

# Irrigation systems for nut orchards: an overview



## FACTSHEET

### *Irrigation systems deliver uniform water across the block, from the first to the last outlet*



*Surface drip irrigation is widely used in nut orchards to apply water efficiently along the tree row, targeting the active root zone while keeping inter-rows drier for easier orchard operations. (Image: GR)*

## 1. Introduction

Irrigation underpins consistent establishment and yield in nut orchards, particularly where rainfall is unreliable or poorly timed.

System choice affects how well water can be placed in the active root zone, how easily the wetted area can expand as trees grow, and how much time and maintenance the system will demand.

## 2. What an irrigation system needs to achieve

- Deliver water evenly across blocks
- Place water where feeder roots are active, especially in young trees with a small root zone
- Cope with your water quality (sediment, algae, salts, iron)
- Match your soil's intake rate and water-holding capacity (*sand behaves very differently to clay*)
- Fit your orchard operations: mowing, herbicide strips, harvest sweeps, traffic lanes, pruning and spraying
- Allow future expansion: larger canopies, deeper roots, higher peak demand, additional blocks

## 3. Grower options

Nut growers can choose from several irrigation system types, each with different strengths.

- 1) **Surface drip** applies low volumes directly along the tree row and can be built up over time by adding emitters or extra lines.
- 2) **Microsprinklers and mini-sprinklers** wet a wider area around each tree, which can suit larger trees and variable soils, but they are more affected by wind and orchard traffic.
- 3) **Subsurface drip** places dripline below the surface to keep rows clear for machinery and reduce surface evaporation, though faults can be harder to detect and repair.
- 4) **Larger sprinkler systems** (such as impact sprinklers or overhead setups) can wet broader areas but generally require higher pressures, use more water per hour, and are more exposed to wind and evaporation losses.

## 4. Surface drip

### 1) How it works:

Low-flow emitters apply water in small wetted bulbs or strips along the tree row.

Typical outputs (per emitter):

2 to 8 L/hr.

### 2) Pros for nut growers

- High water-use efficiency when designed and maintained well
- Targets the tree row and reduces wetting of inter-row
- Suits fertigation and block-by-block control
- Scales well: add emitters or move to inline drip as trees mature.

### 3) Cons and watch-outs

- Filtration and maintenance discipline are non-negotiable (blockage is the usual failure)
- Rodents, ants, UV exposure and machinery can damage laterals
- Narrow wetted patterns can limit root spread if not designed for orchard maturity
- Salt can build up at the edge of the wetted area, so extra flushing may sometimes be needed.

### 4) Best fit

Drip is often the first choice when growers want precise, efficient delivery and flexibility. It suits:

- Limited or restricted water supply
- High pumping and energy costs
- Variable soils within the same block (easy to zone and tailor layouts)
- High-value plantings where uniformity and control are priorities
- Modern orchards wanting staged expansion as trees mature
- Growers planning fertigation and block-by-block control.



*Young hazelnut trees established on a surface drip irrigation line, with tree guards supporting early growth along the row. (Image: Oregon Orchards. With permission)*

## 5. Microsprinklers

### 1) How it works:

Low-trajectory, under-tree sprinklers wet a wider area around each tree than drip.

Typical outputs (per sprinkler):

20 to 60 L/hr.

### 2) Pros for nut growers

- Wider wetted area can promote broader root systems and buffer short-term variability
- Helps with salt management by wetting more soil volume (site dependent)
- Can be more forgiving than drip where soils crack or where emitter placement is challenging

### 3) Cons and watch-outs

- Wet foliage and trunk zones can increase disease pressure in some settings
- Wind affects distribution more than drip

- Mowers, herbicide booms and harvest operations can strike risers and heads
- Still needs filtration; nozzle wear and partial blockages reduce uniformity over time.

### 5) Best fit

Microsprinklers suit growers who want to wet a wider area around each tree and see what the system is doing in real time. They suit:

- Orchards wanting a larger wetted footprint per tree
- Mixed or variable soils where broader wetting helps buffer differences
- Sites where encouraging wider root spread is a goal
- Growers who prefer a visible wet pattern for troubleshooting
- Blocks where dripline damage is likely (provided risers and heads are protected).

## 6. Mini-sprinklers / low-impact sprinklers

### 1) How it works

Higher flow than microsprinklers with broader coverage, often used as trees increase in size.

Typical outputs (per sprinkler): 40 to 100 L/hr.

### 2) Pros for nut growers

- Broad wetting can suit mature orchards and larger canopies
- Can reduce the number of emitters per tree compared with drip-heavy designs
- Easier to see performance and identify failures during operation

### 3) Cons and watch-outs

- More water applied to non-target areas, depending on layout and management
- Wind drift can reduce uniformity
- Greater pumping requirement compared with drip for the same block.

