



SOIL HEALTH BOTTOM LINE PROGRAM

JUNE 2025

Irrigation Efficiency & Economic Case Study

Alec Earle, E&S Farms, LLC

E&S Farms LLC owns an 18-acre almond orchard in Merced County, California with family members. Alec Earle is the previous co-owner, and in 2015 he planted the orchard (Nonpareil and Monterey). The farm is in a region surrounded by tree crops, annuals, and dairies. The soils consist of clay and clay loams atop flat terrain, and micro-sprinklers are in place to provide irrigation. This Irrigation Efficiency and Economic Case Study describes Alec's background, irrigation practices, and the economic impacts of practice adoption.

Alec's start in farming began after his retirement as an Air Force officer. Prior to planting, he conducted extensive research on tree varieties, orchard production, and irrigation management. Alec's military career provided him with organizational skills and an eye towards detail, which he incorporated into his farming career. Motivated by the challenges of growing crops on clay soils, in a region affected by drought and reduced groundwater supplies, E&S Farms applied for numerous grants to help pay for practices that improve irrigation and energy efficiency, reduce input costs, and improve soil health. Alec says, "I aim to be as efficient as possible with water and inputs, and I strive to grow productive crops while farming sustainably. There are different websites and services to improve your farming operation. There's help and funds available, but you need to do some research and look for the programs."

Financial Assistance Programs

In 2020, E&S Farms applied for California's Healthy Soils Program (HSP) grant and received funding to apply compost for three consecutive years. As a result, Alec reports better nutrient availability and water retention, allowing for reduced irrigation applications. In 2022, the farm was awarded a USDA Environmental Quality Incentive Program Grant (EQIP) to plant cover crops and install sand

media filters to reduce the clogging of the micro-irrigation system.

E&S Farms applied for the State Water Efficiency & Enhancement Program (SWEEP) and received financial assistance to install automated soil moisture sensors, an irrigation pump Variable Frequency Drive (VFD), and an irrigation pump retrofit. In addition, SWEEP funded the installation of a weather station and a pump flow meter.

Efficient Irrigation Practices

E&S Farms realizes multiple benefits from installing the irrigation system enhancements. The automated sensors allow for remote viewing of moisture levels in real-time and to see impacts from irrigation and rain events. The weather station provides orchard weather conditions and evapotranspiration (ET) data, which can also be read remotely. E&S Farms combines the flow readings, ET, and soil moisture data to help guide irrigation scheduling with the goal of applying adequate water to maintain tree vigor while avoiding water stress or over-irrigation. Alec says "The tools help us schedule our irrigations more precisely. We are able to maintain a constant level of soil moisture throughout the season, without periods of saturation. The trees are more vigorous and we have been able to reduce water use and save money."

The VFD automatically decreases or increases the irrigation pump motor speed to meet the actual flow demands of the irrigation system. Operating at less than full throttle has lowered energy costs for the farm. The pump retrofit increased flow production from 400 gpm to 550 gpm, and pumping efficiency improved, further reducing energy costs.

The Bottom Line

The Cost-Benefit Analysis, displayed in a T-chart (shown below), is a partial budget analysis that assesses the irrigation practice costs and income

Key Facts

COUNTY: Merced, California

WATERSHED: Merced River

CROPS: Almonds

FARM SIZE: 18 acres

SOIL: Clay and Silty Clay Loam

IRRIGATION EFFICIENCY PRACTICES:

- Soil moisture sensors
- Weather Station ET data
- Flow meter
- Pump tests and retrofit
- Pump Variable Frequency Drive
- Distribution uniformity testing

American Farmland Trust's **SOIL HEALTH BOTTOM LINE PROGRAM** supports research and on the ground programs that assist in the protection of California's diverse farms and ranches. AFT's Soil Health Bottom Line Program supports on-farm research that showcases the economic and environmental benefits of using efficient irrigation practices.

gain from increased yield. The analysis found a financial gain of **\$480/acre** to the bottom line. Crop productivity has steadily improved, and while primarily due to tree maturity, E&S Farms attributes a 9% increase in yield to the adopted practices. Decreased costs stem from power savings from the VFD and pump retrofit (\$133/acre), lower pumping costs due to reduced water use (\$35/acre), and the elimination of the neutron probe soil moisture monitoring service (\$50/acre). Increased costs are from estimated labor costs for monitoring soil moisture data (\$12/acre), ET rates (\$4/acre), and flow meter readings (\$3/acre).

Final Thoughts

Alec is passionate about irrigation efficiency and regenerative soil health practices to conserve water and energy while building the soil and maintaining optimal crop production. Alec readily adopts technology,

and the grant programs have been a significant contributor to the success of Alec’s farm. Alec says, “SWEEP, EQIP, and Healthy Soils are great programs, and they have been very beneficial to our operation. We are saving money and water, and confident that yields will continue to improve.”

American Farmland Trust utilized the following tools to quantify economic and environmental benefits of efficient irrigation practices: NRCS’s Level III T-Chart analysis to produce costs and benefits.

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Authored by Paul Lum, AFT Senior Agricultural Specialist.



T-CHART: BENEFIT & COST ANALYSIS FROM IMPLEMENTING EFFICIENT IRRIGATION PRACTICES

E&S FARMS, LLC			
Merced, CA • May 2025			
POSITIVE EFFECTS		NEGATIVE EFFECTS	
REDUCED COSTS	\$/AC/YR	INCREASED COSTS	\$/AC/YR
Electricity <ul style="list-style-type: none">Combined VFD & increased pumping efficiencyReduced water pumping due to water conservation practices	\$133 \$35	Variable Frequency Drive (VFD): \$11,541 (paid by SWEEP) ¹	\$0
Automated soil sensors <ul style="list-style-type: none">Eliminated neutron probe monitoring service	\$50	Automated soil sensors: \$4,639 (paid by SWEEP) ¹	\$0
Total Reduced Costs	\$218	Automated weather station: \$3,377 (paid by SWEEP) ¹	\$0
INCREASED REVENUE	\$/AC/YR	Well pump retrofit: \$5,514 (paid by SWEEP) ¹	\$0
Increased yields due to improved irrigation practices (9% increase) ²	\$280	AG-3000 flow meter with data logger: \$3,030 (paid by SWEEP) ¹	\$0
		Management labor <ul style="list-style-type: none">Monitor soil moisture dataMonitor ET dataMonitor flow meter data	\$11 \$4 \$3
		Total Increased Costs	\$18
Total Dollar Benefits	\$498	Total Costs	\$18
\$498/yr Total Benefits - \$18/yr Total Costs = \$480/ac/yr Net Benefits			

References:

1. State Water Efficiency & Enhancement Program (SWEEP) from the California Department of Food and Agriculture (CDFA) grant covered the costs of the VFD (\$11,541), Automated soil sensors (\$4,639),

2. 9% increase in crop revenue, attributed by E&S Farms to improved irrigation practices, based on E&S Farm’s average yield and price, 2024.