CA-02

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Chestnut production & climate change

FACTSHEET

The past is no longer a reliable indicator of future growing conditions.

This chestnut orchard demonstrates proactive management under climate variability. The raised beds and well-maintained tree rows suggest attention to drainage and soil structure. The open canopy and orderly spacing enhance airflow, reducing humidity and associated fungal disease risk during wetter seasons.

1. Introduction

Managing climate variability and adapting to long-term climate change are becoming defining aspects of modern farming.

For chestnut growers, this means adjusting to shifting temperature, rainfall, and disease risk patterns to maintain viable production.

Successful chestnut management now requires forward planning and climate-informed decision-making.

2. Impacts of climate change

Six key areas where climate change may impact high-value horticulture include:

1) **Changes in average temperature**, accelerating crop development, increasing water use, and altering pest and disease risks.
2) **Increased extreme temperature events**, including more frequent heatwaves.
3) **Shifts in frost risk**, affecting flowering and fruit development.
4) **Altered rainfall patterns**, influencing soil moisture and disease outbreaks.
5) **Reduced water availability** for irrigation due to both climatic and regulatory factors.
6) **Rising atmospheric carbon dioxide**, with complex implications for plant physiology.

3. Climate requirements

Chestnuts grow best in regions with cool to cold winters, warm to hot summers, and moderate to high annual rainfall, preferably with a summer component.

Ideal summer maximum temperatures for nut ripening are between 25–30°C.

Rainfall Patterns

In Australia, chestnuts are primarily grown in regions receiving 750 to 1500 mm of annual rainfall.

These areas typically experience some summer rainfall, although irrigation remains essential in dry years.

Climate models suggest:

- Suitable rainfall zones may shift to higher elevations.
- Rainfall variability, particularly from mid-summer to autumn, is likely to increase.
- Demand for irrigation will rise, while availability may decline.
- Selecting drought-tolerant cultivars may become increasingly important.
- Increased frequency of short, intense rainfall events may lead to greater surface runoff and reduced effective soil moisture recharge.
- Shifts in seasonal rainfall patterns could result in delayed or disrupted flowering and nut development stages.

4. Temperature challenges

Warming trends

- Suitable growing areas may shift toward the upper end of the current 300–1000 m elevation range.
- Excessive heat can suppress yields and induce stress in trees.
- Higher temperatures may lead to earlier flowering and harvesting.
- Pollination may benefit from warm, dry, low-humidity conditions but could be disrupted if flowering periods for different cultivars become unsynchronised.

Chilling requirements

Chestnuts require a winter chilling period to break dormancy and support proper flowering.

The chilling requirement is estimated at 300–400 hours below 7.2°C, equivalent to about 2–3 weeks of cold weather.

Warming winters may reduce chill accumulation in some areas, affecting tree performance.

Cold & frost tolerance

While chestnuts tolerate freezing well, late frosts can damage young foliage or buds, reducing yields.

Snow and frost have not posed long-term problems in Australian production areas to date.

Heat & sunlight

Chestnuts can withstand summer temperatures over 40°C, common in many Australian regions.

However, extreme heat during flowering or harvest can stress trees.

Trunk painting is commonly used to prevent sunscald on young trees.

5. Orchard management

Wind and altitude

Wind is not a significant concern for chestnut trees, though top-grafted trees require careful early pruning. In Australia, chestnuts are typically grown between 300 and 800 metres elevation, with some reaching 1000 metres.

Climate and disease risk

Climate change is expected to alter the incidence and severity of key chestnut diseases:

- **Chestnut blight**: May increase under climate stress.
- **Phytophthora root rot**: Greater risk from irregular wet-dry cycles.
- **Gnomoniopsis rot**: May decrease with drier, warmer autumns.
- **Verticillium wilt**: Could become more prevalent under drought conditions.

6. Recent observations

Assessments by the Chestnut R&D Committee show climate conditions have directly influenced the prevalence of nut rot:

High rot year (2015/16)

- Warmest October on record.
- Significant rainfall during flowering.

Hot, dry harvest period with low humidity and tree stress.

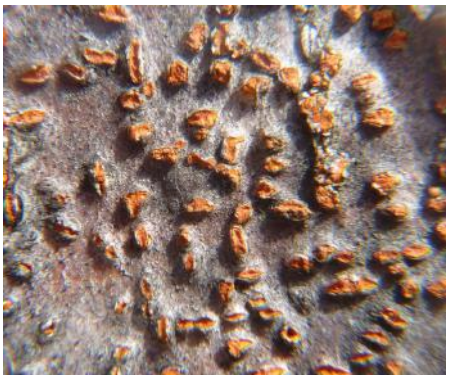
Low rot year (2016/17):

- Wet winter and spring.
- Cooler summer with limited rain during flowering.
- Cool autumn, less tree stress, minimal rot development.

