



CLIMATE CHANGE: EL NINO FORECAST FOR THE SUMMER. DROUGHT MANAGEMENT OF CITRUS: RECOMMENDED STRATEGIES

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The El Niño-Southern Oscillation (ENSO) is the strongest driver of year-to-year global climate variations and can lead to extreme weather conditions in various regions worldwide. The ENSO is currently experiencing a La Niña state for the third consecutive year, which has only occurred twice since. A La Niña is a phenomenon where temperatures are colder than normal, and rainfall is above average, posing the risk of flash floods. This was evident in the northern provinces of South Africa during February of this year, with damaging floods occurring due to these heavy rainfall events.

An El Niño event usually follows a La Niña. This phenomenon is where rainfall is below average, and temperatures are hotter than normal, posing a drought risk. Over the next few months (April – June), La Niña is expected to shift to 'neutral' conditions, with the possibility of lower-than-normal rainfall during winter in the southwest region of South Africa and higher-than-normal rainfall in the northeast in 2023, as seen in **Figure 1** below (US National Oceanic and Atmospheric Administration, 2023). Furthermore, **water-intensive agricultural sectors, like the South African citrus industry in the northern regions, could be greatly impacted if El Niño conditions occur in the coming summer season, resulting in lower-than-average rainfall.** However, this is not a certainty, as prediction models could change during winter (South African Weather Service, 2023). Therefore, monitoring the situation is ongoing, and growers are advised to stay informed.

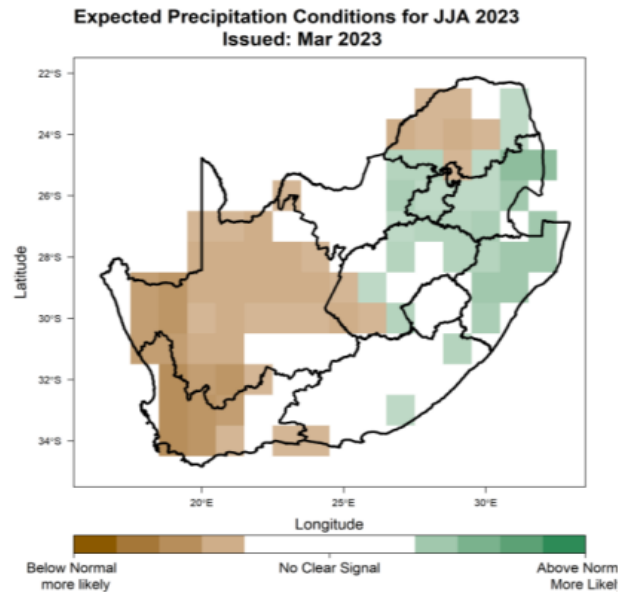


Figure 1. Seasonal precipitation prediction for June-July-August 2023 (JJA), showing probabilistic categories of below normal, near normal, or above normal rainfall (South African Weather Service, 2023).

Since there is a strong possibility of an El Niño event in the near future, CRI recommends some preventive measures to help growers prepare if such an event should occur over the next few seasons. Below, therefore, are a few recommendations to curtail the impact of drought conditions.

Water saving practices:

- Establish priorities on orchard level for water use.
 - Providing optimum water to most profitable orchards and producing good marketable fruit is more sustainable than providing below optimal water quantities to all orchards and producing small, unmarketable fruit.
 - Consider the long-term value of the trees and compare it to the cost of water.
- Set up a water budget.
 - Establish the total amount of water available for the season.
 - Estimate monthly water use per orchard for each fruit development phase.
 - Prioritise irrigation applications, i.e., young trees and most profitable orchards.



