Century Orchards – Almonds – Australia 2023

CASE STUDY SUMMARY by Harvest Harmonics Corp

Time

- The almond trees were planted several years ago at various times.
- Trial installed: July 25, 2022
- Harvest ended: May 12, 2023.

Location

- Century Orchards, Luxton, South Australia

Details

- Crop: mature almonds of five varieties – Nonpareil, Carmel, Monterey, Vela, and Carina.
- Three orchard blocks were treated with KPCB[1], with a total area of 22.56 hectares.
- Three Control blocks were assigned, with a total area of 2.3 hectares. Each of these blocks was assigned to a similar KPCB-treated block, with a matching variety per protocol.
- Each KPCB block had five treatments, each spanning five rows of trees for repeatability:
    - KPCB with 0% reduction of inputs
    - KPCB with 10% reduction of inputs
    - KPCB with 20% reduction of inputs
    - KPCB with 30% reduction of inputs
    - KPCB with 40% reduction of inputs.
- Fertigation was delivered through the same drip irrigation; therefore, each of these reduction rates indicates a specific reduction of both water and fertigation for each treatment.
- The variety spread between blocks was as follows:
    - Block D1: Nonpareil, Monterey, Vela, Carina, and Carina
    - Block C1: Nonpareil, Carmel, and Monterey
    - Block E10: Nonpareil, and Carmel.

[1] Kyminasi Plants – Crop Booster

Results

- On average, almond trees treated with KPCB achieved significant yield gains over their respective Control blocks, with 10% and 20% inputs reduction achieving the highest yield gains of 24% and 22%, respectively:

Average YIELD GAIN from all blocks, by variety and reduction level						
	Nonpareil	**Carmel**	**Monterey**	**Vela**	**Carina**	Avg.
KPCB, 0% reduction	**19%**	**2%**	**6%**	**24%**	**48%**	**20%**
KPCB, 10% Reduction	**18%**	**26%**	**9%**	**33%**	**34%**	**24%**
KPCB, 20% Reduction	**11%**	**30%**	**12%**	**23%**	**37%**	**22%**
KPCB, 30% Reduction	**13%**	**29%**	**7%**	**22%**	**30%**	**20%**
KPCB, 40% Reduction	**20%**	**9%**	**-4%**	**17%**	**11%**	**11%**

- Each block achieved a diverse set of results, as seen in the tables below, where the numbers are in ton/hectare:

D1								
	Nonpareil	GAIN	**Monterey**	GAIN	**Vela**	GAIN	**Carina**	GAIN
Control: B1	1.88		2.47		2.74		2.10	
KPCB, 0% reduction	2.65	**41%**	2.97	**20%**	3.40	**24%**	3.11	**48%**
KPCB, 10% Reduction	2.68	**42%**	3.14	**27%**	3.64	**33%**	2.81	**34%**
KPCB, 20% Reduction	2.91	**55%**	3.39	**37%**	3.36	**23%**	2.88	**37%**
KPCB, 30% Reduction	2.68	**43%**	2.97	**20%**	3.34	**22%**	2.72	**30%**
KPCB, 40% Reduction	2.84	**51%**	2.59	**5%**	3.21	**17%**	2.33	**11%**

C1						
	Nonpareil	GAIN	**Carmel**	GAIN	**Monterey**	GAIN
Control: G10	3.79		2.60		4.60	
KPCB, 0% reduction	4.47	**18%**	2.97	**14%**	4.18	**-9%**
KPCB, 10% Reduction	4.22	**11%**	4.21	**62%**	4.22	**-8%**
KPCB, 20% Reduction	3.05	**-20%**	4.46	**72%**	4.02	**-13%**
KPCB, 30% Reduction	3.87	**2%**	4.56	**75%**	4.27	**-7%**
KPCB, 40% Reduction	4.00	**6%**	3.47	**33%**	3.98	**-13%**

E10				
	Nonpareil	GAIN	**Carmel**	GAIN
Control: E9	2.71		3.08	
KPCB, 0% reduction	2.64	**-3%**	2.75	**-11%**
KPCB, 10% Reduction	2.75	**1%**	2.75	**-11%**
KPCB, 20% Reduction	2.63	**-3%**	2.70	**-12%**
KPCB, 30% Reduction	2.53	**-7%**	2.54	**-18%**
KPCB, 40% Reduction	2.84	**5%**	2.63	**-15%**

- In Block D1, all varieties got high gains in the range between 10% and 30% of inputs reduction, and the most sustainable treatment was 20% reduction, with which the following yield gains were obtained: variety "Nonpareil" gained 55% higher yield, "Monterey" and "Carina" gained 37%, and "Vela" gained 23%.
- In Block C1, "Carmel" variety gained significantly higher yield gains:
    - 62% higher yield with 10% inputs reduction
    - 72% higher yield with 20% inputs reduction
    - 75% higher yield with 30% inputs reduction.
- In the same Block C1, varieties "Nonpareil" and "Monterey" had low or negative gains.
- In Block E10, varieties "Nonpareil" and "Carmel" had negative gains.
- When comparing varieties, the least performing was "Monterey" with 12% yield gain on average.
- The most productive varieties were "Carina" and "Carmel" which achieved yield gains of 37% and 30%, respectively – with 20% reduction of inputs.

Conclusions

1. Even though numerous data points have been documented on soil conditions, soil nutrients, and leaf health, no immediate correlation was found between the high and low results listed above. Therefore, the reason for low results in the grossly underperforming blocks and underperforming varieties is unclear at this time of writing, and we highly recommend that the grower investigate these areas to boost their profitability even higher.

   The chief scientist for Century Orchard, Gemma Nunn, added essential information: *"I do not expect there to be a correlation just yet as we need to remember that the drip tube for the reductions in this trial was not installed until a few months in. I do not expect to see much fluctuation/correlation in soil/leaf nutrient levels and yield in the 2022-2023 season due to this and the fact that almonds store carbohydrates and nutrients to supply the next year's crop. As we didn't get the drip tube in in time, I do expect there to be minimal correlation as the trees will be using stored reserves at this time."*

2. Overall, we can draw two major conclusions:
    a. Significant yield gains on the average demonstrated the profitability and sustainability potentials of the KPCB technology in fruit trees, and
    b. Proof of the effectiveness of gradual input reduction in pinpointing to the grower which levels gain optimal profitability and sustainability on their own soil and crops. Note that the yield gains listed above have NOT been adjusted for the savings in water and fertilizers; the grower can therefore select their preferred reduction level. This optimization system is standard in our POPS (Profitability Optimization Protocol for Sustainability) program which is highly recommended to every grower.