California’s community of almond growers is committed to using sustainable agricultural practices that respect the environment and local community, orchard by orchard. And when it comes to following sustainable agricultural practices, California Almond growers and handlers together have been progressive from the beginning and are continuously challenging themselves to do more.

Following more than 40 years of research aimed at improving production practices, in 2009 the almond industry established the California Almond Sustainability Program (CASP) to formalize that effort and to ensure the continuous improvement of grower practices related to the following aspects in their operations:

- **WATER**
- **AIR QUALITY**
- **ENERGY**
- **NUTRIENT MANAGEMENT**
- **PEST MANAGEMENT**
- **BEE HEALTH**

Grower self-assessments capture a snapshot of the almond sustainability journey. In parallel, each of the practices used to grow almonds were evaluated for their relative impact on the environment or grower economics. Having a “critical mass” of acreage assessed enabled the analysis of practices used to grow almonds for their relative impact on the environment or on grower economics. This value analysis has helped the almond community identify which of the many sustainable practices with the greatest impact on the environment are most widely in use, as well as identify those opportunities for more effective use. The results of the analysis have directly impacted the ongoing research and grower education programs offered by Almond Board.

The data, based on grower completed assessments, not only helps the community understand the ongoing efforts of the industry, but also enables growers and handlers to better document and communicate their growing practices.

### WHAT DEFINES CALIFORNIA ALMOND SUSTAINABILITY?

Sustainable almond farming utilizes production practices that are economically viable and are based upon scientific research, common sense and a respect for the environment, neighbors and employees. The result is a plentiful, nutritious, safe food product.

### WATER

**OPTIMAL STEWARDSHIP**

Optimal water stewardship in almond farming is focused on ensuring a healthy tree by:

1. Efficient use of limited water resources
2. Protection of groundwater and surface water quality

These two goals go hand in hand. Efficient irrigation delivers water directly to the root. Newer irrigation technologies, like microsprinkler and drip irrigation, allow nutrients to be delivered to the tree with the irrigation water, resulting in optimized uptake by roots. These technologies also reduce nutrient losses and the potential for contaminants like nitrate to damage groundwater and surface water quality. Decisions about irrigating efficiently can be complex, as growers need to balance not only what their trees need, but also what their soil can hold, how much water is available, the capacity of the irrigation system, changing weather conditions and more.

### LEADING IN WATER EFFICIENCY

California Almond growers are true leaders when it comes to water efficiency. In fact, more than 70% of assessed almond orchards conserve and protect water with micro-irrigation systems (drip and micro sprinklers), despite the significant capital investment and increased management effort they require.

- When partnered with increased use of integrated fertilization and irrigation strategies (fertigation), micro-irrigation has significantly contributed to near doubling of per-acre yields over the last three decades.
- These practices enhance water use by the crop and decrease offsite movement and any resulting effects on the environment.

83% of growers report utilizing demand-based irrigation: reviewing weather, soil moisture and/or tree needs to determine efficient irrigation strategies. Setting up and maintaining the irrigation system is crucial to ensuring that water is used efficiently. Designing irrigation systems to account for any significant differences in soil characteristics is a key water stewardship practice as it enhances water infiltration and distribution. Similarly, maintenance is critical or water can be wasted or underapplied.

- 62% of assessed orchards use soil maps during irrigation system design.
- 71% of micro-irrigation systems have flowmeters installed and 58% of growers monitor the flow meter of each irrigation application to ensure the proper amount of water is flowing through the system.
- 73% of orchards assessed integrate fertilization into irrigation as needed to minimize potential contamination of water resources.

Continued on back.
Sustainability starts with knowledge and almond growers take a long-term view, based on data and leveraging research. By understanding the impacts and trade-offs associated with each management decision, almond growers continue to provide a plentiful, nutritious and economically viable product while protecting the environment and our communities.

**PROTECTING WATER QUALITY**

In addition to the water quality benefits afforded by advances in irrigation improvements, almond growers use a range of techniques to reduce potential impact on water quality.

- 89% of growers reported using **no-till or other floor management techniques** to avoid soil disturbance and, thus, erosion.
- More than 86% of growers use **Integrated Pest Management (IPM) principles** to minimize pests through non-chemical tools and safely manage pesticide applications when necessary.
- 84% of orchards assessed reduce pesticide use by preemptively removing “mummy nuts,” almonds that cling to the tree after harvest and serve as pest habitat.

**FOCUS ON THE FUTURE**

Because almond growers are committed to continual progress, the CASP highlights techniques that growers are beginning to adopt that offer opportunity for ongoing growth.

**For example:**

- 50% of assessed orchards already use advanced technology like neutron probes and tensiometers to measure soil moisture, often in combination with communications technology allowing real-time soil moisture monitoring.
- Many orchards are using crop evapotranspiration (ETc) to calculate the cumulative volume of soil water used by the trees and lost to evaporation.

**Fast Fact:** ABC is co-funding research to further improve irrigation technology by using soil and plant sensors to assess both when and where irrigation is necessary in an orchard. The latest advanced sensing technology, such as electrical conductivity mapping, is now being used by many almond growers to determine best irrigation system design.

Additional tools are integrating various sources of orchard data (weather, soil, irrigation) to further refine irrigation amounts and timing.

An updated Nitrogen Management Planning website is available for growers to help them more precisely calculate the nitrogen needs specifically for almonds (based on recent research) and to assist in making adjustments based on data developed during the growing season.

In the coming years, efforts will focus on reaching as many growers and handlers as possible and creating additional content and tools to increase value and increase education.

**Fast Fact:** By combining old and new technology, growers are now able to make irrigation decisions based on real-time data about their soil and the weather.