



# Improving almond yield through better canopy, water and carbon management

Key insights from the UC Davis short course: Principles of fruit & nut tree growth, cropping & management

## Background

In March 2026, Industry Development Officer, Peter Jealous attended the 'Principles of fruit & nut tree growth, cropping & management' short course at the University of California, Davis. The course brought together more than 40 participants including growers, agronomists, researchers and consultants, primarily from the United States. It was led by leading tree crop physiologist Ted DeJong and focused on the underlying drivers of tree growth, yield and orchard performance. Attendance, as part of the Almond Innovation and Adoption Program (AL22001), aimed to strengthen technical capability, comparing global production systems and identifying practical improvements for Australian almond orchards. This fact sheet highlights the key learnings most relevant to Australian growers.



Students from the UC Davis short course in an almond orchard

**Key message:** Yield is driven by multiple factors including how effectively light, water, nutrition and carbon are managed together across the season, rather than by an individual input alone.

## Canopy structure and light distribution

Orchard productivity is driven by how efficiently light is intercepted and distributed through the canopy. While individual leaves reach photosynthetic saturation at relatively low light levels, many leaves within commercial orchards operate below this due to shading. As a result, canopy size alone does not determine productivity, canopy efficiency does.

- Aim to target 80 percent light interception
- Maintain open canopies that allow internal light penetration
- Remove or manage shaded, unproductive wood
- Use pruning to maintain renewal of fruiting wood



Almond orchards should be pruned to maintain renewal of fruiting wood.

**What you are trying to achieve:** A canopy where most leaves are active and contributing to yield, not just the outer shell.

**Why:** A well-structured canopy with good light distribution will produce more consistent yield than a dense canopy with shaded internal wood.

## Irrigation and tree function

Water use drives photosynthesis, as transpiration enables carbon dioxide to be taken up and converted into carbohydrates. This means any reduction in water availability or plant water status directly limits carbohydrate production. This has immediate impacts on growth and yield, as well as longer-term impacts on tree health and longevity. Irrigation strategies that allow trees to cycle through stress and recovery may be reducing their overall productivity.

- Use evapotranspiration (ET)-based scheduling tools to inform irrigation
- Avoid cycles of stress and recovery
- Use pressure bombs to monitor plant status and calibrate sensors and equipment rather than to trigger an irrigation event
- Aim to maintain consistent transpiration through the season

**What you are trying to achieve:** Trees that are optimising photosynthesis and producing carbohydrates.

**Why:** Stress reduces carbohydrate production, which impacts both current yield and next season's production.

## Early season management and yield potential

The period from bloom through the first 6 to 8 weeks of fruit development is critical in determining final yield and kernel size. During this stage, fruit growth potential is established and is highly sensitive to environmental conditions, particularly water availability and temperature. Maintaining adequate irrigation, nutrition and canopy function during this period is therefore essential. Crop load also influences fruit growth through competition for carbohydrates.

- Avoid water stress from bloom to 6 to 8 weeks after bloom
- Maintain adequate nutrition during early growth
- Manage crop load through canopy balance
- Protect canopy function during this period by managing pests and diseases that reduce leaf area or photosynthetic activity
- Avoid severe pruning or canopy disturbance during active growth

**What you are trying to achieve:** Strong early fruit development that sets fruit and kernel size.

**Why:** Stress during early season reduces yield potential as there is competition for carbohydrates between fruit which cannot be recovered later.



*The period from bloom through the first 6 to 8 weeks of fruit development is critical in determining final yield and kernel size.*

## Post-harvest management and carryover effects

Post-harvest is a critical phase for rebuilding carbohydrate reserves that support flowering and early growth in the following season. Trees continue to photosynthesise after harvest, and this period represents a key opportunity to replenish carbohydrate reserves before dormancy. Maintaining healthy leaf area and continuing appropriate irrigation and nutrition post-harvest is essential for long-term orchard performance.

