

# ALL ABOUT ALMONDS

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## Better almond pollination

Dr. Saul Cunningham, CSIRO

Good pollination provides the foundation for good yield, so it is important to ensure that honeybee hives are provided in the most effective manner. Our research focused on the influence of pollination strategy on bee activity (which drives pollination) and the flower to fruit conversion ratio (which is strongly influenced by pollination). To understand bee activity we recorded the rate at which pollen was removed from flowers in a survey of more than 2,000 flowers. This showed that pollen removal was lower on trees further than ~ 300meters from hive placements (compared with those near hives) indicating that bees are doing less work in parts of the orchard too far from hives.

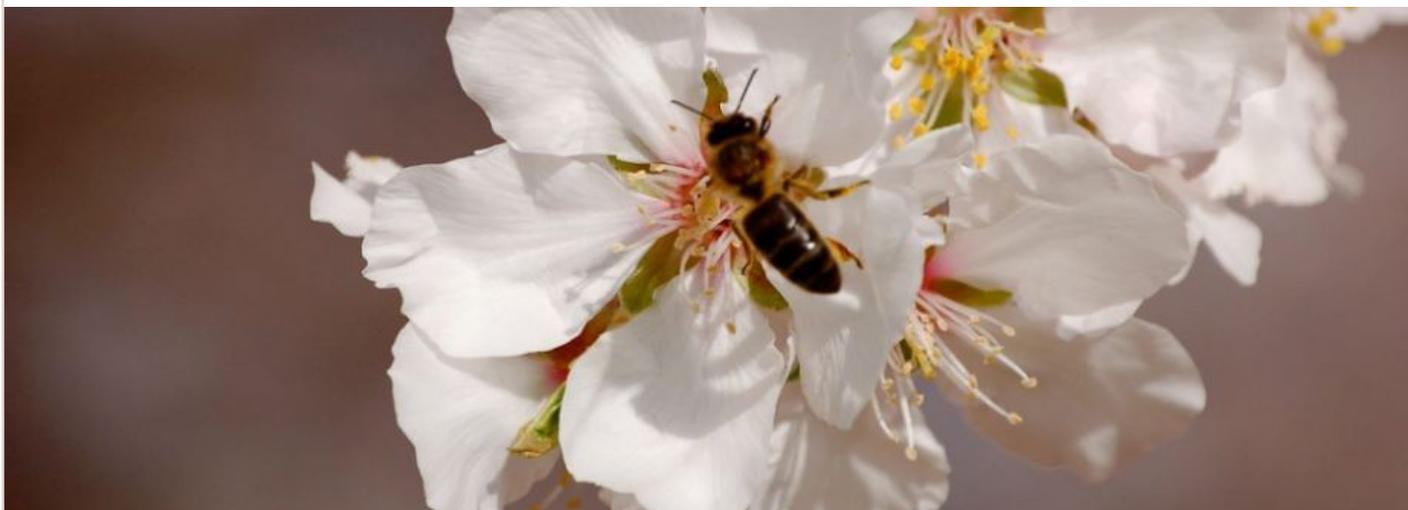
Having established that bee activity declines with distance from hive placements at this scale, we tested to see if reduced bee activity far from hive placements also corresponded with reduced flower to fruit conversion. This research was conducted over many orchards, over two seasons.

The experiment confirmed that reduced bee activity at increasing distance from hives corresponds with a reduction in the conversion of flowers to fruit. Our analysis shows fruit set declining from (on average) about 36 percent near hives, to 28 percent at 850 meters (a decline by one fifth).

Standard practice in many large orchards is 6.7 hives per hectare (hph) achieved with placements of approximately 120 hives hundreds of meters apart. This represents only one of many possible strategies, so our next experiment examined a range of strategies using lower hph and smaller numbers of hives per placement. Again the experiment was conducted over many orchards and two flowering seasons. We found that reducing the hive density below 6.7 hph was associated with lower flower to fruit conversion (46 percent at 6.7 down to 33 percent at 2.8 hph). Considering the two experiments together, we found that the best fruit per flower outcomes were gained by maintaining hive density at ~ 6.7

hph but using fewer hives per placement with shorter distances between placements. Because we were not able to examine all possible combinations of placement size and spread we cannot yet identify one "best" strategy for maximum conversion of flower fruits. The data indicates that hives should be arranged so that no trees are more than 300m away and hive placements of around 20 hives perform better than placements of 120.

