, less subsequent hand pruning, and ultimately higher yields and economic returns. Rope breakage with tree shaking at

harvest has been greater than expected and is a concern we are monitoring. It obviously may take a number of years, if at all, to observe the economic benefits of circle-tying.

Acknowledgements

This study would not have been possible without the grower cooperation of Tom and John Coleman, Coleman Farming Company, Madera, and funding from the California Pistachio Research Board and Paramount Farming Company.

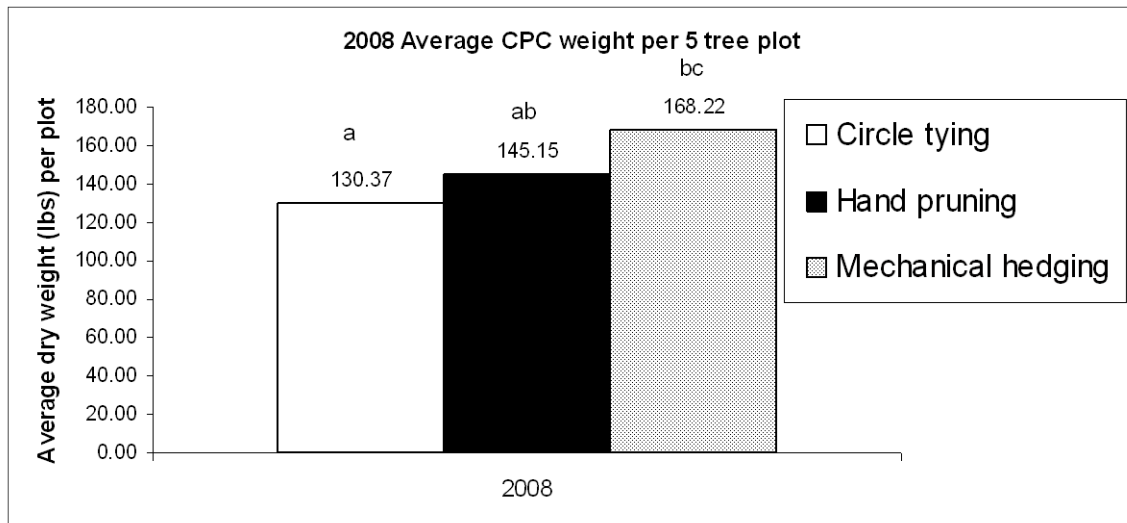


Figure 1. In the replicated block trial the mechanically hedged treatment had the highest yield, averaging 168.22 lbs CPC dry weight per 5 tree plot (33.64 lbs/tree), followed by the hand pruned trees, averaging 145.15 lbs per plot (29.03 lbs/tree), while the circle tied trees averaged 130.37 lbs per plot (26.07 lbs/tree).

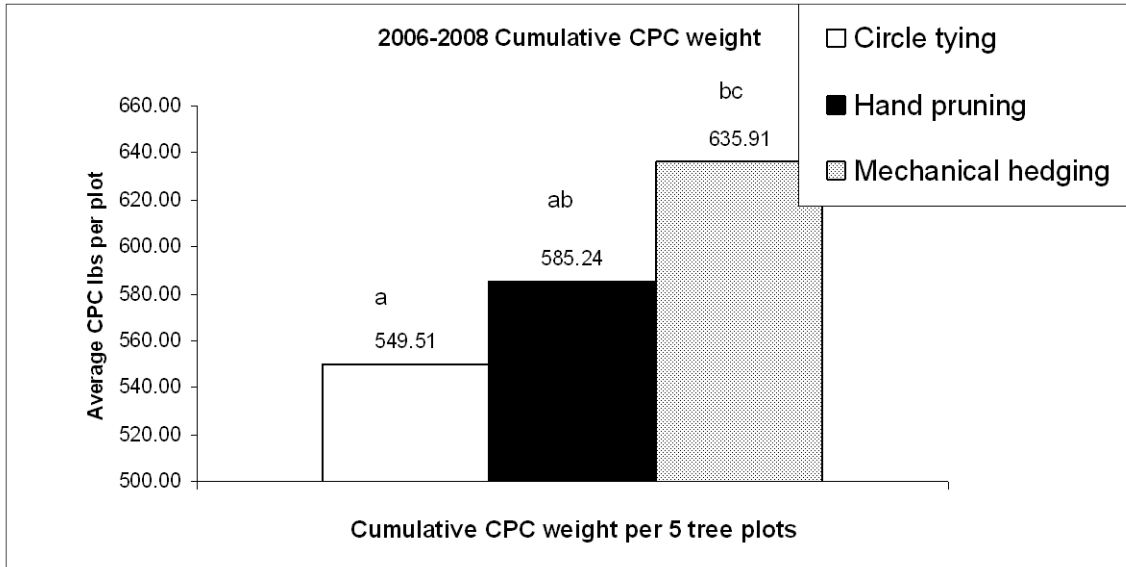


Figure 2. When cumulative yields from 2006-2008 were examined, mechanical hedging has the highest average weight of 635.91 lbs CPC dry weight per plot (127.18 lbs/tree), followed by hand pruning at 585.24 lbs per plot (117.05 lbs/tree), and circling tying with 549.51 lbs per plot (109.90 lbs/tree).

