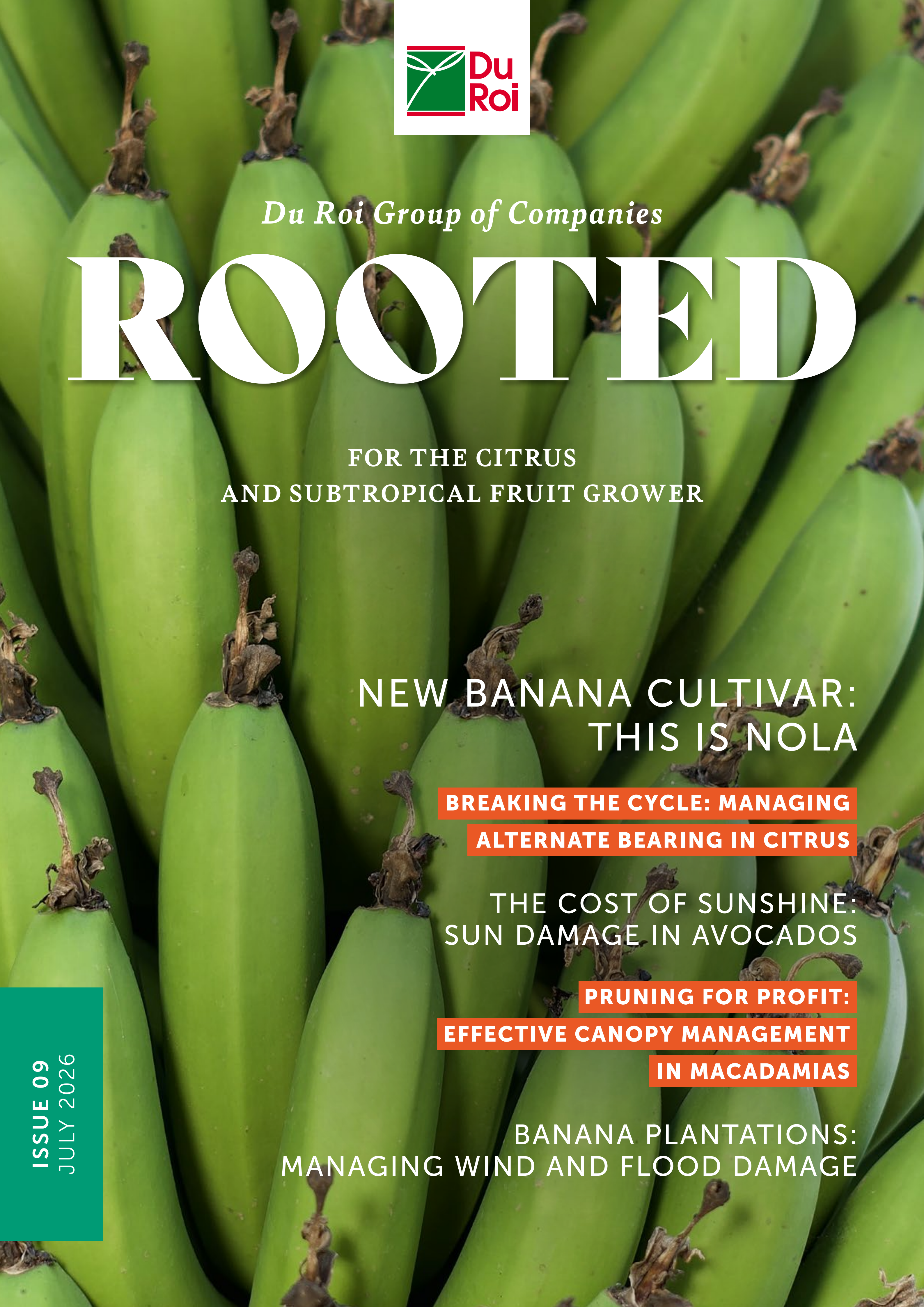


Du Roi

Du Roi Group of Companies

ROOTED

FOR THE CITRUS
AND SUBTROPICAL FRUIT GROWER

NEW BANANA CULTIVAR: THIS IS NOLA

BREAKING THE CYCLE: MANAGING ALTERNATE BEARING IN CITRUS

THE COST OF SUNSHINE: SUN DAMAGE IN AVOCADOS

PRUNING FOR PROFIT: EFFECTIVE CANOPY MANAGEMENT IN MACADAMIAS

BANANA PLANTATIONS: MANAGING WIND AND FLOOD DAMAGE

ISSUE 09
JULY 2026

2026
Q1&2

"Cultivators are the most valuable citizens."

Thomas Jefferson

Du Roi Group of Companies

Du Roi Nursery

Letsitele, Limpopo Province, South Africa

With its 35 years of excellence, Du Roi Nursery specialises in the production of recommended citrus cultivars and rootstocks from certified material. It is the biggest establishment of its kind in Southern Africa. With over 9 hectares of grow-out structure (under shade and under cover), Du Roi Nursery can annually produce more than 1,5 million citrus trees.

Du Roi Nursery follows strict phytosanitary standards by being registered with the South African Department of Agriculture, Forestry and Fisheries in terms of the Plant Improvement Act, as well as being a member of the South African Citrus Nurserymen's Association. Du Roi Nursery is also fully accredited by the Citrus South African Improvement Scheme as a five-star nursery.

Du Roi's team of technical specialists strives to provide the best technical support to all its clients to ensure the success of their citrus development, locally or internationally.

The company does not only aim to get the benefits of selling good products, but also to enhance the communities in and around the vicinity of the facility.

Du Roi Laboratory

Letsitele, Limpopo Province, South Africa

Du Roi Laboratory, established in 1994, specialises in the production and distribution of disease-free, virus-indexed tissue culture plants, with a focus on the banana and sugarcane industries. The Laboratory annually produces over eight million plants for supply to local and international customers in more than 35 countries. Elite selections of banana plants are made available at three stages of development: rooted in-vitro, weaned in-vivo, and nursery-hardened field-ready plants. As an ISO 9001 accredited facility for banana tissue culture production, Du Roi Laboratory provides customers with quality plants with complete traceability from foundation block to the grower.

Du Roi Multiplant

Letsitele, Limpopo Province, South Africa

Established in 1998, Du Roi Multiplant specialises in the production of subtropical crops, such as macadamia and mango, as well as the micro-propagation of guava, pomegranate, litchi and granadilla plants. The company also possess the technology and genetics to produce dragon fruit, kiwi and casuarinas. The company is equipped with specialised rooting facilities which allow for multiple types of plants to be cultivated simultaneously. The plants can be produced in different formats that are suitable for local and international growers.

Du Roi Multiplant is fully accredited by the Seedling Growers Association of South Africa (SGASA) as well as the Department of Agriculture, Land Reform and Rural Development (DALRRD), which guarantees that only high standard trees are distributed locally and internationally.

Furthermore, the nursery partners with the Agricultural Research Council (ARC) in plant breeding and cultivar selection programs and holds propagation licenses with Citrogold and Westfalia to guarantee the supply of elite cultivars.

Cederberg Tree Nursery

Citrusdal, Western Cape Province, South Africa

Established in 2014, Cederberg Tree Nursery (CTN) specialises in the propagation and distribution of field-ready commercial citrus trees. The facility is located in Citrusdal, which has been declared a greening-free and citrus black spot-free area. CTN is fully accredited by the South African Citrus Improvement (SACIP) Scheme, which means all trees are certified and disease-free. The CTN team delivers unparalleled plant quality and goes the extra mile for all their clients.

Du Roi Halls Nursery

Nelspruit, Mpumalanga Province, South Africa

We believe in enabling excellence for all farmers by giving access to top-quality clonal avocado trees that are produced within an environment of developing our people and supported by our collective passion, experience, and pioneering, innovative approach.