- Establish the economic viability of the orchard, current and long-term plans for the orchard, tree age, variety, crop load (on/off year) and growth stage, packer, processor, or agent priorities – current and future.
 - Implement good irrigation scheduling practices.
 - Monitoring the soil moisture with regular field observations is critical to allow for more precise scheduling.
 - Make sure that each orchards effective root depth (80% of the feeder roots) is captured to be able to calculate the correct amount of water needed to wet the root zone.
 - Extend irrigation intervals as far as possible without stressing the trees.
 - Check, manage and maintain the irrigation system.
 - Fix leaks and broken pipes/valves.
 - Check the accuracy of water meters by cross-referencing readouts with application rates.
 - If irrigation uniformity is below 75%, contact the appropriate service providers.
 - Stop leaching losses.
 - Establish the depth of infiltration during different lengths of irrigation and use reliable soil water monitoring technology or field observations to ensure water is not over-applied and lost below the root zone.
 - Apply mulch to reduce evaporation of the wetted zone.
 - Especially relevant option for small trees.
 - Synthetic ground covers are effective – remove them when the drought ends.
 - Organic material – drip line underneath the mulch reduces evaporation.
 - Reduce wetted zone/surfaces to limit evaporation loss.
 - Change over from sprinklers to drip lines or change micros-sprinkler to reduce the wetted area.
 - Full cover weed control.
 - Remove weeds that compete for water in drip zone.
 - Irrigate at night or outside the maximum evaporation periods.
 - 20-30% of water could be saved compared to daytime irrigation.
 - Reduce water runoff.
 - If runoff occurs due to crusting apply mulching in the wetted zone. If crusting is due to high magnesium levels try to address the high levels over time.
 - If runoff occurs without any crusting present investigate the application rate of the irrigation system and make certain adjustments to assist the penetration.
 - Mulches improve effective water penetration.
 - Reduce or stop irrigating windbreaks.
 - Re-use back-flush water from drip irrigation gravel filters.
 - Reduce crop load and total leaf area index.
 - Orchards with an excessive crop load will lead to more water stress.
 - Monitor the crop load and fruit growth and apply appropriate thinning strategies.
 - Prune trees and remove unwanted growth on a continual basis.
 - Other strategies to reduce transpiration losses:
 - Consider establishing shade netting over orchards.
 - Kaolin/silicon-based foliar spray products are claimed to reduce water losses through leaves.
- Longer-term strategies:**
- Install valves in smaller sections of the orchards.
 - Water use differs with tree age and variety - install valves to separate sections with different water requirements.
 - Convert to more efficient irrigation systems.
 - Drip irrigation is the most efficient irrigation system.
 - Best to install drip irrigation in winter because of the shutdown of the irrigation system during conversion from micro-sprinklers. When applying in the Northern summer rainfall areas make sure to wet the orchard thoroughly before changing over from micro irrigation to drip irrigation to reduce the shock on the root system.
 - After changing the irrigation system make sure to support the root system while it is adjusting to the new irrigation wetting zone.



Tree management strategies for different orchard ages:

- Young tree management (0-6 years).
 - Reduce leaching losses below the root zone.
 - Install sprinkler swivels with a reduced wetting area and only irrigate according to soil water content, not pre-scheduled intervals. In the case of drip irrigation use spaghetti pipe and pegs to direct the water to the root zone.
 - Use “C” clips on dripper lines to block off drippers between trees where the roots have not yet been established.
 - Spread mulch around the trees to reduce evaporation losses from the soil surface. Make sure not to spread the mulch up against the stem of the young trees. Keep a hand width open around each tree.
- Canopy reduction of mature trees.
 - Tree water use is directly related to canopy size.
 - Young trees have a smaller canopy and root zone than mature trees and can use up to 50% less water than mature trees.
 - Trees with a large canopy should be pruned to reduce transpiration losses.
 - Thereafter, all the branches in the trees should be whitewashed against sunburn.
 - Use a combination of water based PVA and copper at a 50/50 ratio to water to paint the stems exposed to sunburn
 - The amount of canopy removed for each orchard should be based on tree age, crop load, growth stage, long-term block viability and how much water needs to be saved.
 - Trees that have their canopies reduced recover quicker than trees without canopy reduction.
 - Adjust fertiliser application to suit tree canopy size – gradually increase the amount of fertiliser as the canopy re-grows.
- Skeletonising/Stag horning.
 - This is the most severe form of canopy reduction and involves the removal of nearly all tree branches and foliage.
 - Trees use much less water after skeletonising, taking 2-3 years to recover (full production).
- Directly after pruning, whitewash the tree (Use a combination of water based PVA and copper at a 50/50 ratio to water to paint the stems exposed to sunburn)
- As the tree re-grows, the best shoots must be selected to develop the new canopy.
- Prune for re-grafting.
 - Cutting trees back for grafting with a new variety will reduce water use (remember to whitewash).
- Reduce crop load:
 - Suppress flower development by using appropriate chemicals (GA₃) in autumn.
 - Prune at flowering or remove weak limbs, crossover limbs and water shoots.
 - Do chemical and/or hand thinning

