

Grower: Arlan Thomas

Crop: Almonds

Location: Chowchilla, Madera County



Project Description

Arlan Thomas is an organic almond grower who was motivated to replenish the overdrafted aquifer below his farm to save his well from drying up and to prevent land subsidence. The organic farm used vegetative cover crops in alternate rows to help increase the water infiltration rate on the orchard floor. This farm has desirable Soil Agricultural Groundwater Banking Index (SAGBI) and Land IQ ratings that prioritized the site for on-farm recharge.

Mr. Thomas was willing to apply higher rates as one of the initial on-farm recharge pilot sites in the San Joaquin Valley because the almond trees were very old and the risk was lower as he planned to remove the almond trees in the near future. Yields were already low as a result of crop age.

This farm was the subject of an in-depth study, [*On-Farm Flood Capture and Recharge at an Organic Almond Orchard, Recharge Rates and Soil Profile Responses*](#) by Phil Bachand & Associates, Davis, California, and Tetra Tech, Rancho Cordova, California (April 2017). The information in this case study is largely based on the Bachand/Tetra Tech report, which focuses on salinity, soil moisture, and other aspects of the effects of on-farm recharge on tree crops.

Field Description

Category	Details
Acres	<ul style="list-style-type: none"> • 13.5 acres high recharge (targeted 2 feet of water per recharge event). • 13.75 acres medium recharge (targeted 1 foot of water per recharge event). • 26.25 acres control (no on-farm recharge).
Type of crop	Organic almonds since 2014.
Age of crop	<ul style="list-style-type: none"> • Planted 1976 (40 years old at time of recharge). • Well past prime (usually 25–30 years old).
Average rood depth	4–5 feet.
Irrigation infrastructure	Flood infrastructure using district turnouts.
Soil amendment	<ul style="list-style-type: none"> • Mr. Thomas relied on cow manure compost inputs every other row at 5 tons per acre to fertilize the almond trees (equivalent to 225 pounds per acre of nitrogen). • Mr. Thomas grew cover crops on the plant rows where manure was not applied. He mowed the cover crop to a height of 2 inches and spread the plant residues on the topsoil in the late fall.

Hydrogeology

Category	Details
Soil texture	Loamy sand.
Land IQ rating	<ul style="list-style-type: none"> • Moderately good. • The grower’s field observation experience leads him to think infiltration is very high.
SAGBI rating	Good to excellent.
Restrictive layers	Corcoran clay layer about 180 feet below ground surface
Depth to groundwater	160–170 feet

On-Farm Recharge Logistics

Category	Details
Source of water	Chowchilla Water District (CWD).
Maximum diversion rate	3–6 cubic feet per second.
Method of diversion	CWD canal turnout with gravity flow to the field.
Cost of water	CWD delivered surface water at \$118 per acre-foot to customers who were able and willing to participate in on-farm recharge.
Field preparation and management during recharge	<ul style="list-style-type: none"> • Before recharging, the grower mowed the cover crop to approximately 4–5 inches. • Trees are planted on raised plant lines, so no further preparation was needed to manage water in the field.
Nutrient management	No additional fertilizer inputs were made in-season besides the manure compost prior to the dormant season.
Average inundation height	3–4 inches.
Duration of inundation	<ul style="list-style-type: none"> • The fields were inundated for two days, then rotated back through the field for additional water applications. • Actual infiltration of water applied was within 24 hours.
Time to dry down	3–4 days.

Recharge Events

High Recharge Site

Dates of recharge (2016)	Duration (days)	Field size (acres)	Water applied (total acre-feet)	Water applied (feet per acre)	ETc (feet)	Net water recharge (total acre-feet)	Net water recharge (feet per acre)
June 4– June 13	10	13.5	92.9	6.88	1.76	64.39	4.77
June 28– July 3	6	13.5	92.9	6.88	1.76	64.39	4.77
July 20– July 26	7	13.5	92.9	6.88	1.76	64.39	4.77

Table notes: Dates of recharge, field size, and water applied sourced from grower. Crop evapotranspiration (ETc) value sourced from California Irrigation Management Information System station #71C.

Net water recharged = water applied – (1.2 x ETc x acres).

Medium Recharge Site

Dates of Recharge (2016)	Duration (days)	Field size (acres)	Water applied (total acre-feet)	Water applied (feet per acre)	ETc (feet)	Net water recharge (total acre-feet)	Net water recharge (feet per acre)
June 1– June4	4	13.75	42.25	3.07	1.76	13.21	0.96
June 25– June28	4	13.75	42.25	3.07	1.76	13.21	0.96
July 18– July 20	4	13.75	42.25	3.07	1.76	13.21	0.96

Table notes: Dates of recharge, field size, and water applied sourced from the grower. ETc value sourced from California Irrigation Management Information System station #71C.

Net water recharged = water applied – (1.2 x ETc x acres).

Control Site (Irrigation)

Dates of Recharge (2016)	Duration (days)	Field size (acres)	Water applied (total acre-feet)	Water applied (feet per acre)	ETc (feet)	Net water recharge (total acre-feet)	Net water recharge (feet per acre)
May 13– June 16	4	26.25	43.19	1.65	1.75	-11.94	-0.45
June 23– June 25	3	26.25	43.19	1.65	1.75	-11.94	-0.45
July 18	1	26.25	43.19	1.65	1.75	-11.94	-0.45

Table notes: Dates of recharge, field size and water applied sourced from the grower. ETc value sourced from California Irrigation Management Information System station #71C.

Net water recharged = water applied – (1.2 x ETc x acres).

Changes in Field Conditions

Category	Details
Diseases and weeds	No evidence of disease was found.
Yields	Yields were approximately 1,500–1,600 pounds per acre in 2010. Six years later, yield was down to a low of 400–600 pounds per acre in 2016. The grower expected the decline in yield because the crop was 40 years old at the time of this recharge event and well past its prime growing years.
Salinity	For information on salinity dilution impacts resulting from recharge, see the Bachand report .
Changes to field practices	None.

On-farm Recharge Pilot Projects Case Study

The following information on tree fall is sourced directly from the [Bachand report](#), Table 5: Tree Fall Observations, June 22, 2016.

Treatment	Number of Trees down	Area (acres)	Number of Trees down per acre
Control	5	26.25	0.2
Medium	5	13.75	0.4
High	8	13.5	0.6
Total	18	53.5	0.3

Note: According to the grower, the number of trees felled is normal for this orchard. Differences between treatments are within the range of variability that he has observed in the past, with trees less healthy on the west side (high treatment) than on the east side (control treatment) of the orchard.

Grower's Experience

Category	Details
Grower observations	The grower was surprised at how easy it was to apply a large amount of water to recharge. He would not be surprised if 10–15 feet of water can be recharged on the same field.
Grower motivations	Mr. Thomas wants to promote the future of recharge collaboration for the benefit of the farm community. He thinks that all growers should get involved in on-farm recharge for the benefit of the community.
Monitoring systems	For information on various monitoring methods to measure effects of recharge, see the Bachand report .

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