In 2017 Halls (a sub-tropical fresh produce business with global footprint) and Du Roi Nursery (SA's largest and most progressive citrus nursery) combined their expertise to address the shortfall of quality avocado trees resulting from the current and projected growth trajectory of the industry.

Du Roi Halls Nursery is registered with the Department of Agriculture, Forestry and Fisheries (DAFF), Avocado Nurserymen's Association (ANA) with a current 5-star accreditation, and a member of the South African Avocado Growers' Association (SAAGA).

From the Director

Zylon McGaffin

Farming has never been simple – but it has rarely demanded more from those who practice it, than it does today. Volatile commodity markets, shifting trade relationships, rising input costs, an upcoming El Niño weather phenomenon and the ever-present uncertainties of global geopolitical tensions are testing the resilience of agricultural producers at every level. We see it in the conversations we have with our clients daily, and we do not take that reality lightly.

It is precisely against this backdrop that we decided to launch ROOTED – a technical publication dedicated to giving Du Roi Group clients the kind of practical, evidence-based knowledge that translates directly into better decisions in the orchard, the packhouse, and the market.

Each issue brings together the expertise of our agronomists, technical managers, and industry specialists, with one shared purpose: to help you achieve optimum yields, consistent quality, and the strongest possible returns for your operation. Whether it is varietal selection, pruning concepts, pest and disease management, or post-harvest handling, our aim is to equip you with the tools to keep improving – season after season.

We are also deeply grateful. The trust our clients place in Du Roi is the foundation on which everything we do is built.

Your continued partnership – through good seasons and difficult ones – is not something we take for granted. Thank you for choosing to grow with us.

The road ahead will not be without its challenges. Geopolitical tensions continue to disrupt global supply chains and export markets, and the economic pressures facing the agricultural sector are real and significant. But we remain committed to standing alongside you – not only as a supplier of plant material, but as a long-term partner invested in the success of your farm and the sustainability of the industry as a whole.

We hope you find ROOTED to be a resource you reach for often. As always, we welcome your feedback.

2026
Q1&2

Contents

Rooted edition 9

BREAKING THE CYCLE:

Managing alternate bearing in citrus

Alternate bearing remains a major production challenge in many citrus orchards. The phenomenon refers to the tendency of trees to produce a heavy crop during one season (the "on" year), followed by a significantly lighter crop in the subsequent season (the "off" year). In addition to causing inconsistent yields, alternate bearing also affects fruit size, pack-outs, market timing, and long-term orchard profitability. In severe cases, once established, the cycle can persist for several years.

Many mandarin and easy peeler cultivars are particularly prone to alternate bearing, although the problem can occur across many citrus cultivars. Heavy crop loads during an "on" year place the tree under substantial physiological stress. As the fruit become the dominant sink for carbohydrates and nutrients, vegetative growth and root development are suppressed, reducing the formation of new flowering sites for the following season.

Historically, alternate bearing has been largely attributed to carbohydrate depletion. Research has demonstrated that heavily cropped trees contain significantly lower starch reserves than lightly cropped trees, particularly in roots, branches, and leaves. Goldschmidt and Golomb (1982) showed that "off" trees accumulate substantially greater carbohydrate reserves than "on" trees, supporting the theory that reserve depletion contributes to poor return bloom.

However, more recent research suggests that carbohydrates alone do not fully explain alternate bearing. Studies increasingly point towards a complex interaction between carbohydrate availability, hormonal signalling, and flowering regulation. Developing fruit are associated with hormonal signals, including gibberellins, that can suppress floral induction in nearby buds. Heavy fruit loads therefore reduce the number of flowers formed for the following season, even when environmental conditions remain favourable.

The suppression of vegetative growth during heavy crop years is another important factor. Summer vegetative flushes play a critical role in producing future bearing wood. Research on Nadorcott mandarins has demonstrated that excessive fruit load significantly reduces summer shoot development and root growth, directly contributing to poor flowering in the following season. Fruit effectively outcompete vegetative tissues for assimilates, weakening the tree's ability to renew a productive canopy structure.

Environmental and orchard stresses can further intensify alternate-bearing cycles.

Heat stress, water deficits, nutrition limitations, pest pressure, and poor canopy condition during an "on" year may place additional strain on already heavily cropped trees.

If trees enter winter with depleted reserves and limited vegetative development, return bloom is often poor. Once the cycle becomes established, growers may struggle to restore consistent production without active management intervention.

2026
Q1&2

FRUIT THINNING

One of the most effective strategies for managing alternate bearing is crop load regulation. Excessive fruit numbers should be viewed as a physiological burden rather than simply as a sign of high productivity. In heavy flowering years, thinning practices can help to reduce competition between fruit and vegetative growth. Although manual thinning in citrus is often impractical on a large scale, selective hand thinning, chemical thinning (where appropriate and registered), or pruning-based crop load adjustment may assist in balancing the crop load. The goal is not necessarily to maximise yield during a single season but rather to stabilise production across multiple years.

HARVEST TIMING

Harvest timing also plays a significant role. Fruit retained late on the tree can prolong the inhibitory effect of crop load on floral induction, particularly in alternate-bearing mandarin cultivars. The earlier harvesting of mature fruit may therefore improve return bloom and reduce biennial fluctuations.

PRUNING

Pruning can help to moderate alternate bearing when used as part of a crop-load management strategy. In light crop years, trees often produce strong vegetative growth. Selective pruning can improve light penetration, remove poorly positioned wood, and reduce excessive bearing potential for the following season. The aim is not simply to remove wood but to maintain a balanced canopy with enough good-quality bearing shoots for regular production.

NUTRITION AND WATER MANAGEMENT

Nutritional and irrigation management remain equally important. Trees carrying heavy crops require sufficient nutrient availability to simultaneously support fruit development and vegetative growth. Nitrogen management should promote healthy flushing without encouraging excessive vegetative vigour late in the season. Potassium demand is high during heavy crop years because of its role in fruit growth, fruit quality, and general tree function. Water stress should also be minimised during the key stages of fruit growth and summer flushing, as stressed trees are more susceptible to severe alternation.

Ultimately, alternate bearing should not be viewed as a single-cause problem. The condition develops through a combination of excessive crop load, suppressed vegetative growth, carbohydrate competition, and hormonal inhibition of flowering. Successful management therefore requires an integrated approach focused on maintaining tree balance throughout the production cycle.

Consistent yields are rarely achieved by pushing trees to maximum production in a single year. Instead, sustainable citrus production depends on managing the crop load, maintaining healthy vegetative growth, and supporting the long-term physiological balance of the orchard.

References

Agustí, M., Reig, C., Martínez-Fuentes, A., & Mesejo, C. (2022). Advances in citrus flowering: A review. *Frontiers in Plant Science*, 13: 868831. DOI: https://doi.org/10.3389/fpls.2022.868831

Goldschmidt, E. E., & Golomb, A. (1982). The carbohydrate balance of alternate-bearing citrus trees and the significance of reserves for flowering and fruiting. *Journal of the American Society for Horticultural Science*, 107(2): 206–208.

Matias, P., Barrote, I., Azinheira, G., Continella, A., & Duarte, A. (2023). Citrus pruning in the Mediterranean climate: A review. *Plants*, 12, 3360. DOI: https://doi.org/10.3390/plants12193360

Nishikawa, F. (2013). Regulation of floral induction in citrus. *Journal of the Japanese Society for Horticultural Science*, 82(4): 283–292.

Shalom, L., Samuels, S., Zur, N., Shlizerman, L., Zemach, H., Weissberg, M., Ophir, R., Blumwald, E., & Sadka, A. (2012). Alternate bearing in citrus: Changes in the expression of flowering control genes and in global gene expression in on- versus off-crop trees. *PLOS One*, 7(10): e46930.