These examples highlight that warm temperatures and high humidity around flowering can significantly increase disease pressure.

7. Harvest & post-harvest climate impacts

- Warm, humid harvest conditions elevate fungal risks like Gnomoniopsis.
- Regular harvesting and timely, controlled cooling help reduce spoilage.
- Increased heat may require upgrades to post-harvest handling infrastructure.
- Hail frequency may increase slightly, impacting nut quality.



Orange fungal pustules rupturing bark surface – characteristic of chestnut blight (Image: CAI)

Dark, sunken canker at tree base indicating

Chestnut rot: Internal brown rot with mouldy tissue; nut discolouration from Gnomoniopsis smithogilvyi. (Image: MDPI CC_BY_4)

8. Tools for growers

Weather monitoring

Growers are encouraged to integrate real-time weather data into decision-making. Local weather station networks provide timely, location-specific data. Key Australian sources include:

- Bureau of Meteorology: www.bom.gov.au
- NSW DPI Weather Station Network
- North East Catchment Management Authority (NECMA)
- Lower Murray Water Network
- Riverine Plains Inc. Network
- TAFCO Weather Stations: weather.tafco.com.au

Crop calendars

A crop calendar is a useful tool for mapping out key production stages and identifying weather-related risks.

See overleaf for an example of crop calendar for chestnut growing.

Positioning for the future

While climate change presents new challenges, chestnuts remain a resilient and adaptable crop for many regions.

The industry has opportunities to reduce emissions and strengthen resilience through:

- Improved irrigation efficiency.
- Sustainable land management practices.
- Embracing weather-informed orchard planning.
- Considering site relocation or elevation for future plantings.

9. Sunscald

Chestnut trees

Sunscald is a known risk in high-radiation environments like many parts of Victoria and New South Wales, where chestnuts are typically grown at mid to high elevations with strong summer sun.

Why it matters

Sunscald can damage the cambium layer beneath the bark, especially on the north and west-facing sides of young trunks.

It commonly occurs when trees are young, newly planted, or recently pruned or grafted, and the bark is exposed.

Damage can lead to cracking, bark sloughing, fungal infection, and in severe cases, tree death.

Common grower practice

Painting trunks with diluted white water-based paint (usually a 1:1 mix of paint and water) is a common method growers use to prevent sunscald.

The reflective white coating reduces heat absorption during hot days and prevents rapid temperature drops in the evening, which can stress the bark.

Growers may also manage sunscald risk through canopy design, avoiding over-pruning, and temporary shading structures for young plantings.

Chestnut nuts

Chestnut fruit can also suffer from sun exposure, particularly when outer burrs are poorly shaded.

Sunburned nuts may exhibit darkened, hardened, or shrivelled patches on the shell and sometimes on the kernel, reducing quality.

Avoiding excessive thinning and maintaining sufficient leaf cover during nut development minimises this.

10. Drought

Chestnuts are relatively drought-tolerant once established, but productivity is significantly reduced without adequate water during flowering and nut fill.

In prolonged dry periods, irrigation becomes essential, especially in sandy or shallow soils.

Mulching around the dripline can help conserve moisture and reduce temperature stress.

Strategic pruning to reduce canopy load may also assist during water shortages.

Maintaining organic matter in the soil improves water-holding capacity.

Avoid drought stress during flowering and kernel fill to ensure yield and nut quality are not compromised.

White paint reflects sunlight, protecting young chestnut trunks from sunscald damage and heat stress. (Image: G Rischmueller)

11. Chestnut crop calendar

Crop calendars are practical tools that help growers align key orchard tasks with seasonal weather patterns and crop development stages.

By mapping activities such as pruning, flowering, pest monitoring, irrigation, and harvest across the year, growers can anticipate risks, optimise labour, and respond more effectively to climate variability.

In chestnut production, where timing of flowering and rainfall can directly impact nut quality and disease incidence, a crop calendar provides a visual guide for proactive management.

The following example outlines typical annual activities for chestnut growers in southern Australia.

