Avocado Establishment & Production Costs & Profitability Analysis in High Density Plantings

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Avocado has been one of the prominent crops produced in Southern California since the early 1950s. California avocado production reached a peak in 1987/88 with about 76,307 acres. At that time, San Diego County was the leading producer accounting for about 60% of the acreage. The California avocado industry has declined from its peak acreage in 1988, but has stabilized over the last four years at 54,000 planted acres. This decrease in acreage is due in part to the expansion of urban development, which has increased the cost of producing the crop and greatly impacted the cost of water – reaching up to $2,000 per acre-foot in 2020. With this in mind, the University of California Cooperative Extension (UCCE) specialists and advisors have conducted experiments and field trials for years in order to investigate and develop strategies and methods for increasing productivity and reducing costs of production to improve grower returns.

In 2011, Dr. Gary Bender, then San Diego County Farm Advisor, initiated a field trial/experiment in Valley Center, CA, to investigate the potential of high-density planting to improve productivity, water consumption and punning strategies. The experiment was conducted at a cooperating grower's field from 2012-2017 with planting space of 10'x10'; 430 trees per acre. The experiment included Hass and Lamb Hass varieties with Zutano trees planted as pollinizers. Details about the experiment and results were published by Dr. Bender (High Density Avocado Production A Method to Improve Yield per Acre, Winter 2018 / From the Grove / page 35), https://www.californiaavocadogrowers.com/sites/default/files/documents/11-High-Density-Avocado-Production-Winter-18.pdf.

High Density Avocado Planting in San Diego (Picture by Gary Bender, Farm Advisor Emeritus, San Diego County).

In 2018, Etaferahu Takele conducted a partial budgeting economic analysis to evaluate the results of the experiment for Hass variety. The partial budgeting analysis showed that high-density planting increased returns. It also showed water consumption to be cost effective when distributed over the high-density yield. This is because the same amount of water was as sufficient for the high density as it was for the traditional planting (20'x15'=145 trees per acre.). Pruning of the high-density planting also showed relatively lower cost compared to the traditional planting when distributed over the high-density yield (Table 1).

Planting Space	Average Yield (3 years)	Costs $/lb. of Yield	
	lbs./Acre	Water	Pruning
High density (10'x10'; 387 Hass trees + 43 Zutano)/acre)	19,173	0.29	0.07
Conventional (20'x20'; 109 Hass trees best managed grove)	9,000	0.62	0.17
Conventional (20'x20'; 109 Hass trees/acre county average)	5,925	0.95	0.26

Table 1. Comparing Costs of Water and Pruning for High-Density Hass Avocado Planting and Conventional Planting.

In 2019-20, an enterprise budget analysis — including investment estimates for orchard establishment and production costs — gave a full picture of the profitability of the high density planting. The study (https://coststudyfiles.ucdavis.edu/uploads/cs_public/b4/3d/b43d58d9-1e91-4a3e-80f9-a2edb14958b0/2020avocadohighdensitysandiegocounty.pdf; Takele et. al, 2020) used the experiment outcome of yield, water consumption and pruning. Other production practices data – such as fertilization, pest and disease management and harvesting – was collected from the collaborating grower. References also were made to the 2011 Sample Establishment and Production Cost avocado study in San Diego (https://coststudyfiles.ucdavis.edu/uploads/cs_public/5a/87/5a87bb11-59b3-4056-a2d6-a6e14507dd84/avocadoconventionalsdr2011.pdf , Takele et. al).

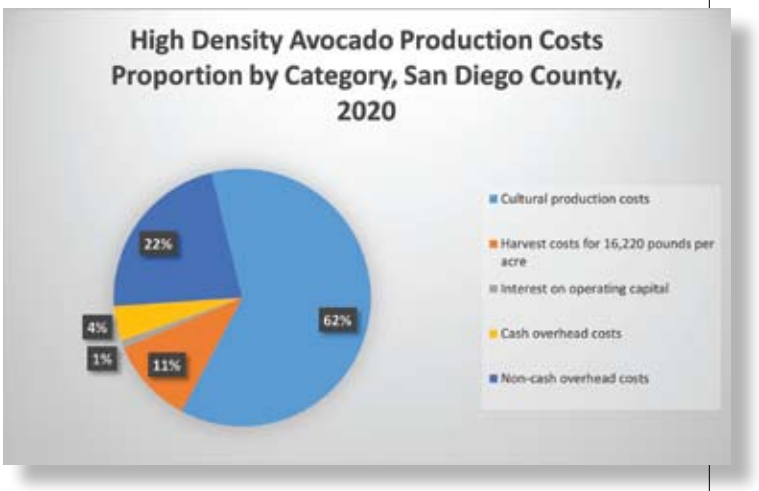
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Yield (pounds)			13,246	25,100	5,541	20,992
Establishment Costs ($)	$29,712	$9,841	$10,969	$18,633	$14,895	$16,804
Returns ($)			$17,187	$29,191	$9,810	$27,069
Establishment Cost After Returns ($)	$29,712	$9,841	$6,218	$10,558	-$5,085	$10,265
Cumulative Establishment Costs ($)	$29,712	$39,553	$33,335	$22,777	$27,862	$17,597