Stander, O. P. J., & Cronjé, P. J. R. (2016). Reviewing the commercial potential of hand thinning in citrus with a cost-benefit analysis of summer hand thinning of "Nadorcott" mandarin. *HortTechnology*, 26(2), 206–212.

Stander, O. P. J., Barry, G. H., & Cronjé, P. J. R. (2018). Fruit load limits root growth, summer vegetative shoot development, and flowering in alternate-bearing "Nadorcott" mandarin trees. *Journal of the American Society for Horticultural Science*, 143(3): 213–225.

Verreynne, J. S., & Lovatt, C. J. (2005). Mechanism and underlying physiology perpetuating alternate bearing in citrus. *HortScience*, 40(4): 1117C–1117.

THE COST OF SUNSHINE:

Sun damage as a loss factor in avocado production

A sunny December holiday at the beach is a good way to conclude a busy season on the farm. Unfortunately, your avocados back home do not enjoy basking in the sun quite as much as you do.

In South Africa, the avocado production cycle coincides almost perfectly with the country's hottest and highest-radiation months. Critical phenological stages such as flowering, fruit set, and fruit sizing all occur during spring and summer, when UV and ambient temperatures are at their peak. According to industry observations and South African Avocado Growers' Association (SAAGA) technical information, sun damage is an important contributor to fruit rejection, alongside factors such as wind damage, insect damage, lenticel damage, and postharvest disease.

Climate variability, prolonged heatwaves, reduced cloud cover, and poor canopy protection are contributing to a noticeable increase in sunburn incidence across many production regions *(Whiley et al., 1999).*

Sun damage is not simply a cosmetic issue. Even superficial marks can lead to downgrading, reduced export quality, a shorter shelf life, and increased susceptibility to pre- and postharvest disease. In severe cases, the fruit become completely unmarketable. As international markets continue to demand high standards, growers are under pressure to minimise sun damage without compromising yield.

Although avocado trees are naturally adapted to warm subtropical climates, commercial production systems often push orchards into increasingly marginal heat conditions.

UNDERSTANDING SUN DAMAGE TO AVOCADOS

Sunburn develops when fruit surface temperatures exceed the avocado skin's physiological tolerance threshold. Research conducted by the University of California found that avocado fruit surface temperatures can exceed ambient air temperatures by as much as 15–20 °C under direct sunlight (Schroeder, 1953). Damage commonly begins when fruit surface temperatures rise above 45 °C.

Initially, affected fruit may develop pale yellow or bronze patches on the side exposed to direct sunlight. As injury progresses, these areas darken into brown or black necrotic lesions. The skin becomes roughened, cracked, and, in severe cases, collapses inward.

Fruit exposed on the western and north-western sides of the canopy are generally the most vulnerable due to the intense accumulation of afternoon heat.

The tree itself also suffers from prolonged heat stress. Leaf scorching, margin burning, branch dieback, and canopy thinning are common symptoms during severe summer heatwaves. However, this often creates a vicious cycle: as the canopy becomes thinner, more fruit is exposed to direct sunlight, increasing the risk of additional damage.

Figure 1: *Sunburn on young fruit in an orchard in Kiepersol, Mpumalanga. Defoliation caused by a hailstorm left these fruits unprotected when a 42 °C day followed. (Source: Fresh Plaza)*

Researchers such as Whiley et al. (1999) and Wolstenholme (2002) have repeatedly highlighted the importance of maintaining a healthy canopy structure as the orchard's primary natural defence mechanism against heat stress and sunburn.

2026
Q1&2

REGIONAL VULNERABILITY WINDOWS

Although sunburn occurs throughout South Africa's growing regions, observations by growers suggest that regional risk windows differ across South Africa.

In Mpumalanga and Limpopo, high summer temperatures combined with low relative humidity create ideal conditions for severe sunburn on fruit. Orchards in these regions are particularly vulnerable between October and February, during periods of rapid fruit growth and heatwaves exceeding 35 °C. Dry winds can cause moisture stress that rapidly increases fruit surface temperatures beyond critical thresholds.

In KwaZulu-Natal, a slightly different challenge is faced. Although humidity levels are generally higher – reducing some evaporative stress – intermittent cloud cover can create sudden exposure to high UV. Fruit that develop under overcast conditions may not be acclimatised properly to intense solar radiation when skies clear suddenly. Growers in these regions often report severe damage following short periods of extreme heat after prolonged overcast, humid conditions.

The Western Cape, despite being cooler overall, is not exempt from sunburn. Dry summer winds and sudden temperature spikes associated with berg winds can cause substantial damage, particularly in orchards where wind has caused defoliation, opening the canopy.

In the Southern Cape, meanwhile, many growers observe increased damage during January and February when dry heat coincides with low soil moisture availability.

SECONDARY COMPLICATIONS

One of the most underestimated aspects of sun damage is its role as a gateway to secondary problems.

Sunburned tissue is physiologically weakened and often deteriorates faster after harvest. Where skin is cracked or necrotic, the fruit are also more vulnerable to secondary infection and decay. This can aggravate postharvest problems such as anthracnose and stem-end rot, especially where latent infections are already present, shortening shelf life and increasing packhouse losses.

Some growers have also observed increased opportunistic insect feeding on compromised fruit surfaces, but published research on this interaction remains limited. Although sunburn itself is not caused by pests, the resulting weakened tissue creates conditions that favour further damage. This compounding effect means that even relatively low levels of sunburn can ultimately contribute to economic losses throughout the supply chain.

Figure 2: *Severe sun damage on a Fuerte avocado where the flesh has become soft and sunken in. This creates an entry point for pests and pathogens. (Source: Greg Alder – The Yard Posts)*

PRACTICAL SOLUTIONS FOR GROWERS

There is no silver bullet to sunburn management. Successful control depends on integrating canopy management, irrigation, plant nutrition, cultivar selection, and protective sprays into a holistic strategy.

Among the most important management tools is **pruning.** The excessive opening of the canopy before peak summer often exposes previously shaded fruit before it has had time to acclimatise to harsh sunlight. Many growers unintentionally create severe sunburn conditions through aggressive summer pruning programmes. According to *Wolstenholme (2002)*, maintaining balanced internal leaf cover is one of the most effective long-term strategies for reducing fruit surface temperatures.

Pruning should therefore aim to improve light penetration without excessively exposing fruit to afternoon sun. Staggered or selective pruning over multiple seasons is often preferable to severe canopy removal in a single year.

Nutrition and irrigation management also play an important supporting role. Trees undergoing water stress lose their ability to regulate canopy temperature effectively through transpiration. Even short irrigation interruptions during extreme heat can significantly increase sunburn severity by causing wilting and defoliation. Furthermore, balanced calcium and potassium nutrition supports cell wall integrity and stress tolerance, and silicon supplementation has shown promising results in improving plant resilience under conditions of environmental stress.

Protective sprays have gained popularity across avocado regions globally. Reflective particle films, including aluminium-silicate, kaolin-based products, and calcium carbonate formulations, work by reflecting a portion of incoming solar radiation and reducing fruit surface temperatures. Research from the University of California Agriculture and Natural Resources has demonstrated measurable reductions in fruit surface temperatures following the application of reflective films during heat events. However, timing and coverage remain critical. These products are generally most effective when applied preventatively before major heatwaves rather than reactively after damage has already occurred. Reapplication is also needed as many of these products can wash off with rain.

Pests such as thrips and other sap-sucking insects, together with diseases like Phytophthora, can indirectly increase sunburn on fruit as a result of stress and defoliation within the canopy. As leaves are damaged or lost, previously shaded fruit become exposed to direct sunlight and high surface temperatures. Trees affected by root disease or severe pest pressure are also less able to regulate water uptake and canopy cooling through transpiration, further increasing susceptibility to heat and sun damage.

