CSIRO PLANT INDUSTRY

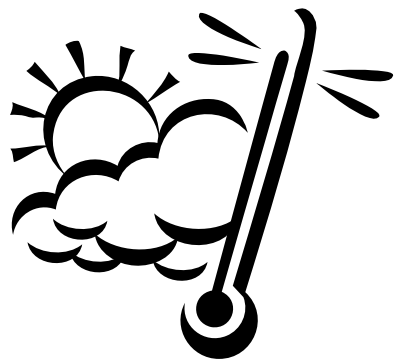
Impact of Climate Change on Cotton's Growth and Development

Michael Bange CSIRO Plant Industry

Cotton Catchment Communities CRC

Climate Change

- **increases in atmospheric Carbon Dioxide CO2 concentration**
- **Reduced water availability coupled with increased atmospheric evaporative demand (lower humidity)**
- **increases in temperature**



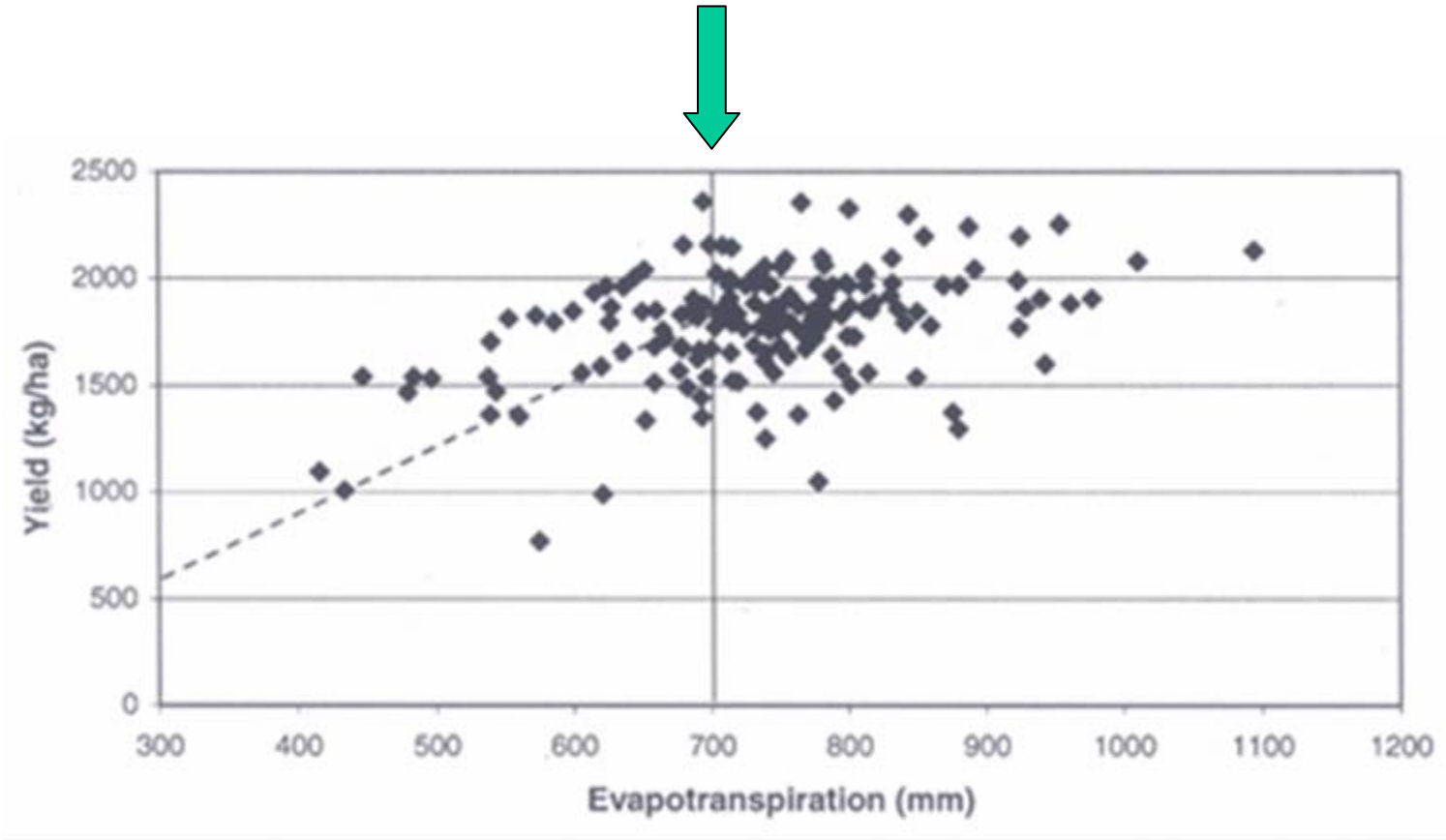
Negative and Positive Consequences

Negative Consequences

- **Reduced water availability coupled with higher evaporative demand**
- **Higher incidence of hot days through season**
- **Warmer boll filling period predisposing crop to higher micronaire**

Water Use

7 Ml on average to grow crop before yield loss



Tennakoon and Milroy 2004 (CSIRO)