Table 2. High-Density Avocado Yield and Establishment Costs Per Acre.

Orchard Establishment and Production Costs and Returns Analyses

The total establishment cost estimate (the first six years' cumulative costs and returns) for high-density avocado planting in 2020 is $17,597 per acre (Table 2). Though investment in high-density planting is very high ($100,854 per acre cumulative of the six years establishment period), returns during establishment offset about 82.5% of the investment cost.

The annual production cost estimate is $16,233 per acre. The pie graph below shows the proportion of production costs by category. Though water cost accounts for a major part (44%) of the total production cost in the high-density planting, the water cost per pound of yield as mentioned above shows to be less than the conventional planting.



High-Density Avocado Production Costs Proportion by Category, San Diego County, 2020.

Profitability Analysis

Gross Margin and Net Profit: The cost analysis for the high-density planting shows a gross margin of $9,857 per acre. Growers often consider gross margin (or returns above cash operating costs) as profit if there is no debt on the farming operation. Deducting depreciation, gross margin also approximates taxable income. The net returns are often considered as returns to management (because management charges are not included in the cost estimates) are approximately $6,260 per acre.

Break-Even Prices (prices needed to cover costs): Given the average yield of high-density planting, break-even prices needed to cover the costs of production included a gross margin break-even price of $0.78 per lb. and that of total production costs (except management) of $1.00 per lb. In other words, given the average price of $1.39 (the average for San Diego County Hass prices; Agricultural Commissioner report for 2014-17), the enterprise showed a $0.61 per lb. gross margin and $0.39 per lb. net returns.

Range Analyses: To account for variability of prices and yield that may exist among farms, the range analyses in Tables 3 and 4 provide gross margin and net returns. Growers can identify their gross margin and net returns on their yield and prices received. Given the average yield of the experiment (16,220 lb. /acre), gross margin will be positive even if prices fall to $0.89/lb. and net returns will be positive even if prices fall to $1.14/lb.; or given a price of $1.39/lb., gross margin and net returns will be positive even at a yield level of 11,720 lbs./ acre.

Price $/lb.	Yield (lbs./A) of High Density Planting						
	11,720	13,220	14,720	16,220	17,720	19,220	20,720
	$ Per Acre						
0.64	-4,698	-3,901	-3,105	-2,308	-1,511	-715	82
0.89	-1,768	-596	575	1,747	2,919	4,090	5,262
1.14	1,162	2,709	4,255	5,802	7,349	8,895	10,442
1.39	4,092	6,014	7,935	9,857	11,778	13,700	15,622
1.64	7,022	9,318	11,615	13,912	16,208	18,505	20,802
1.89	9,952	12,623	15,295	17,967	20,638	23,310	25,982
2.14	12,882	15,928	18,975	22,022	25,068	28,115	31,162

Table 3. Returns per Acre above Cash Costs at Various Price and Yield Levels.

Price $/lb.	Yield (lbs./A) of High Density Planting						
	11,720	13,220	14,720	16,220	17,720	19,220	20,720
	$ Per Acre						
0.64	-8,294	-7,498	-6,701	-5,904	-5,108	-4,311	-3,514
0.89	-5,364	-4,193	-3,021	-1,849	-678	494	1,665
1.14	-2,434	-888	659	2,205	3,752	5,299	6,845
1.39	495	2,417	4,339	6,260	8,182	10,104	12,025
1.64	3,425	5,722	8,019	10,315	12,612	14,909	17,205
1.89	6,355	9,027	11,699	14,370	17,042	19,714	22,385
2.14	9,285	12,332	15,379	18,425	21,472	24,519	27,565

Table 4. Returns per Acre above Total Costs at Various Price and Yield Levels.

Summary: We developed this study to provide growers and investors information about costs and returns of high-density avocado planting in Southern California. This study answers the question concerning what the investment requirement for high-density planting is, as well as the profitability potential of the investment. This study did not include assessment of land slope requirements for high-density planting.