Cultivar selection can also be beneficial. Certain varieties, such as Lamb Hass, naturally have denser canopies, more favourable fruit positioning within the tree, and thicker skins. Source BI's 2024 summary of losses per cultivar showed that Lamb Hass has the lowest percentage of all South African avocado cultivars. In high-risk production areas, orchard establishment decision-makers should consider long-term sunburn resistance alongside yield potential.

Even when these management protocols are implemented effectively, sun damage can still occur during harvesting if fruit remain exposed in picking crates under direct sunlight. To minimise this risk, harvested fruit should be kept in shaded areas or covered with shade netting immediately after picking. During transport from the orchard to the packhouse, crates should remain covered to reduce exposure to excessive heat, solar radiation, and wind, thereby preserving fruit quality and minimising additional damage.

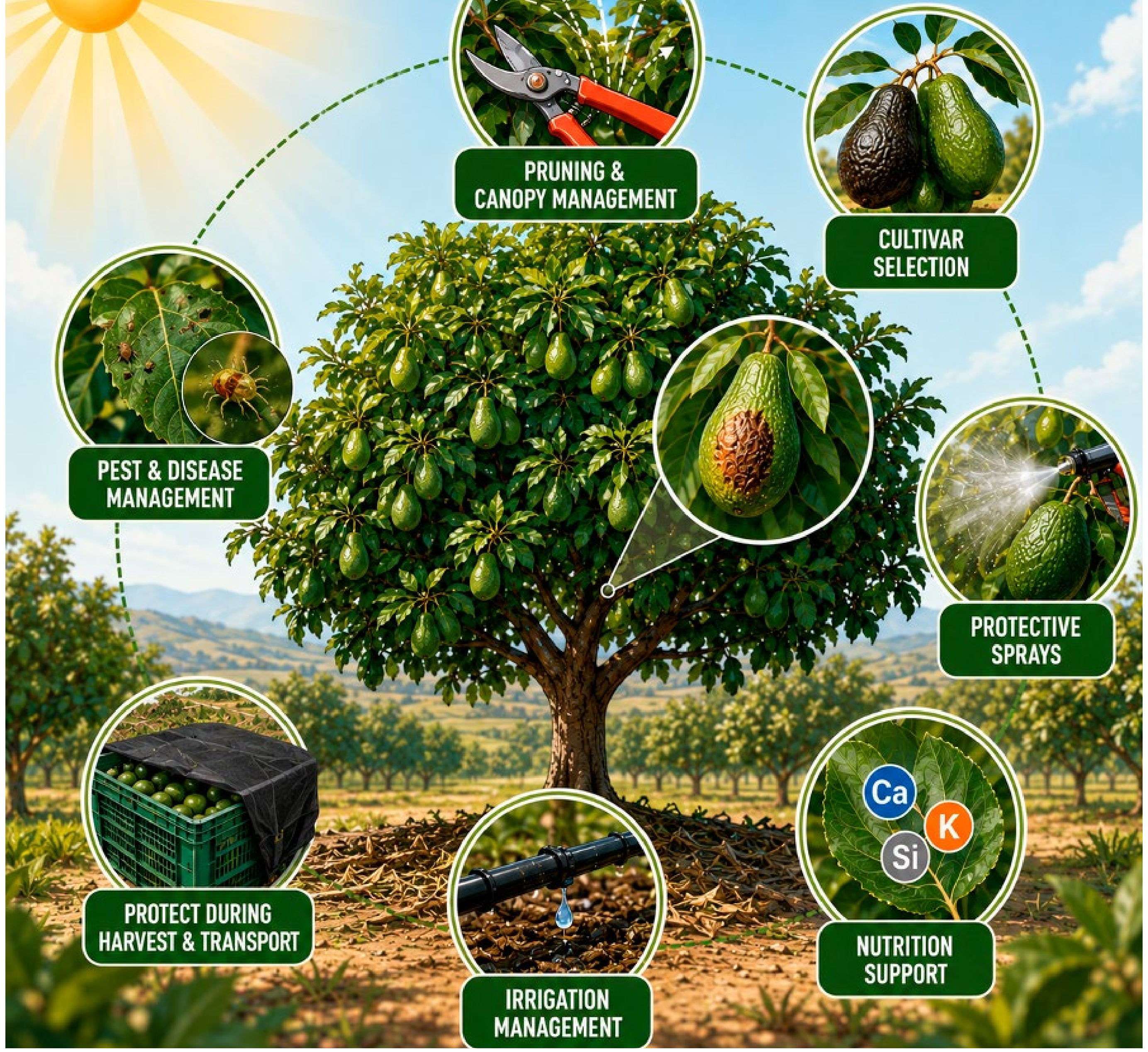


Figure 3: *Key orchard and harvest practices that reduce sunburn risk to avocados.*

(Source: Image generated using artificial intelligence (OpenAI ChatGPT) and reviewed by the authors.) (Source: Greg Alder – The Yard Posts)

"'N BOER MAAK 'N PLAN"/ASK A FARMER

South African growers have become increasingly innovative in managing and mitigating sunburn.

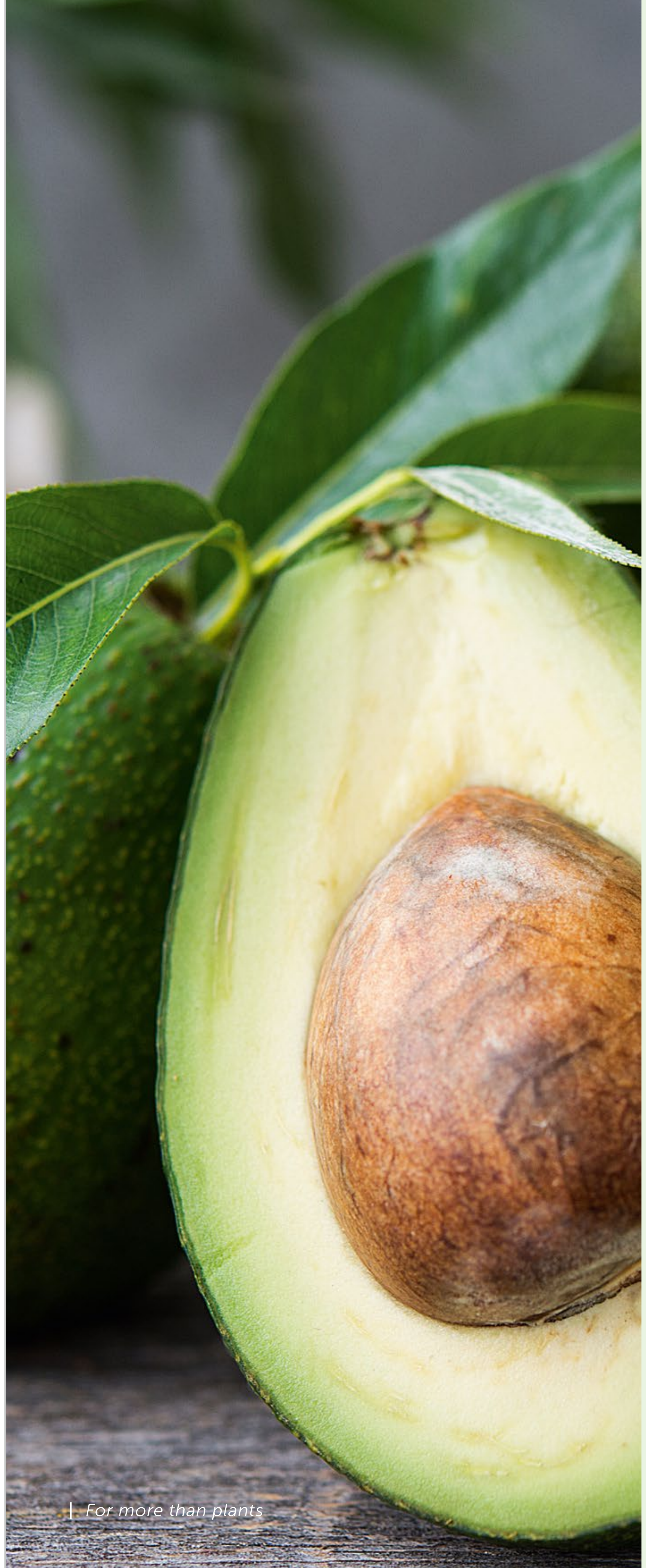
In regions such as Mpumalanga and Limpopo, some producers are modifying pruning systems specifically to maintain western canopy protection during the hottest months of the year. Others are experimenting with shade netting on younger orchards or adjusting row orientation to reduce afternoon sun exposure to fruit.

