High-density hedge (slim-hedge) design, pruning and training

What is a slim hedge?

Hedges are defined by allowing neighbouring tree canopies to touch along the intra-row, achieving a wall of vegetation and fruit along each lateral face (Figure 1a). Hedge systems may occasionally (e.g., every 1-3 years) have the intra-row tree canopies pruned back between neighbouring trees, if canopies become entangled or too dense, and usually have some internal vegetation removed every year. Mango hedge systems are not a new concept and older, wide-spaced trees have often been allowed to grow into hedges. Wide-spaced hedge designs, however, are often characterised by wide canopy widths, resulting in large voids within the trees, which can harbour pests and diseases and are less efficient for pesticide management practices. The new high-density hedge systems are characterised by very narrow canopy widths (Figure 1b). These hedge systems are known as 'slim-hedges'. They have lower row canopy volumes per hectare, but higher canopy surface area per hectare, than low density systems.

For a video on slim hedge orchard designs and considerations please view the High-density mango orchards: slim hedges video on the Queensland Agriculture YouTube channel.

(a) (b)

Figure 1a. Example of a slim hedge orchard planted in the 1990s at Bowen with average yield of 30-38 tonnes/ha; Figure 1b. Slim hedge orchards are characterized by narrow canopy widths of less than 3m.

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Slim-hedges have the following advantages over wider-spaced hedge or conventional systems:

- Greater orchard canopy surface area per hectare provides greater photosynthetic capacity per hectare
- Greater canopy surface area per hectare means more sites for flowering and fruit production, resulting in higher yields
- Lower tree volume per hectare requires less pesticide spray volume per hectare, thus reducing pesticide input costs and improving efficiencies
- Lower tree volumes per hectare reduces harbourage sites for pests and diseases
- Improved harvesting efficiency. Fruit harvested from short, narrow trees, are more easily and rapidly picked from the ground, either by hand or with short picking sticks, than larger trees
- Efficient use of site resources and input costs


Figure 2

Figure 2. Many growers now use harvest aids when picking. The small Keitt mango trees in this orchard are fast and easy to pick, with the harvest aid applying Mango Wash® to prevent sap burn, before depositing the mangoes into a half-tonne bin.

Principles of slim-hedge orchards

- Tree canopies are maintained as narrow hedges no more than 2 – 3 metres wide
- Trees are planted no more than 2 – 3 metres apart within the row
- Trees are regularly tip-pruned during the establishment years to maximise the number of tertiary fruiting terminals
- Mechanical hedging along the row is implemented early (from approximately year 4 onwards) to maintain the canopy at no more than 2 – 3 metres wide. Mechanical pruning is used to remove only one year of growth to 're-set' the tree each year (Figure 3).
- Maximum tree height is reached by 6 – 7 years and is maintained with mechanical pruning
- Pruning between trees along the row is only necessary every 2 – 3 years.

Figure 3. Post-harvest mechanical pruning is a common practice in Australian mango orchards.

Considerations when planning a slim-hedge orchard

- Sprinkler irrigation systems may be less suitable to high density slim hedge designs due to their smaller canopies and dripline. Consider discussing alternative options - such as dripper systems - with your irrigation supplier.
- A narrower canopy means a less-powerful spray rig is needed to achieve adequate canopy coverage. Alternatively, operators can increase tractor speed when spraying, resulting in savings on labour, chemical and running costs.
- If the hedge face has gaps between trees, trial techniques such as pruning or cincturing to encourage branching to fill gaps. Branches may also be trained using weights or tied to neighbouring trees to encourage growth to fill voids.

Can you retrofit existing low-density orchards?

Retrofitting low density orchards by inter-planting between existing trees is possible but is not without challenges (Figure 4). The newly planted, young trees compete for light and site resources with the larger, established trees and may suffer from higher pest pressure, resulting in poorer thrift. Instead, it is worth considering transitioning to a high-density orchard using a staged approach a block or two at a time. This allows trialing higher planting densities on a small scale to assess the management requirements and economic benefits before implementing it across the entire farm. It also maintains an income stream from existing blocks while the newer high density blocks reach maturity. Ongoing renewal of orchards every decade or two, also means new mango varieties can be incorporated into the farming system.

Figure 4

Figure 4. Low-density orchards, such as this one, are being phased out as the Australian mango industry transitions to higher density planting systems. Retrofitting low density orchards by inter-planting young trees within rows or adding new rows between existing rows, would present management and productivity challenges. Instead, consider a staged approach where old trees are removed a block at a time and replaced with new blocks of higher density plantings.