For more information on the likelihood of an El Niño event, please visit the following page: <https://agrisa.co.za/media/seasonal-climate-watch-april-to-august-2023>



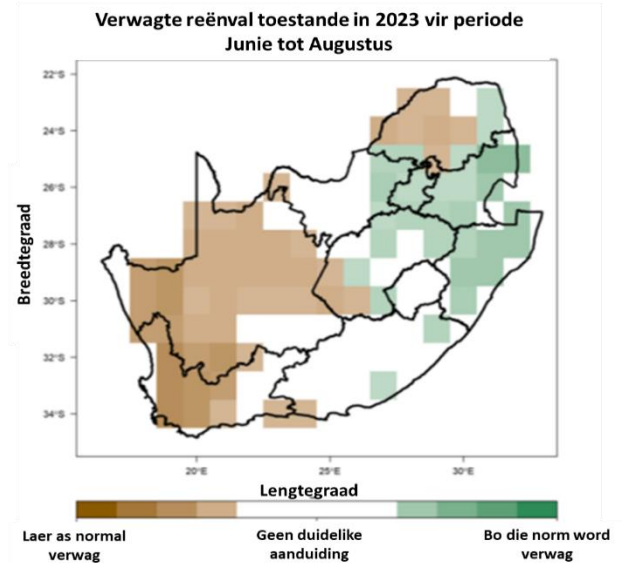
KLIMAATSVERANDERING: EL NIÑO VOORSPEL VIR DIE SOMER. DROOGTEBESTUUR VAN SITRUS: VOORGESTELDE STRATEGIEË

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Die El Niño-Suidelike Oosillisie (ENSO) is die sterkste drywer van jaar-tot-jaar variasies in globale klimaatstoestande en kan tot ekstreem uiterste weersomstandighede in verskeie streke regoor die wêreld lei (Ludescher et al., 2023). Vir die derde agtereenvolgende jaar beleef ENSO tans 'n La Niña-toestand, wat slegs tweemaal sedert 1950 voorgekom het (Suid-Afrikaanse Weerdiens, 2023). 'n La Niña is die verskynsel waar temperature kouer as normaal is en reënval bó gemiddeld is (Bradshaw et al., 2022), wat die risiko van flitsvloede verhoog. Dit was duidelik in die noordelike provinsies van Suid-Afrika gedurende Februarie vanjaar, met skadelike vloede as gevolg van hierdie swaar reënval.

'n La Niña word gewoonlik deur 'n El Niño-verskynsel gevolg. Hierdie is 'n verskynsel waar reënval ónder gemiddeld is, met temperature warmer as normaal, met die gevolglike risiko van droogte wat verhoog word (Bradshaw et al., 2022). Gedurende die volgende paar maande (April – Junie) word daar verwag dat La Niña na 'neutrale' toestande sal skuif, met die moontlikheid van minder reënval gedurende die winter in die suid-westelike streek van Suid-Afrika en hoër reënval in die noord-ooste, soos gesien in **Figuur 1** hier onder (Amerikaanse Nasionale Oseaan- en Atmosfeeradministrasie, 2023). **Verder kan water-intensiewe landbousektore, soos die Suid-Afrikaanse sitrusbedryf in die noordelike streke, beïnvloed word as El Niño- toestande gedurende die komende somerseisoen ontwikkel, met die gevolg van laer as gemiddelde reënval.** Daar is wel nog onsekerheid of die verskuiwing na 'n El Niño gaan plaasvind, aangesien voorspellingsmodelle gedurende die wintermaande kan verander (Suid-Afrikaanse

Weerdiens, 2023). Daar word tans aanbeveel om die situasie te monitor.