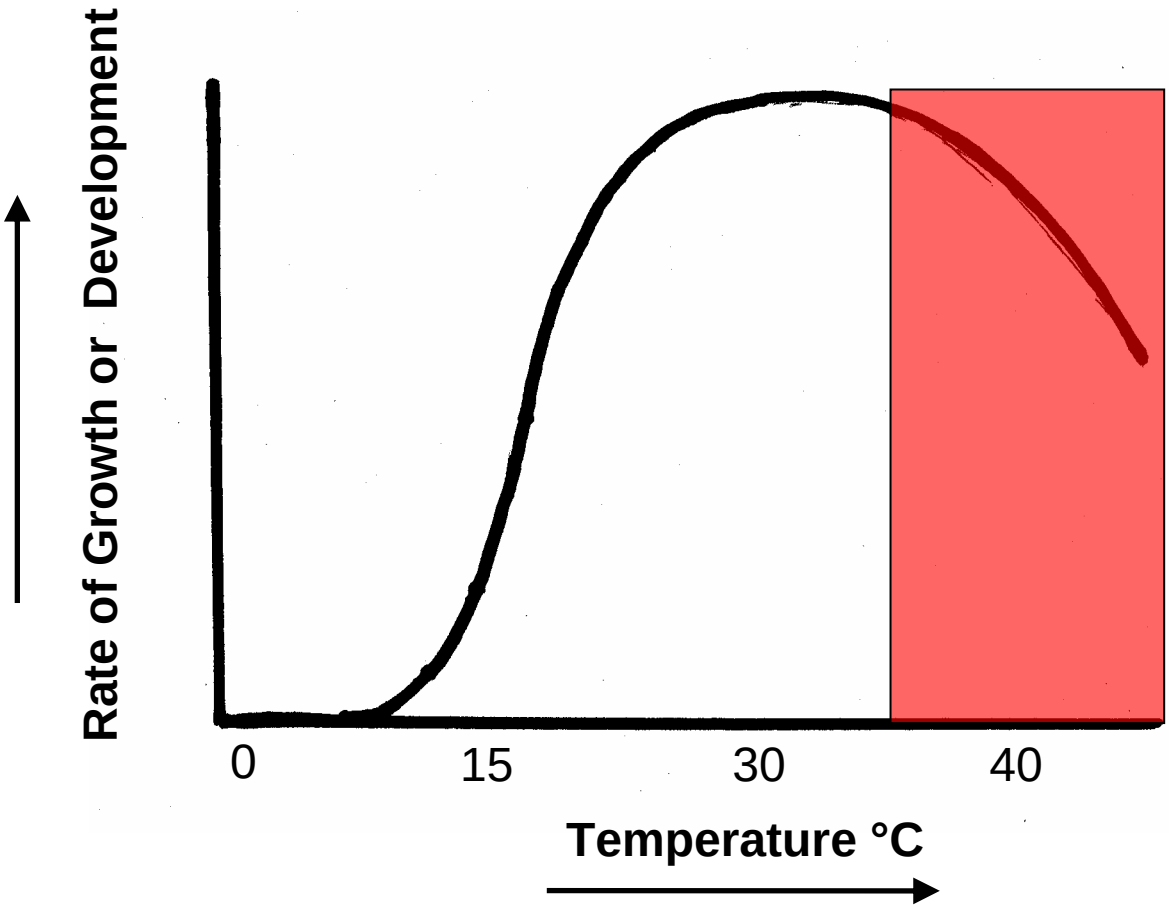
Evaporative Demand

Low humidity significantly increases plant stress

Leaf water Potential Stress at -18bar	Wet Soil	Dry Soil
Low Evaporation (~6mm/day)	-14.5	-14.8
High Evaporation (~14mm/day)	-14.5	-38.8

James Neilsen CSIRO

High Temperature Effects



Reduced photosynthesis
High night respiration
Low pollination (parrot beak)
Shedding squares and flowers
Boll freeze
Short fibre
High Micronaire