These experiments focused on the benefit side (i.e. improved flower to fruit conversion) but did not include the costs of hives and the labour associated with spreading them around the orchard. The best management outcome must, of course, consider the cost/benefit ratio: using smaller placements closer together might increase the beekeeper's labour costs. The most cost effective approach will be determined by balancing the benefits of better pollination outcome with the cost of implementing the pollination strategy.



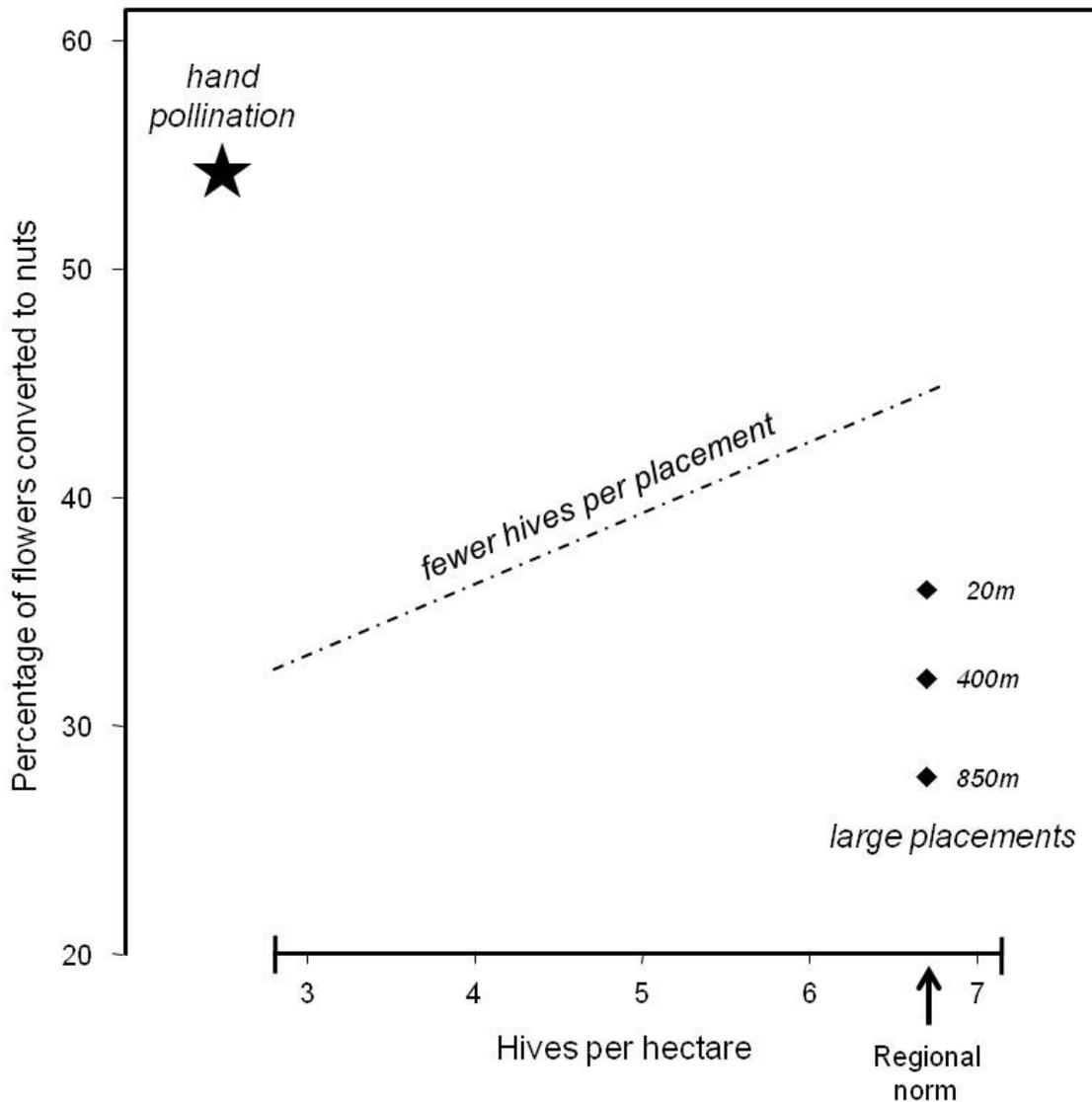


Figure 1: Summary of the outcomes of the “distance from hive” experiment (diamonds) and the “hives per hectare” experiment (dotted line) which used smaller placements of hives. The hand pollination value is the average across both experiments.

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