### 4) Best fit

Mini-sprinklers are often suited to larger trees and higher water demand, where a broader wetted



*Mini-sprinklers installed under the tree canopy to wet a broader root zone in an olive orchard, providing uniform coverage along the row. (Image: Rivulus. With permission)*

pattern is preferred. They suit:

- Mid-to-late orchard life as canopies and root zones expand
- Heavier soils where a wider wetted area helps spread water through the root zone
- Blocks with robust pumping capacity & adequate pressure
- Growers wanting fewer outlets per tree than drip layouts
- Situations where a visible, broad wetting pattern helps confirm coverage.

## 7. Impact sprinklers (orchard-scale sprinkling)

### 1) How it works

High-flow sprinklers throw water further and can wet large areas.

Typical outputs (per sprinkler): 200 to 600 L/hr.



*Impact sprinklers operating in an orchard row, delivering broad, high-flow coverage across the orchard floor. (Image: Nelson Australia. With permission.)*

### 2) Pros for nut growers

- Can cover large areas with fewer outlets
- Useful where full-surface wetting is desired (site and system dependent)
- Can provide visible, easy-to-check coverage that helps identify failed or blocked sprinklers.

### 3. Cons and watch-outs

- Lower water efficiency than drip and micro systems in many orchard settings
- High pumping and pressure needs
- Wind drift, evaporation loss and non-uniformity risk rise quickly in exposed sites
- Can increase weed growth and boggy conditions between rows by wetting a larger soil surface area



*Brass impact sprinkler (Image: Nelson Australia. With permission.)*

### 4) Best fit

Impact sprinklers tend to suit larger-scale applications where full-area coverage is desired and the system can justify higher flows and pressures. They suit:

- Existing legacy systems where replacement with micro/drip is not practical
- Selected frost or cooling roles where sprinkler output is designed for that purpose
- Large, open blocks where layout suits wide sprinkler spacing
- Situations where fewer, larger sprinklers are more economic
- Sites with reliable high flow and pressure capacity, and manageable wind exposure.

## 8. Subsurface drip (SDI)

### 1) How it works

Drip lines buried below the soil surface.

### 2) Pros

- Minimal interference with machinery and harvest
- Reduced evaporation from the soil surface
- Less wildlife and UV damage compared with surface drip

### 3) Cons

- Harder to diagnose blockages and breaks
- Root intrusion risk if design and maintenance are weak
- Installation and repairs are more specialised

### 4) Best fit

Subsurface drip suits growers who want water delivery without hardware on the surface, particularly where machinery and harvest operations demand clear rows. It suits:

- Highly mechanised orchards with frequent traffic in tree rows
- Operations wanting clear rows for sweeping and harvest
- Dusty or windy sites where reducing surface evaporation is desirable
- Blocks where surface dripline damage is common (e.g. machinery, wildlife, UV)
- Growers comfortable with more specialised installation



*Subsurface dripline being installed in an orchard row using a tractor-mounted reel and trenching attachment. (Image: Metzer-Group. With Permission.)*

and fault-finding.

## 9. Overhead systems

### 1) How it works

Water applied above the canopy or above the orchard floor by soil set or travelling irrigators.

### 2) Pros

- Can serve multiple roles (irrigation plus some cooling/frost functions, depending on design)
- Full-surface coverage (site dependent)
- Disease risk can rise where canopies remain wet for extended periods
- Wind drift and evaporation can be high
- High infrastructure costs and complex maintenance

### 4) Best fit

Overhead systems suit orchards where water delivery is intended to serve a defined climate-risk role as well as irrigation. They suit:

- Frost-risk sites where an overhead strategy is part of the frost plan
- Heat events where evaporative cooling is used
- Blocks needing whole-area coverage for a specific reasons
- Operations prepared for higher infrastructure, pressure and maintenance demands
- Sites where canopy wetting and disease risk are managed through layout and operation.

## 10. In a nutshell

- 1) A good irrigation system matches your water supply, soils and orchard operations, and keeps delivering evenly as the system ages.
- 2) Start with what you can supply: confirm flow, pressure and water quality
- 3) Choose a system that wets the tree root zone well, and can expand as trees grow
- 4) Design for uniform delivery across the whole block, from first to last outlet
- 5) Fit the layout to how you mow, spray and harvest, so hardware survives traffic



*Overhead sprinklers provide a broad, uniform coverage through a grid of risers. (Image: Nelson Australia. With permission.)*



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