Growers in the Southern Cape, where berg winds frequently strip leaves and expose fruit suddenly, often emphasise the importance of dealing with the primary problem first by installing windbreaks in the orchard, thereafter implementing gradual canopy management and maintaining tree health throughout stressful periods.

The common thread among successful orchards is proactive management. Sunburn control is rarely achieved through one intervention alone. It is the cumulative result of thoughtful orchard design, balanced tree canopy, nutrition management, and the proper handling of fruit from farm to packhouse.

What's next?

In the next edition of Rooted, we'll explore the third-largest loss factor to the avocado industry – insect damage.



References

California Avocado Commission. *Heat stress publications.* https://www.californiaavocadogrowers.com

Schroeder, C. A. (1953). Growth and development of the "Fuerte" avocado fruit. *Proceedings of the American Society for Horticultural Science,* 61, 103–109.

South African Avocado Growers' Association. *Technical production information.* https://southafrica.co.za/south-african-avocado-growers-association.html

University of California Agriculture and Natural Resources. *Avocado heat management resources.*

Whiley, A. W., Schaffer, B., & Wolstenholme, B. N. (Eds) (1999). *The avocado: Botany, production and uses.* Wallingford, Oxon, UK: CABI Publishing.

Wolstenholme, B. N. (2002). "Ecology of the avocado tree". In: Whiley, A. W., Schaffer, B., & Wolstenholme, B. N. (Eds), *The avocado: Botany, production and uses* (2nd ed.). Wallingford, Oxon, UK: CABI Publishing.

2026
Q1&2

"The soil is the great connector of lives, the source and destination of all."

Wendell Berry

2026
Q1&2

NEW BANANA CULTIVAR:

This is Nola

Before his retirement, Dr John Robinson, one of the most respected banana researchers, was finalising his last cultivar, Nola. Nola is a refined selection from the Nandi, bred for shorter plant height, a more cylindrical bunch, and a faster crop cycle.

The variety never reached commercial release after monkeys destroyed the Ratoon 1 trial fruit shortly after Dr Robinson retired, leaving the dataset incomplete and the variety idling in the Mother Block for years.

Du Roi Laboratory has since reestablished a trial, with the parent crop data collection now completed.

The full three harvest evaluation is still underway, but with early interest of some commercial farmers, orders and plantings of Nola are already established ahead of its official release.

Full Comparison Summary

Mean ± standard deviation for all key agronomic metrics

METRIC	NOLA (NEW)	WILLIAMS (CONTROL)	DIFFERENCE	BETTER
Days to flower	320.9 ± 18.6 days	340.0 ± 36.2 days	-19.1 days	NOLA
Crop cycle	446.1 ± 16.9 days	465.0 ± 36.8 days	-18.9 days	NOLA
Timing consistency (SD)	±16.9 days	±36.8 days	53% less variable	NOLA
Bunch weight	31.2 ± 6.2 kg	30.0 ± 6.8 kg	+1.2 kg	NOLA
Hands per bunch	11.1 ± 1.9	9.7 ± 1.9	+1.3 hands	NOLA
Plant height	2,123 ± 198 mm	2,305 ± 294 mm	-182 mm shorter	NOLA
Stem circumference	713.6 ± 33.1 mm	743.0 ± 36.0 mm	-29.4 mm	WILLIAMS
2nd hand avg finger	20.5 ± 1.7 cm	21.6 ± 1.1 cm	-1.1 cm	WILLIAMS
7th hand avg finger	19.4 ± 1.2 cm	19.3 ± 1.2 cm	+0.1 cm	EQUAL
2nd–7th hand diff	1.47 ± 0.92 cm	2.40 ± 1.42 cm	-0.93 cm	NOLA
Cylindricity	More cylindrical	Less cylindrical	39% less taper	NOLA

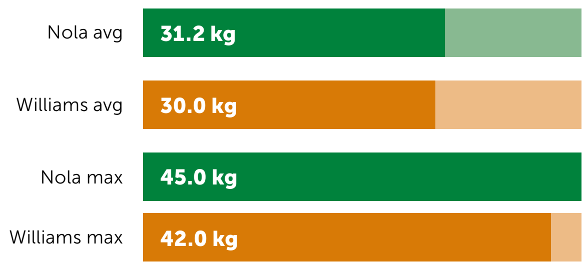
Bunch & Yield Metrics

Bunch weight and number of hands per bunch

Bunch Weight (kg)

Average fresh bunch weight in harvest

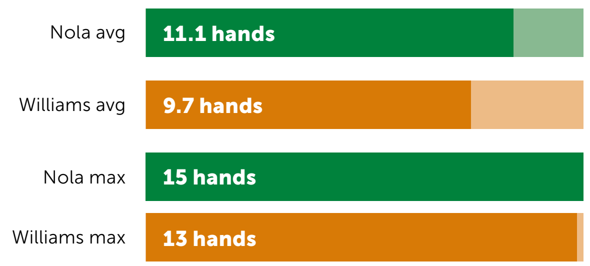
● NOLA ● WILLIAMS



Hands per Bunch

Average number of hands per bunch

● NOLA ● WILLIAMS



2026
Q1&2

Finger Length - 2nd vs 7th Hand

Three measurements per hand. Less difference between hands = more cylindrical bunch.

2nd Hand Avg Finger Length

Mean of 3 measurements per plant (cm)

● NOLA ● WILLIAMS

7th Hand Avg Finger Length

Mean of 3 measurements per plant (cm)

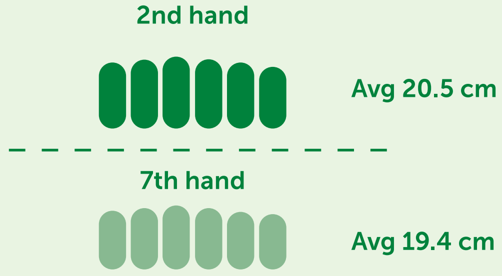
● NOLA ● WILLIAMS

Cylindricity

Lower 2nd - 7th hand finger difference = more uniform bunch = better market grade. Nola shows 39% less taper.

Nola - More Cylindrical

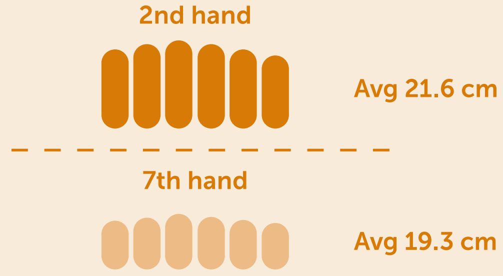
Mean 2nd-7th hand finger length difference



1.47 cm
Avg 2nd-7th hand difference
SD ±0.92 cm - tight and consistent

Williams - Less Cylindrical

Mean 2nd-7th hand finger length difference



2.40 cm
Avg 2nd-7th hand difference
SD ±01.42 cm - more variable taper

Cylindricy Index

Lower value = more uniform from top to bottom hand. Nola 39% more cylindrical than Williams.

PRUNING FOR PROFIT:

The importance of effective canopy management in macadamia

The macadamia is one of nature's most interesting and unique trees. It is a native of the Australian rainforests where its nuts have been enjoyed by humans for millennia. This popularity has led to it becoming one of the most widely cultivated nut tree species in the world.