- Maintain healthy leaves after harvest
- Avoid early defoliation or stress
- Maintain adequate water and nutrient supply after harvest
- Support carbohydrate reserve accumulation

**What you are trying to achieve:** Rebuild carbohydrate reserves for next season.

**Why:** Poor post-harvest conditions reduce flowering, growth and yield in the following year.

## Root function and uptake efficiency

Water and nutrient uptake is determined by the presence and activity of fine roots, rather than simply the availability of resources in the soil. Fine roots are short lived and continuously turning over, with uptake capacity concentrated in young, active root tips. A deficit in irrigation early in the season may limit fine root growth creating deficiencies later in the season as the weather heats up. Root distribution is influenced by irrigation, soil conditions and orchard management, meaning uptake is highly dependent on where roots are active within the soil profile. Sensor data should therefore be interpreted alongside an understanding of root function, as apparent stress signals may reflect reduced root activity rather than tree water deficit.

- Apply irrigation frequently enough to prevent the wetted zone from drying excessively between irrigations
- Avoid prolonged saturated conditions that reduce oxygen availability and root growth
- Apply nutrients through the irrigation system when roots are actively growing and able to take them up

- Encourage roots to explore the desired soil profile through irrigation placement by moving the drip line away from the tree as it grows

Assess root health alongside sensor data

**What you are trying to achieve:** An active root system that can access water and nutrients when needed.

**Why:** If roots are not active, water and nutrients cannot be taken up, regardless of availability.

## Pruning and canopy balance

Pruning plays a central role in managing light distribution, shoot development and crop load. Carbohydrates are not evenly distributed throughout the tree, with leaves and fruit often relying on nearby energy sources. This reinforces the importance of maintaining light exposure across all parts of the canopy. Dependent on tree and row spacings, excessive pruning can stimulate vegetative regrowth and reduce short-term yield, while insufficient pruning may lead to shading and long-term decline in productivity.

- Avoid excessive pruning that drives vegetative regrowth
- Avoid insufficient pruning that may lead to shading
- Maintain consistent renewal of fruiting wood
- Develop a canopy that supports both light penetration and productive fruiting wood

**What you are trying to achieve:** An active root system that can access water and nutrients when needed.

**Why:** If roots are not active, water and nutrients cannot be taken up, regardless of availability



*Pruning plays a central role in managing light distribution, shoot development and crop load.*

## Bloom and pollination conditions

Successful fruit set depends on an effective pollination period, which is influenced by pollen viability, stigma receptivity and ovule longevity. Weather conditions during bloom, particularly temperature, can significantly impact this process. High temperatures can shorten the effective pollination period by accelerating flower ageing and reducing ovule viability, limiting fruit set even when pollen transfer between flowers is occurring successfully.

- Make certain pollinator varieties have good overlap in flowering periods
- Ensure adequate hive numbers, hive strength and pollinator activity during bloom
- Follow the [Honey Bee Best Management Practices For Australian Almonds](#) to support pollinator activity during bloom
- Recognise that abnormally high temperatures during bloom may reduce fruit set

**What you are trying to achieve:** The best possible fruit set under the conditions each season.

**Why:** Even with lots of flowers and strong hives, poor weather conditions during bloom can limit yield.



*Weather conditions during bloom, particularly temperature, can significantly impact fruit set*

## Pest, disease and weed management systems

Effective pest, disease and weed management requires a system-based approach focused on reducing long-term pressure rather than responding to individual events. Pest and disease pressures are strongly influenced by carryover between seasons, reinforcing the importance of sanitation and early intervention. For weed management tree rows typically require higher intensity or more frequent control to minimise competition with tree growth, while mid-rows are managed for access, erosion control and ease of harvest.

- Reduce carryover populations between seasons
- Know pest lifecycles, monitor and act accordingly
- Combine agronomic, biological and chemical control methods
- Manage tree rows and mid-rows differently for weed control

**What you are trying to achieve:** Lower long-term pressure from pests, diseases and weeds.

**Why:** System-based management reduces reliance on reactive inputs and improves consistency.



*Cover crops can be used as an agronomic control to manage weeds and support beneficial insects*

## Conclusion

High-performing almond orchards consistently align canopy structure, irrigation, soil conditions and seasonal timing to maintain continuous tree health and function. Yield is set early in the season and influenced by carryover effects from previous seasons, reinforcing the importance of proactive, system-based management. Practices that optimise light distribution, maintain consistent transpiration, protect early season growth and prioritise post-harvest conditions will support both current productivity and long-term orchard performance across Australian growing regions.

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