Figuur 1. Seisoenale reënvoorspelling vir Junie-Julie-Augustus 2023, wat waarskynlike kategorieë van onder-normale-, byna-normale- of bo-normale reënval aantoon (Suid-Afrikaanse Weerdiens, 2023).

Aangesien daar 'n moontlikheid van 'n El Niño-verskynsel in die nabye toekoms is, wil CRI voorsorgmaatreëls voorstel wat produsente help om voorbereid te wees indien so 'n gebeurtenis oor die volgende paar seisoene sou plaasvind. Hieronder volg dus 'n paar aanbevelings om die impak van droogte-omstandighede te beperk.

Waterbesparingspraktyke:

- Vestig prioriteite vir waterverbruik op boordvlak vir waterverbruik.
 - Dit is meer winsgewend om optimale water aan die mees winsgewende boorde te verskaf en goeie bemerkbare vrugte te produseer, as om water aan al die boorde te verskaf en klein vrugte te produseer.
 - Oorweeg die langtermynwaarde van die bome en vergelyk dit met die koste van water.
- Stel 'n waterbegroting op.
 - Bepaal die totale hoeveelheid water wat vir die seisoen beskikbaar is.
 - Beraam maandelikse waterverbruik per boord vir elke vrugontwikkelingsfase.



- Prioritiseer besproeiingstoedienings, d.w.s. jong bome en mees winsgewende boorde.
 - Bepaal die ekonomiese waarde van die blok, huidige en langtermynplanne vir die blok/boord, boom-ouderdom, verskeidenheid, oeslading (aan/af jaar) en groeistadium, verpakkingsmaatskappy, verwerker of agent prioriteite – tans en toekomstig.
 - Implementeer goeie besproeiingskeduleringsspraktyke.
 - Dit is krities om gereeld grondwater te meet vir meer akkurate skedulering.
 - Verleng besproeiingsintervalle sover moontlik sonder om stremming op die bome te plaas.
 - Kontroleer, bestuur en onderhou die besproeiingstelsel.
 - Herstel lekkasies en gebreke pype/krane.
 - Kontroleer die akkuraatheid van watermeters deur waardes te vergelyk met die toedieningstempo te vergelyk.
 - As besproeiingseenvormigheid onder 75% is, kontak die betrokke persone om regstellings te maak.
 - Vermyn logings verliese.
 - Maak gebruik van sorgvuldige grondwatermonitering om te verseker dat water nie onder die wortelsone toegedien en verlore gaan nie.
 - Dien 'n deklaag toe om verdamping van grondvog te verminder.
 - Veral 'n toepaslike opsie vir klein bome.
 - Sintetiese grondbedekking is effektief – verwyder wanneer die droogte verby is.
 - Organiese materiaal – plaas druplyn onder die deklaag om evaporasie te verminder.
 - Verminder die besproeiingsoppervlakte om verdamping te beperk.
 - Verander van sproeiërs na driplyne of verander mikrosproeiërs om die besproeiingsoppervlakte te verminder.
 - Volledige onkruidbeheer.
 - Verwyder onkruid wat kompeteer vir water in drupsone kompeteer.
 - Besproei gedurende die nag of buite die maksimum evaporasie periodes.
 - 20-30% van water word bespaar in vergelyking met dagtyd vir onderboom-sprinkelaars.
 - Verminder waterafloop.
 - As waterafloop voorkom bedek die grond met 'n deklaag.
 - Waterafloop kan ook voorkom waar die leweringstempo te hoog is.
 - Verminder besproeiing van windbreke.
 - Hergebruik terugspoelwater van drupbesproeiing gruisfilters.
 - Verminder oeslading en totale blaaroppervlak-indeks.
 - Bome met swaar oesladings sal onder meer water stres wees.
 - Monitor oeslading en vruggrootte, en dien gepaste uitdunningspraktyke toe.
 - Snoei bome voldoende en verwyder ongewenste lote deurlopend.
 - Ander strategieë om transpirasieverliese te verminder:
 - Plant bome onder skadunette.
 - Daar word beweer dat kaolien-/silikonbasis blaarspuitmiddels word beweer om waterverlies deur blare te verminder.
- Langertermyn-strategieë:**
- Installeer kleppe in kleiner dele van boorde.
 - Waterverbruik verskil met boomouderdom en kultivar – installeer kleppe om boorde of gedeeltes van boorde met verskillende waterbehoefte te skei.
 - Skakel om na meer effektiewe besproeiingstelsels.
 - Dripbesproeiing is die mees effektiewe besproeiingstelsel.
 - Dit is die beste om dripbesproeiing in die winter te installeer aangesien die besproeiingstelsel afgeskakel moet word gedurende die omskakeling. In die Noorde moet bome eers goed nat gemaak word voor daar van mikro-besproeiing na dripbesproeiing oorgeskakel word.