South Africa is one of the world's leading macadamia producers and exporters, making orchard productivity, kernel quality, and long-term competitiveness increasingly important. As a result, it is critical for South African producers to maintain quality and competitiveness in the global macadamia market. Effective canopy management can improve light distribution, spray penetration, harvest access, and long-term productivity. However, pruning must be well timed and moderate, because excessive canopy removal can reduce short-term yield.

Young trees should not be ignored, but training should also not become excessive. When left to their own devices, some cultivars may be inclined to grow either more upright (816 and 344, for example) or more spreading (695 and A4, for example). In the case of the former, early lateral branch formation may be hindered. A lack of these early bearing branches may delay the first commercial crop, and cash flow will also be negatively affected *(Shaw, 2006).*

Forgoing tree training in the early years in the life of a newly planted tree can manifest as large, overgrown, and unproductive canopies. As macadamia trees can easily be in the ground for 20 years or more, pruning during later years to fix these problems is a significant and expensive exercise, which may decrease yields even further *(Lee, 2019).*

It is important for growers to realise that good and timely tree training during the period of orchard establishment results in optimised light penetration, a more manageable growth habit, faster time to commercial production, and the maintenance of productive canopies over the lifetime of the orchard *(Lee, 2019).*

STRUCTURAL PRUNING

Structural pruning activities are those that change the physical structure of the tree. These include cutting shoulders into the canopy and topping overgrown trees *(Macadamias South Africa NPC, n.d.).*

If trees have not been adequately pruned during their lifetime, and their height exceeds 80% of the row width, more aggressive cuts may be needed to rejuvenate the tree. This is costly in terms of labour and yield loss. Using the industry standard of 8 m x 4 m spacing, this will start to occur when the tree reaches around 6.5 m in height. As a general guideline, avoid removing more than about 15–20% of the canopy in one event unless a deliberate rejuvenation strategy has been planned. Heavy cuts can reduce short-term yield and stimulate vigorous vegetative regrowth *(Macadamias South Africa NPC, n.d.).*

Once the trees are trained to the desired shape or if the desired structure is regained after heavy structural pruning in older orchards, then less grower intervention is needed. The focus should be on removing regrowth and selectively thinning out upper branches that cast shade over lower ones *(Macadamias South Africa NPC, n.d.).*

Tree training is the strategy that growers implement to guide the growth of a tree during its life to give it the shape desired. The primary goal in implementing correct tree training is to keep trees smaller and more manageable for a longer period of time. The reason for this is that smaller trees are more efficient than larger trees when looking at the number of nuts produced per cubic metre (m3) of canopy volume when compared to larger trees *(Lee, 2019).*

When considering the training of a young tree, it is important to understand the growth habit and unique nodal morphology of the macadamia – in other words, how the tree grows when unmanipulated and how the shoots grow when cuts and manipulation take place.

Ideally, the young tree should be delivered from the nursery as a dominant single-leader plant. This is a standard practice for all SAMAC-accredited nurseries, such as Du Roi Multiplant.

Depending on the cultivar, this single leader can be maintained naturally, which leads to a "gum pole"-looking tree if left untrained. Strong, lateral growing shoots need to be stimulated. Other cultivars are more predisposed to developing lateral growing branches, but manipulation at a young stage is still necessary. These trees will not naturally maintain their desired central leader structure but may be prone to developing a multiple stem structure with too many framework branches, as seen in ***Figure 1.***

These framework branches may also have weak crotch angles with the upright stem(s), leaving them prone to wind damage (Shaw, 2006), which can be seen in ***Figure 2.***

On Macadamia integrifolia cultivars, at each node, knob, or joint of a plant stem at which leaves arise, there are three leaves. Meanwhile, on M. tetraphylla or hybrid cultivars, there can be three or four. In the axil, or the angle between the leaf and branch, there are three buds, each arranged vertically one on top of the other. When the buds grow and develop, the primary (top) bud grows out first, followed by the secondary and then the tertiary bud (Shaw, 2006). The growth of the primary buds is the strongest, with the narrowest crotch angles, whereas the tertiary buds are the weakest but with the widest crotch angles. An example of primary and secondary shoot growth arising from newly pruned macadamia regrowth can be seen in ***Figure 3.***

Figure 1: *A multi-stemmed macadamia tree.*

Figure 2: *Wind damage to a macadamia tree.*

Figure 3: *Stimulation of primary and secondary bud growth on a young, newly pruned macadamia tree.*

2026
Q1&2

When a new flush is naturally initiated based on tree physiology, only the primary buds will grow from the node or nodes just behind the growing point. This has the tendency of producing more vertical branches with undesirable narrow crotch angles to the main stem *(Lee, 2019).*

This matters because pruning does not simply remove growth; it changes which buds are stimulated. A well-placed cut gives the grower a choice of new shoots, whereas an untimed or poorly placed cut can create another upright, crowded problem.

On M. integrifolia cultivars, there are three leaves per node which, in theory, gives the potential for a maximum of nine shoots to grow out just below a pruning cut. In practice, only some of these buds will break strongly, which is why shoot selection after pruning is essential.

One commonly used training approach is to make heading cuts at approximately 0.5 m intervals as the young tree develops, selecting well-positioned shoots after each cut. The exact timing should depend on the tree vigour, cultivar, and quality of regrowth *(Lee, 2019).*

Structural pruning refers to the actions of topping and cutting shoulders into the tree. The general rule of thumb with topping is to maintain tree height at 60% of the working row width.

The top should be thinned out if it is too dense and a leader selected, with competing side branches cut first and then followed up in subsequent seasons by cutting the central leader. It is important to remember that tree shape can be corrected over several seasons.

Cut some competing branches in one season and others in subsequent seasons. A canopy is still required to bear nuts.

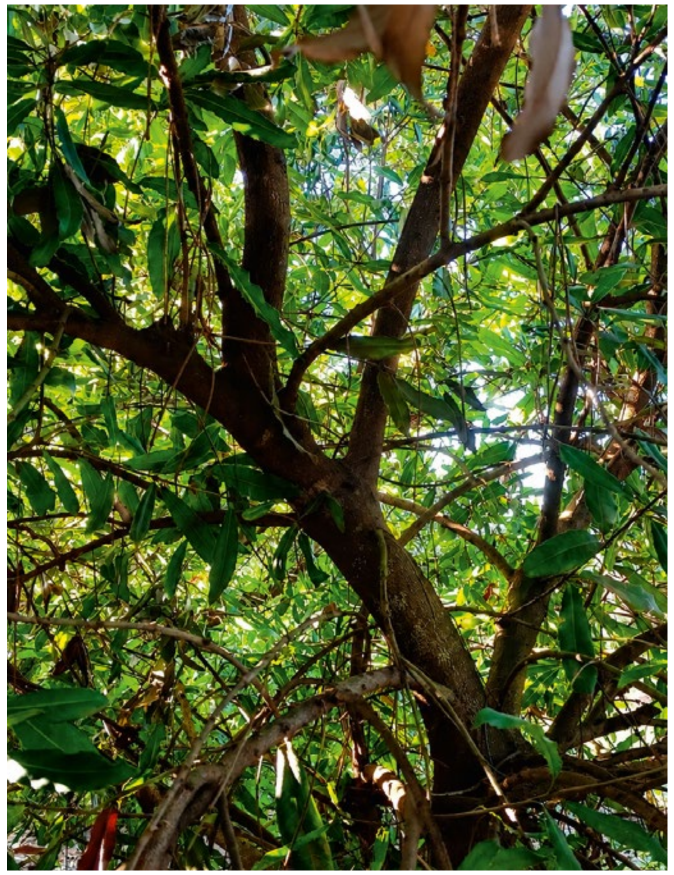


Figure 4: *A dense and internally shaded macadamia tree canopy.*

It is recommended to cut above the swollen area where the branch joins onto the trunk if regrowth is being encouraged in competing side branches.