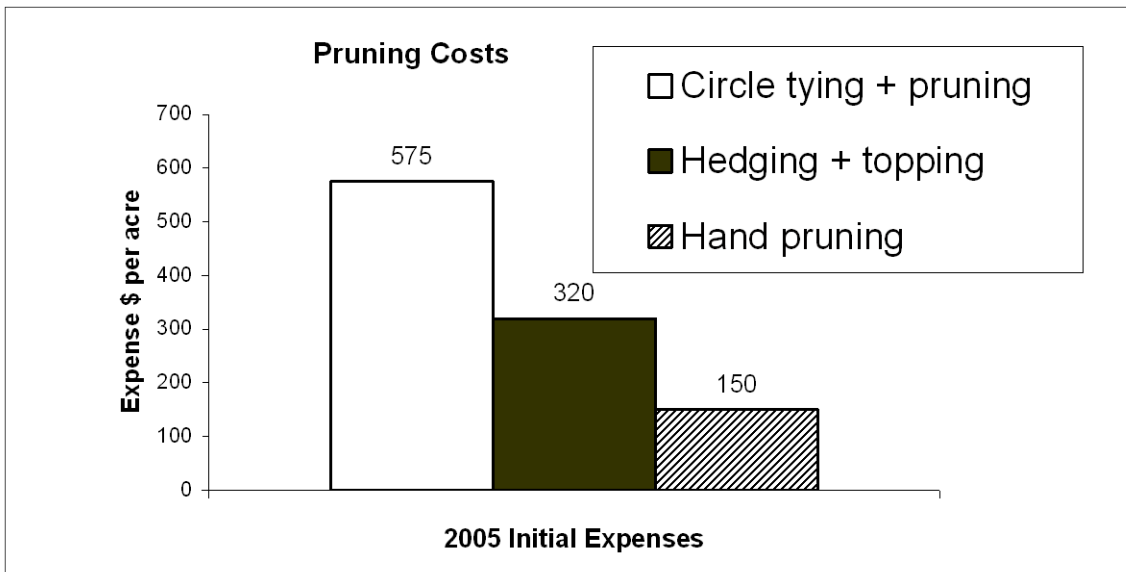


Figure 3. Initial circle tying with hand pruning combined cost averaged \$575 per acre while mechanical hedging average \$320 per acre. The hand pruning alone averaged \$150 per acre.

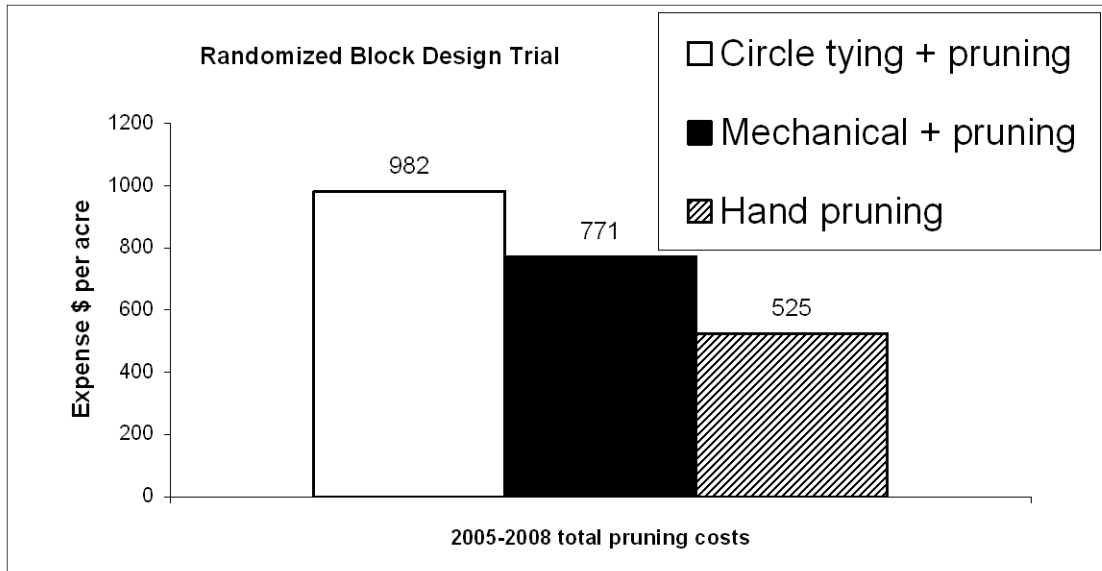


Figure 4. Cumulative 2005-2008 pruning expenses have circle tying combined with hand pruning at \$982 per acre, while mechanical pruning (hedging and topping) and hand pruning totaling \$771 per acre, with hand pruning alone at \$525 per acre.