Boombestuursstrategieë vir verskillende ouderdom boorde:

- Bestuur van jong bome (0-6 jaar).
 - Verminder longing ónder die wortelsone deur laer volume, meer gereelde besproeiing.
 - Instaleer sproeiers met 'n kleiner benattingsarea en besproei slegs volgens die gronds e waterinhoud, nie op vooraf bepaalde intervalle nie. Waar driebesproeiing gebruik word, gebruik spaghetti pyp en plaas penne sodanig dat water na wortelsone gelei word.
 - Gebruik “C” klampies om dripperlyne om drippers tussen bome te blokeer waar die wortels nog nie groei nie.
 - Versprei deklae rondom die boom om verdamping vanaf die grondoppervlakte te verminder.
 - Indien inlyn-druppers gebruik word, plaas spesiale klampies op die lyne om druppers tussen bome, waar die wortels nog nie gevestig is nie, te blokkeer.
 - Installeer sproeiers met 'n kleiner benattingsoppervlakte en besproei slegs volgens grondwaterinhoud, nie vooraf geskeduleerde intervalle nie.
- Vermindering van die blaardak in ouer bome.
 - Boomwaterverbruik is direk gekoppel aan die grootte van die blaardak.
 - Jong bome het 'n kleiner blaardak en wortelsone as volwasse bome en kan tot 50% minder water gebruik as volwasse bome.
 - Bome moet swaar gesnoei word om transpirasieverliese van 'n groot blaarkap te verminder.
 - Gebruik 'n kombinasie van PVA en koper teen 'n 50/50 verhouding van water en verf om stamme wat aan sonlig blootgestel is te verf.
 - Die hoeveelheid van die blaardak wat verwyder word vir elke blok verwyder word, moet gebaseer word op boomouderdom, oeslading, groeistadium, langtermyn lewensvatbaarheid van die blok, en hoeveelheid water wat bespaar moet word.
- Bome van waarvan se blaardakke verminder is, herstel vinniger ná die droogte as bome waar dit nie toegepas was nie.
 - Pas kunsmistoediening aan om by die grootte van die blaardak te pas – verhoog die hoeveelheid kunsmis geleidelik soos die blaardak her groei.
- “Skeletonising/Stag horning”.
 - Dit is die ergste strategie om die blaardak te verklein en behels die verwydering van byna alle raamtakke en blare.
 - Bome gebruik aansienlik minder water ná dié aksie en dit neem 2-3 jaar vir bome om te herstel (volle produksie).
 - Verf bome met 'n witwasmiddel (1 deel water + 1 deel PVA) direk na snoei.
 - Terwyl die boom hergroeit, moet die beste lote geselekteer word vir die nuwe kroon geselekteer word.
- Snoei vir her-enting.
 - Deur bome terug te snoei vir her-enting met 'n nuwe kultivar, sal waterverbruik verminder word (witwasmiddel).
- Verminder oeslading.
 - Doen onderdrukking van blomvorming d.m.v. toepaslike chemikalieë (bv. GA₃).
 - Snoei tydens blom – verwyder van swak takke, kruistakke en waterlote.

Vir meer inligting oor die waarskynlikheid van 'n El Niño-gebeurtenis, besoek asseblief die volgende webtuiste: <https://agrisa.co.za/media/seasonal-climate-watch-april-to-august-2023>