High Temperature Effects

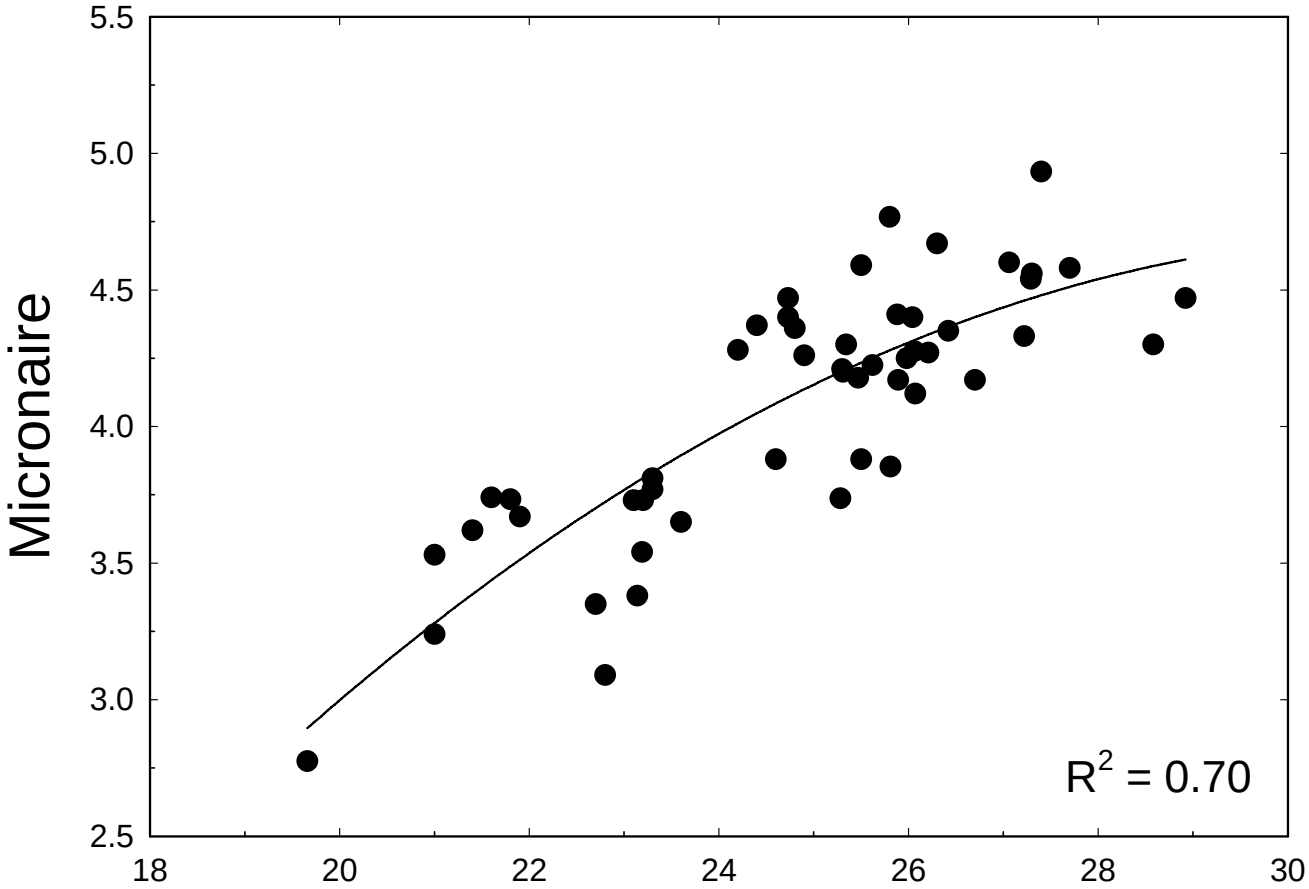
Poor Pollination – Parrot Beak

Fruit Loss

Courtesy Steve Yeates

Temperature and Quality

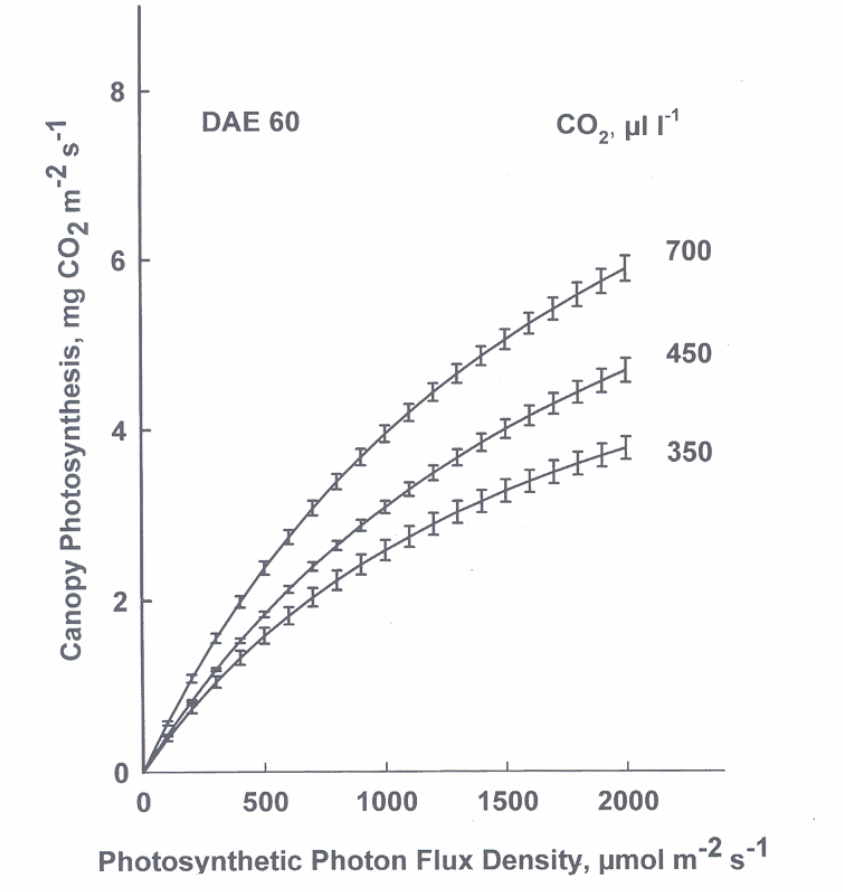
(Bange and Constable, CSIRO unpublished)



Positive Consequences

- Higher CO_2 (increases yield and water use efficiency)
- Less incidence of cold shock
- Longer seasons

Increased CO2



(Reddy et al., 1996)