The second part of structural pruning refers to cutting shoulders into the canopy. This is done to ensure sunlight penetration into the canopy and to balance tree height with row width *(De Villiers and Joubert, 2003).* It is best to focus on cutting thick branches that grow into the tractor row and which can be reasonably reached from the ground, and to remove protruding branches that cast shade over the lower canopy.

During maintenance pruning, keeping the desired shape can be achieved by breaking off regrowth during December or January when the shoots are still green and soft. Preserve horizontal branches while removing vigorous water shoots.

A general rule of thumb is that the stem needs to be visible from the row. If it is not visible, then the tree is too dense and needs thinning. An example of a dense canopied macadamia tree with the stem invisible can be seen in ***Figure 5.*** Remove branches that overshadow the lower canopy. Cuts also do not have to be made to the main stem. Small cuts can be made on side branches, and measuring sticks can be used to make sure the row is straight and uniform *(Macadamias South Africa NPC, n.d.).*

Skirting cuts refers to the removal of branches from younger trees at knee height, whereas more mature trees are generally skirted at around 70 cm from the ground level. Skirting should generally be one of the first thinning cuts and can greatly improve orchard access, spray movement, harvesting efficiency, and airflow under the canopy *(Macadamias South Africa NPC, n.d.).* The branch or shoot to be skirted is cut off at the origin of an older branch. It is generally not desirable for regrowth to be encouraged on these cuts. These limb removal cuts should be made just above the collar of the branch. Sometimes, removing the lower limbs will allow other limbs to relax and settle into the newly available space *(Bright and Alt, 2024).*

Pruning macadamia trees is a costly but very necessary exercise that is critical to maintaining productivity. An efficient pruning regime serves to increase both yield and quality. Keeping the tree at a manageable height makes harvesting easier for workers and improves the efficacy of sprays.

Stinkbugs are often found in the top third of the tree, and macadamia nut borer (MNB) moths are found in the canopy and often lay their eggs between adjacent nuts in the shade (Macadamias South Africa NPC, n.d.).

A lower, more open canopy does not replace pest monitoring or well-timed sprays, but it does improve the chance that spray droplets will reach the target zones where pests and nuts are present.

Figure 5: *A densely shaded macadamia tree*

Trees that are at a reasonable height (less than 6 or 7 m), with sufficient windows cut into them and that have been adequately thinned, will benefit much more from any spray event than dense, canopied, and tall trees *(Botha, 2025).*

Productive nut-bearing branches on a macadamia tree are more horizontally orientated and are at least two years old. Formative training can stimulate more horizontal framework branches while the tree is young, and proper pruning can help to ensure productive, nut bearing branches throughout the lifetime of the tree. Pruning stimulates the lateral branching of the framework branches and increases the potential flowering points, which can in turn translate into higher yields.

If chipped and mulched, pruned branches can also serve as a valuable source of organic matter in the soil of the orchard. Chipped prunings should be spread evenly and not piled against the trunk. Avoid mulching diseased wood or material heavily infested with borers or other pests back into the orchard unless it is properly managed. Organic matter can increase soil microbe activity, improve the water-holding capacity of the soil, and increase soil fertility, all of which contribute to improved yields and better orchard health. Mulched macadamia branches can also suppress weeds and serve to shield against the compaction of the soil from the movement of people and implements over the orchard floor *(Pope, 2019).*

References

Botha, L. (2025). Managing macadamias: Cutting back brings higher yields. *Farmer's Weekly.* Available at: https://www.farmersweekly.co.za/crops/fruit-and-nuts/managing-macadamias-cutting-back-brings-higher-yields/ [Accessed 10 May 2026].

Bright, J., & Alt, S. (2024). "Young trees". In: *Macadamia grower's guide 2024.* Orange, New South Wales: NSW Department of Primary Industries and Regional Development. Available at: https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0004/1596433/Macadamia-growers-guide-young-trees.pdf [Accessed 10 May 2026].

De Villiers, E. A., & Joubert, P. H. (2003). *The cultivation of macadamia.* Nelspruit: ARC-Institute for Tropical and Subtropical Crops, pp. 72–78.

Lee, P. (2019). *Macadamias 101 – An introductory guide to macadamia production in South Africa.* SAMAC (pp. 95–105). Available at: https://samac.org.za/wp-content/uploads/2024/05/MAC-101-Tree-training-and-pruning-1.pdf [Accessed 9 May 2026].

Macadamias South Africa NPC. (n.d.). *Structural and maintenance pruning.* Available at: https://samac.org.za/wp-content/uploads/2024/06/SAMAC-Best-Practice-Pruning.pdf [Accessed 14 May 2026].

Pope, D. (2019). Pruning large trees: Short term loss, long term gain. *The Macadamia South Africa.* Available at: https://themacadamia.co.za/2019/11/25/pruning-large-trees-short-term-loss-long-term-gain/ [Accessed 14 May 2026].

Shaw, A. (2006). Urgent formative pruning. *In a Nutshell.* Macadamias South Africa NPC. Available at: https://samac.org.za/wp-content/uploads/2024/05/UrgentFormativePruningAlister.pdf [Accessed 9 May 2026].

2026
Q1&2

"Rooted in growth, driven by purpose."

Du Roí

BANANA PLANTATIONS:

Managing wind and flood damage

The past few months have been tough across most banana-growing regions in South Africa. Strong winds have caused serious damage, with some farms losing up to 50% of their emerged bunches. In other areas, flooding has added even more pressure. What used to be an occasional event is becoming far more regular.

Extreme weather risk is increasing in many production regions, and global modelling work suggests that wind-related damage risk is likely to rise under climate change *(Bloemendaal, et al., 2025).* On the ground, growers are already experiencing more frequent interruptions from strong winds and flooding.

In this kind of environment, the conversation shifts. It is no longer enough to plan only for avoidance. Growers also need systems that reduce damage and support rapid recovery. The focus must be on understanding how the plants respond, and how quickly and effectively one responds when things go wrong.

Wind is one of the most damaging factors in banana production, but it does not always start with obvious losses. Yes, sometimes you walk into a block and find plants flattened or pseudostems snapped. However, more often, the damage starts with something much simpler: torn leaves. This might not look serious at first, but it comes at a cost. Leaves drive the system.

Once you reduce the functional leaf area, you reduce the plant's ability to fill a bunch.

This relationship has been understood for a long time. Early work linked increasing leaf tearing with a lower bunch weight (Lorch, 1958). For every 10 additional tears per leaf, bunch weight dropped by nearly a kilogram. What is important here is how sensitive the system is: even a 10% reduction in wind speed resulted in a 38% drop in leaf tearing and an 8% increase in bunch weight. Later work reinforced this, showing that leaf damage alone can account for a meaningful portion of yield loss in exposed plantations *(Taylor and Sexton, 1972; Turner, 1970).*

Prevailing winds affect the plant beyond just the leaf area. The whole plant starts to change. The canopy becomes distorted, which affects how efficiently the plant captures light. The pseudostem bends under pressure, and that starts to interfere with the movement of water and nutrients. The result is often uneven bunch development.

At higher wind speeds, the damage becomes structural. At around 18 metres per second, larger plants, especially those carrying bunches, begin to lodge. Whether they snap or uproot depends on root health, soil conditions, and plant size. But even plants that remain standing are not unaffected. Continuous movement weakens the root system, which reduces growth, limits sucker development, and increases disease risk in future cycles *(Stover and Simmonds, 1987).*

One of the more difficult realities is that good management can sometimes increase exposure. Well-irrigated and well-fertilised plants are bigger, more vigorous, and more productive under normal conditions. But in wind, those same plants are more vulnerable. *Holder and Gumbs (1983)* showed that under strong wind conditions, larger plants actually yield less than smaller ones, simply because they catch more wind and suffer more damage. Bigger plants extend above the canopy and experience higher wind speeds, effectively acting like sails. This does not mean reducing inputs, but it does mean that higher production systems need to be matched with proper wind protection.

