Road Blocks to Assessing Climate Impacts on Temperate Perennial Fruit

Rebecca Darbyshire
Scientists have known for decades. They’ve warned us. And changes are well underway.

CLIMATE CHANGE IS HAPPENING NOW

1965
Leading scientists point out the chaotic nature of the climate system and the possibility of sudden shifts.

2013 REMIX
A warming climate is increasing the frequency and severity of many extreme weather events.

1971
Conference of leading scientists reports a danger of rapid and serious global climate change caused by humans, calls for an organized research effort.

2013 REMIX
Scientists are more certain than ever that the warming since 1950 has been primarily caused by humans.

1982
Strong global warming since mid-1970s is reported, with 1981 the warmest year on record.

2013 REMIX
The period 2001–2010 was the hottest decade on record.

2013 REMIX
IPCC First Assessment Report finds global warming is likely to increase heatwaves in summer.

2013 REMIX
Many regions including Australia have experienced longer and more intense heatwaves.
• Food is essential (!)
  – And we are going to need more of it
• Food production dependent on the climate
• Assessing climate impacts and adapting to new conditions critical

Biological system + climate = food production

Biological system + climate + climate change = Δ food production?
Fruit production is dependent on flowering.

Flowering is dependent on temperature.
• ‘Springtime warming’
  – Warming accelerates flowering
  – Potential increase to frost risk

• ‘Sequential chill-growth’
  – Winter chill satisfied prior to responding to spring warming
  – Response to warming unclear
Estimate Parameters with Historical Data

Granny Smith apple (Tatura)

Springtime Warming  Sequential Chill-Growth

~Oct

~Sep
Sequential Chill-Growth

Granny Smith Apple (Tatura)

Interaction with frost?
Changes to Frost Conditions?

Granny Smith Apple (Tatura)

Springtime Model

- Historical Bloom
- +1°C warning
- +2°C warning
- +3°C warning

Frost Incidence

Day of Year

September

October
Road Blocks

• Need to provide climate projections translated into meaningful metrics.

• Uncertainty restrictive:
  – Uncertainty in projections
  – Uncertainty in development of frost conditions
  – Uncertainty in physiological relationship
  – Uncertainty in method selection

• To provide meaningful projections, improvements in understanding physiology not just climate science
QUESTIONS?