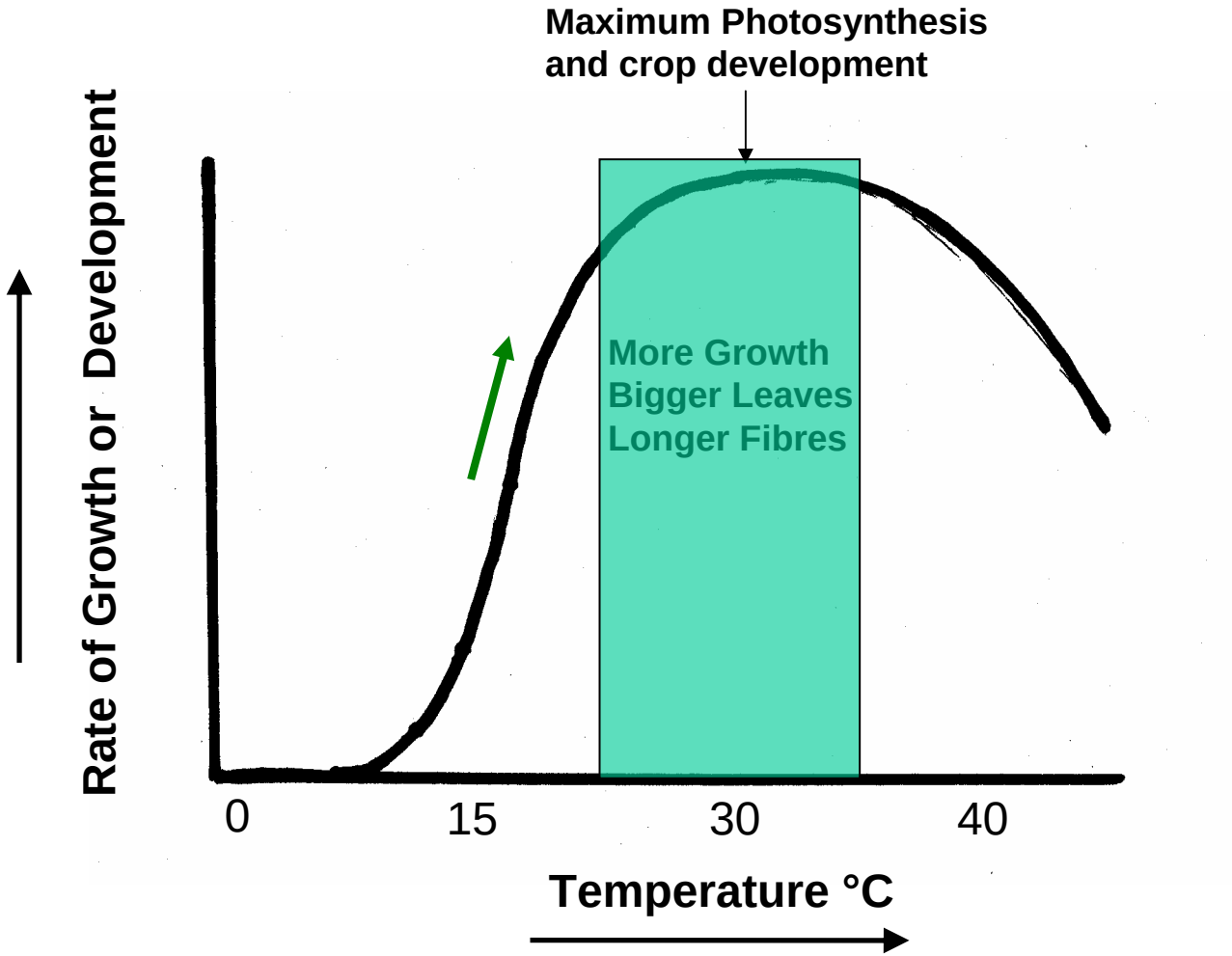
- **Higher photosynthesis**
- **Better water use efficiency**
- **Potentially 40% increase in yield**

Improved crop establishment

	Current climate		2020		2050	
	Bange and Milroy (days)	1966-1995 base (days)	Days of cold shock	Decrease in cold shock (days)	Days of cold shock	Decrease in cold shock (days)
Bourke	26	33	22-30	3-11	10-27	6-23
Gunnedah	33	37	5-33	4-32	13-31	6-26
Moree	25	38	29-36	2-9	17-34	4-21
St George	16	23	15-21	2-8	1-19	3-22

Dr Chris Mitchell CSIRO at the Australian Cotton Conference 2004 (ACGRA)