Month	Activity	Notes / Climate Considerations
July – August	**Dormancy** - Pruning - Remove diseased wood & orchard litter	Monitor for Phytophthora risk in low-lying areas; plan drainage improvements.
September	**Bud swell begins** - Pre-season fertiliser application - Weed control	Avoid heavy machinery in wet areas; check for trunk sunscald from winter exposure.
October	**Flowering begins** - Monitor pollination success	Watch for **nut rot** risk: wet flowering increases Gnomoniopsis infection risk.
November	**Peak flowering / early nut set** - Insect monitoring (aphids, caterpillars)	Avoid overhead irrigation; maintain airflow to reduce humidity.
December	**Nut development** - Begin irrigation if dry - Pest control as needed	Key month for Gnomoniopsis entry via flowers—monitor weather and infection signs.
January	**Nut growth continues** - Check irrigation coverage - Maintain weed control	Risk of sunburn on exposed nuts and trunk—monitor and adjust canopy.
February	**Burrs maturing** - Light pruning if needed	Maintain consistent irrigation; high temps may reduce nut fill.
March	**Harvest begins (early varieties)** - Begin orchard floor clean-up	Regular nut collection reduces rot and pest load.
April	**Peak harvest period** - Post-harvest hygiene - Cooling and sorting	Hot harvest periods increase nut rot—process quickly.
May	**Late harvest (some varieties)** - Begin leaf fall	Remove fallen nuts; begin preparing orchard for dormancy.
June	**Post-harvest** - Soil testing - Review season outcomes	Plan planting, grafting, and new block establishment.

Notes

Hort Innovation Strategic levy investment | CHESTNUT FUND

This project has been funded by Hort Innovation using the chestnut research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

Climate Readiness Checklist:

Is your orchard prepared for a changing climate?

Use this checklist to assess your farm's resilience to climate-related risks in chestnut production. Tick each box that applies. The more you check, the stronger your climate readiness!

Climate-Aware Orchard Planning	
	Have you reviewed projected climate changes (rainfall, temperature, frost) for your region?
	Have you selected cultivars suited to future climate conditions (e.g. chilling requirements,
	Have you considered shifting or expanding planting to higher elevations or cooler microsites?
	Is your orchard layout designed to accommodate drainage and airflow improvements?
	Do you monitor soil temperature and moisture levels throughout the year?
Water & Soil Management	
	Is your irrigation system capable of handling increased drought periods and seasonal shifts?
	Have you installed or upgraded drainage infrastructure to prevent waterlogging?
	Do you use mulches or groundcovers to regulate soil temperature and moisture?
	Are you applying organic matter to improve soil structure and water retention?
	Do you assess and adapt irrigation timing based on current and forecast conditions?
Heat, Frost & Sun Management	
	Do you monitor for sunscald and use trunk painting or canopy cover to protect young trees?
	Are you trialling shade techniques or adjusting canopy density to protect nuts and foliage?
	Do you protect sensitive stages (e.g. flowering, budburst) from late frosts using timing or shelter?
	Are you prepared to manage harvest earlier due to shifting phenology?
	Do you track seasonal timing changes (e.g. flowering, nut fill) for adaptive planning?
Pests, Diseases & Climate Risk	
	Do you monitor for changes in disease patterns (e.g. Gnomoniopsis, Phytophthora) after unusual seasons?
	Have you implemented orchard hygiene measures to reduce pathogen carryover in warmer winters?
	Are you adjusting fungicide application timing to match new climate-triggered infection periods?
	Do you use local weather data or models to assess infection risk and guide intervention timing?
	Have you trained staff to recognise climate-related stress symptoms and emerging threats?
Long-Term Adaptation Planning	
	Do you maintain records of climate conditions, pest outbreaks, flowering and harvest timing?
	Are you collaborating with researchers or extension services on climate resilience?
	Do you trial new varieties or management techniques suited to variable conditions?
	Have you considered risks to post-harvest operations from increasing heat or humidity?
	Are you updating your management plan regularly based on seasonal outcomes?

How Did You Score?

✔ **0–4: "Climate Casualty"** – Very limited preparation. Extreme weather or shifting seasons could cause major losses. Start with basic actions such as monitoring soil moisture and upgrading drainage.

✔ **5–9: "Seasonal Struggler"** – You recognise the issues, but responses are patchy. Drought-ready irrigation, frost protection and record-keeping need serious attention.

✔ **10–14: "Weather Warrior"** – Good progress. Core practices are in place—now refine cultivar choices, canopy management and disease timing to stay ahead of change.

✔ **15–18: "Resilience Ready"** – Your orchard is well-equipped for hotter, drier and more variable seasons. Keep fine-tuning surveillance, staff training and long-term trials.

✔ **19–20: "Climate Champion"** – Benchmark standard. You use data, partnerships and innovation to adapt quickly and safeguard yield and quality every season.

How did you score? _____

What areas need improvement?

_____ _____

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