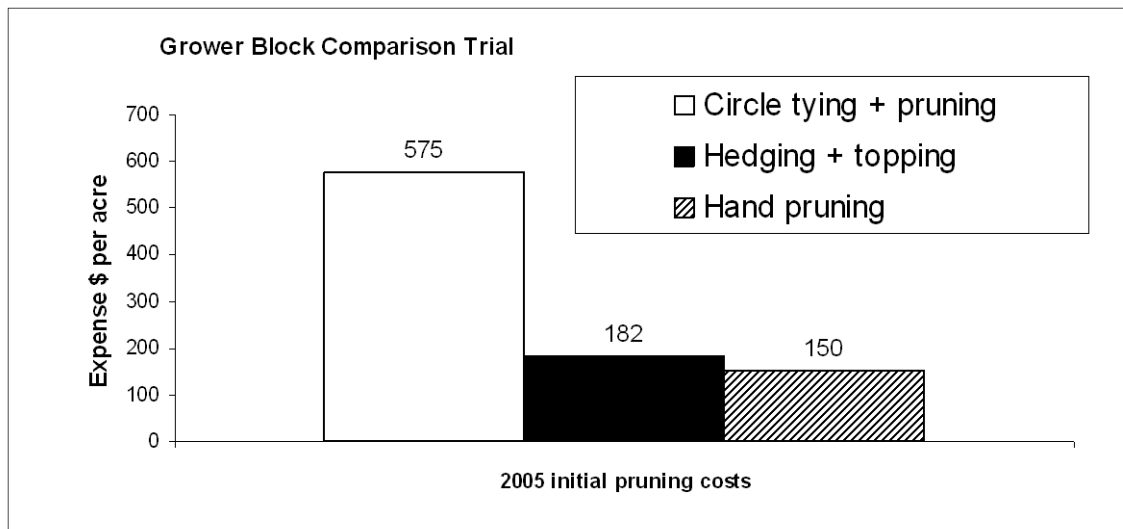


Figure 5. In the grower comparison block initial circle tying with hand pruning combined cost averaged \$575 per acre while mechanical hedging plus hand pruning average \$182 per acre. The hand pruning alone averaged \$150 per acre.

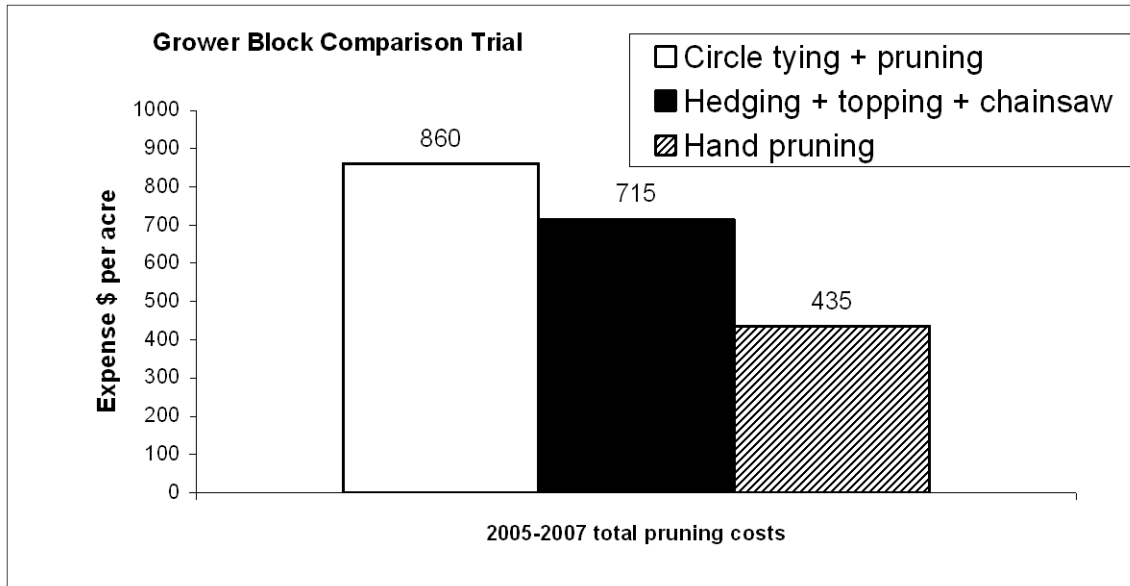


Figure 6. Combined 2005-2007 total pruning costs for the grower comparison block. Total circle tying and hand pruning combined cost averaged \$860 per acre while mechanical hedging, hand pruning, and chain saw cuts averaged \$715 per acre. The hand pruning alone has totaled \$435 per acre.