# Climate Change impact on Citrus Industry

A study was conducted in 2022 into the impacts of Climate Change on Washington Navel Oranges and Afourer Mandarins in Red Cliffs, Victoria.

The table to the right details the impact of Climate Change on average yields and growing season length for these two crop types.

The analysis assumes no change or adaptation to current management practices or varieties.

The analysis was conducted across three different time horizons 2030, 2050 and 2070.

Given what is understood to be the current climate trajectory, the best estimates of climate scenarios are predicted to be somewhere between Representative Concentration Pathway (RCP) 4.5 and RCP 8.5.

This data represents the average of these two different climate scenarios.

| | Time Period | Yield | Growing season length |
|---|---|---|---|
| | | Reduction (%) | Reduction (days) |
| Washington navel orange | 2030 | 5 | 15 |
| | 2050 | 11 | 27 |
| | 2070 | 14 | 35 |
| Afourer mandarin | 2030 | 5 | 15 |
| | 2050 | 11 | 27 |
| | 2070 | 14 | 35 |

**The below table summarises the main fruit quality issues of concern raised by the citrus industry.**

| Issue | Cause |
|---|---|
| **Internal quality, longevity, taste** | High overnight temperature can offset the balance between acid and sugar. Acids are metabolised and reduced, influencing taste, the internal quality and longevity of the fruit which is important for export markets (e.g. USA). Fruit developing in warm climates reach marketable sugar:acid ratios sooner than cooler locations, but these fruits are also low in acid resulting in poor eating quality. |
| | High humidity can increase the risk of disease and affect quality, yield and operations (i.e. more spraying). |
| | Sunburn can damage the skin cells and external quality of the fruit, which in turn can lead to internal dryness. |
| | Trees grown in hotter, wetter climates don't have the longevity of production. |
| **Peel quality, albedo breakdown** | Poorly understood seasonal conditions and weather conditions, that delay harvest, increase the risk of albedo breakdown: serious rind defect of navel oranges; outer peel (flavedo) develops dimple (looks like cellulite). Appears around fruit maturity and can worsen as the fruit remains on the tree. Appropriately timed applications of GA (to delay rind maturation) and/or calcium early in cell expansion, are good risk management measures. |
| **Oleocellosis (visual impact on peel)** | Handling wet navel oranges during harvest can result in oleocellosis, a significant rind defect. Mechanical damage at harvest is exacerbated by cold and wet harvest conditions (including dew and fog). The injury causes greenish/brown areas to arise on the fruit's peel as a result of essential oils spilling over into the subepidermal tissues between the oil glands. Fruit should be above 13˚C and dry before picking/handling. |
| **Peel colour** | Warm temperatures inhibit colour break from green to orange. When temperatures fall below 20˚C, the rind will begin to colour as the green pigment (chlorophyll) in the peel starts to degrade and orange pigment (carotenoids) accumulates. |

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