Warm starts & finishes

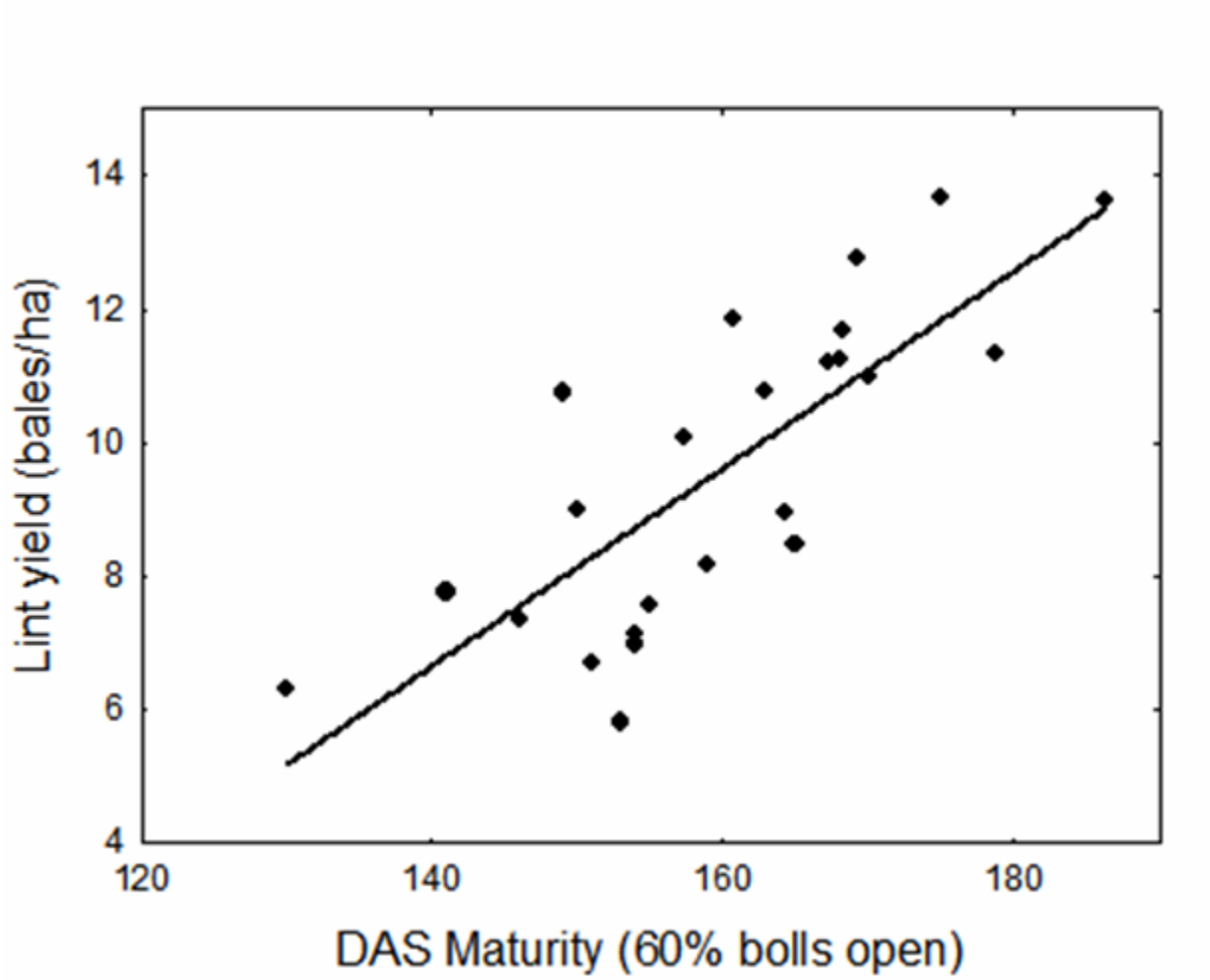


Longer Seasons

1 week =

Approx. 0.3 to 0.6

bales/ha



(Bange and Milroy 2004, CSIRO)

Summary

- **Many facets of cotton physiology affected**
- **Integrative research process will be needed**
- **Crop simulation coupled with climate prediction are powerful tools** 

- **Some more research for Australian climates will be needed**

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Thank you

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