WIND DAMAGE:
More than just torn leaves

Torn leaves reduce the plant's engine – cutting photosynthesis and reducing bunch weight.

Strong winds distort the plant, bend pseudostems and can restrict water and nutrient movement.

At high wind speeds, plants may lodge, snap or uproot – impacting current and future yields.

Flooding is a different problem altogether. The damage is slower and often less obvious initially, but it can be more severe over time. Banana plants have high water requirements, and transpiration can reach up to 150 litres per plant per week under hot conditions (Turner, 1995).

However, despite this, the root system is extremely sensitive to waterlogged conditions. The issue is not the water itself but the lack of oxygen in the soil.

After a wind event, it is very easy to underestimate the loss. The initial assessment is almost always too optimistic. Some plants may have been carrying bunches that were not yet visible and will fail later. Others may produce bunches that never properly develop because of the reduced leaf area. On top of that, indirect effects like reduced photosynthesis and root damage continue to have an impact on the plant over time. What looks like a 30% loss immediately after the event can easily end up being much higher once everything plays out *(Turner, 1972).*

That is why the first 48 hours are critical. The focus needs to be on stabilising the plantation and recovering as much value as possible. Fallen bunches that are close to maturity should be removed quickly, as many can still be marketed if handled in time. Plants that have lost all functional leaf area and can no longer support a bunch should be removed early, allowing resources to shift to the next cycle. At the same time, plants that still have potential, particularly those close to harvest, should be supported and carried through.

Recovery is not just about reacting; it is also about resetting the system. Opening up the canopy allows light to reach the suckers, which will drive the next cycle. All plant material, including pseudostems and immature bunches, should be chopped and returned as mulch. This improves soil structure, helps to retain moisture, and recycles nutrients back into the system. In many cases, this recycling is part of the reason why recovery is faster than expected. With fewer bunches acting as sinks, nutrients are redirected into sucker growth, and increased light penetration accelerates development. Although total production drops, the cycle often shortens, helping the plantation to recover more quickly *(Turner, 1995).*

Once soils become saturated, oxygen becomes rapidly depleted. Roots switch from efficient aerobic respiration to much less efficient anaerobic processes, producing far less energy and harmful by-products. Within 24 hours, roots are already under stress. After 48 to 72 hours, significant root death begins *(Stover and Simmonds, 1987).* Although plants attempt to respond – activating stress response genes, forming air channels, and increasing antioxidant activity – these responses are short lived and begin to fail after a few days *(Teoh et al., 2022).* In practical terms, the difference between two and three days of flooding can determine if a plant survives.

Even after the water has drained away, the impact continues. Flooding changes the soil chemistry significantly. Nitrogen is lost, key nutrients like potassium and magnesium are leached, and certain elements can reach toxic levels. At the same time, damaged roots become highly susceptible to root and corm rots, including water-associated organisms such as *Fusarium and Pythium*. This is why plants often appear to recover initially, only to decline weeks later.

Early signs of waterlogging are easy to miss if you are not looking for them: the yellowing of older leaves, slower leaf emergence, and a softening pseudostem are usually the first indicators. As the problem progresses, bunch development slows or stops, leaves collapse, and plants may eventually fall due to poor root anchorage. At this stage, recovery becomes much more difficult.

Because of this, prevention is far more effective than trying to fix the problem later. In high-rainfall or flood-prone areas, drainage should be treated as a core production investment, not as an afterthought. A proper system should include perimeter drains to intercept runoff, main drains to move water away, and internal drains to remove excess water within a block. In certain soil types, raised beds can provide additional protection by improving root aeration and reducing the risk of waterlogging *(Malan, 1953).*

Banana plants may survive short periods of flooding, especially where water is moving and drains rapidly.

As a practical guide, flowing flood water for up to about 48–72 hours may be tolerated better than stagnant water, where serious damage can occur within 24–48 hours.

Clearing blocked drains, improving flow, and, where possible, pumping water out can make a meaningful difference. Research has shown that reducing waterlogging from 72 to 48 hours can significantly reduce root damage *(Stover and Simmonds, 1987).* Harvesting submerged bunches early can also help to recover some value.

Once drainage has improved and soils begin to re-aerate, nutrition should focus on restoring root activity and supporting new growth. Nitrogen and potassium are important, but applications should be moderate and split, because damaged roots have limited uptake capacity and saturated soils are prone to further nutrient losses. This can be supported by foliar applications while the root system is still compromised, although plants should not be stressed when applying foliar nutrients. Disease management is especially important during this period, as stressed plants are far more vulnerable.

Recovery takes time, but with the right approach, a large portion of the plantation can still be saved.

When flooding does occur, speed becomes critical. Even small improvements in drainage can reduce the duration of waterlogging and limit damage.

In the end, resilience comes down to the fundamentals. Healthy plants with strong root systems are better able to handle stress. Consistent irrigation that avoids both drought and waterlogging supports stable growth. Mulching improves soil structure and moisture retention, and good record-keeping allows farmers to refine their response over time.

Banana farming is not becoming impossible, but it is becoming more technical. The most resilient growers will be those who understand how plants respond, react quickly after damage, and invest in systems that reduce risk before the next event. You cannot control the wind or the rain, but you can control how prepared your plantation is when the next storm hits.

Extreme weather is not going to go away. If anything, it is becoming more frequent and more severe.

References

Bloemendaal, N., Haigh, I. D., de Moel, H., Muis, S., Haarsma, R. J., & Aerts, J. C. J. H. (2025). Tropical cyclone risk and the impact of climate change on global wind damage. *Nature Climate Change*, 15(2), 145–152.

Holder, G. D., & Gumbs, F. A. (1983). Effects of irrigation on the growth and yield of bananas. *Tropical Agriculture (Trinidad),* 60(2), 25-30.

Lorch, R. P. (1958). Leaf damage and its effect on yield in bananas. *Tropical Agriculture,* 35, 123–130.

Malan, E. F. (1953). Drainage requirements for banana cultivation. *Farming in South Africa*, 28, 321–326.

Stover, R. H., & Simmonds, N. W. (1987). *Bananas* (3rd ed.). London: Longman Scientific & Technical.

Taylor, W. B., & Sexton, G. J. (1972). Wind damage and its effect on banana production. *Journal of Applied Ecology,* 9(2), 373–384.

Teoh, E. Y., Teo, C. H., Baharum, N. A., Pua, T.-L., & Tan, B. C. (2022). Waterlogging stress induces antioxidant defences responses, aerenchyma formation and alters metabolisms of banana plants. *Plants,* 11(15), 2052.

Turner, D. W. (1970). The effect of wind on banana leaf area and yield. *Australian Journal of Agricultural Research,* 21(3), 507–512.

Turner, D. W. (1972). Banana plant responses to environmental stress. *Tropical Agriculture,* 49, 123–135.

Turner, D. W. (1995). "Banana plant growth, development and productivity". In: S. Gowen (Ed.), *Bananas and plantains* (pp. 83–109). London: Chapman & Hall.

2026
Q1&2

2026
Q1&2

Thanks for reading.
Expect the next edition in
November 2026

ISSUE 09
JULY 2026

CONTACT DETAILS

Du Roi | duroi.co.za | info@duroi.co.za | +27 15 345 1650
Du Roi Nursery | duroinursery.co.za | +27 15 345 1650
Du Roi Laboratory | duroilab.co.za | +27 15 345 1217
Du Roi Multiplant | duroimultiplant.co.za | +27 15 345 1650
Cederberg Tree Nursery | cederbergtreenursery.co.za | +27 22 921 3526
Du Roi Halls Nursery | duroihalls.co.za | +27 13 004 0462