

35th INTERNATIONAL COTTON CONFERENCE BREMEN 2021



Presentation

Session: **Keynotes (K1)**

Title: **Climate Change: A storm in a teacup?**

Speaker: **Kai Hughes**, ICAC - International Cotton Advisory Committee, Washington, DC, USA

Presentations are available on the conference archive: <https://baumwollboerse.de/en/cotton-conference/lectures/>

Conference Organization

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Climate Change: A Storm in a Teacup?

Kai Hughes

Executive Director

International Cotton Advisory Committee



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So What Causes Climate Change?

Deforestation for Land Use

Energy: Electricity & Petroleum Products

Chemicals: Fertilisers, Pesticides, Synthetic Fibres, Dyes etc.

What are the Effects of Climate Change?

Greenhouse gases (CO₂, CH₄, N₂O etc.) ↑

Temperature anomalies ↑

Rainfall patterns ↑ ↓

Drought intensities ↑

Frequency of extreme events ↑



1. What Causes Climate Change?

Deforestation for Land Use

Energy: Electricity & Petroleum Products

Chemicals: Fertilizers, Pesticides, Synthetic fibres, Dyes etc.,

2. What are the Effects of Climate Change?



Greenhouse gases (CO₂, CH₄, N₂O etc.) ↑

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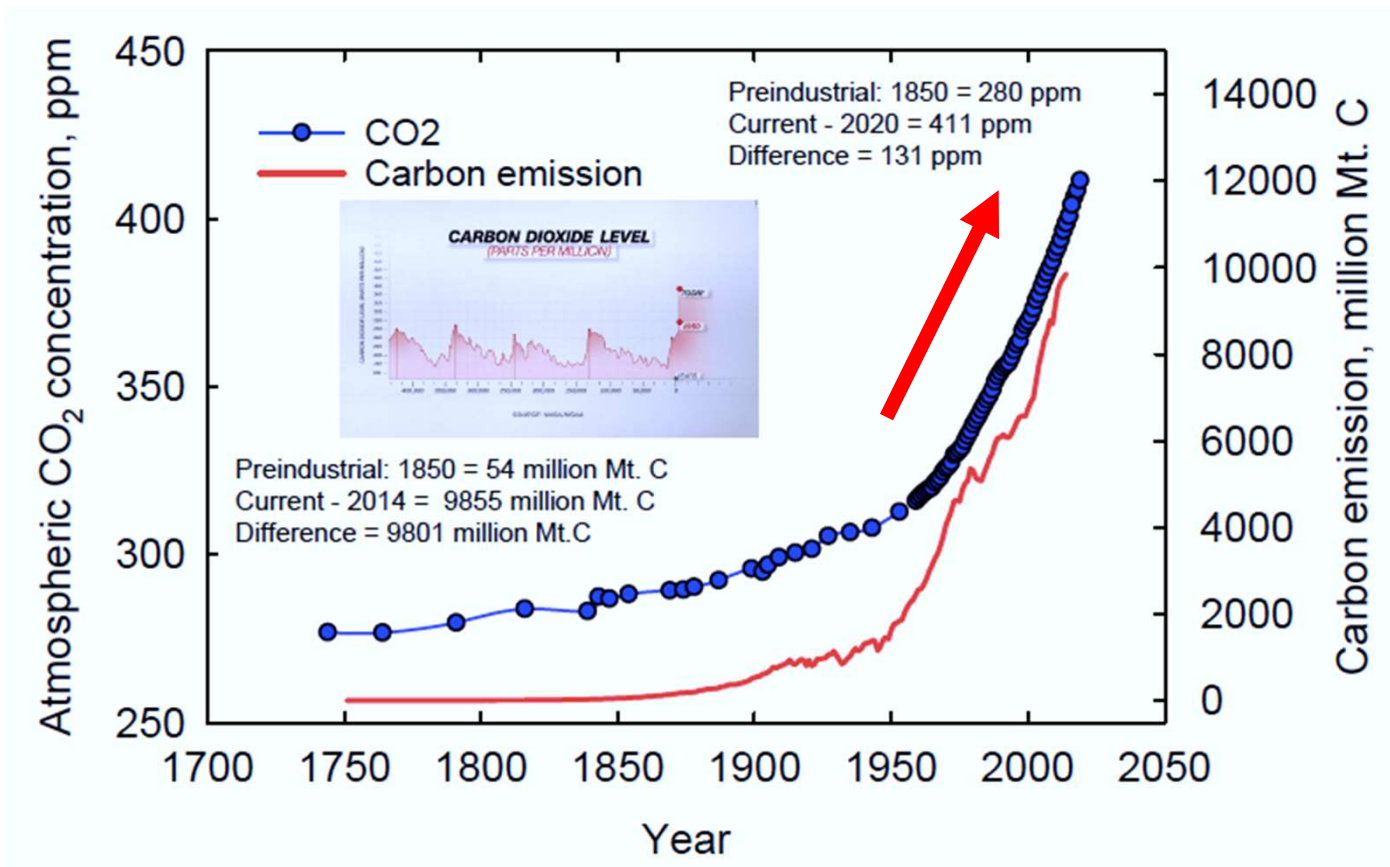
Rainfall patterns ↑ ↓

Drought intensities ↑

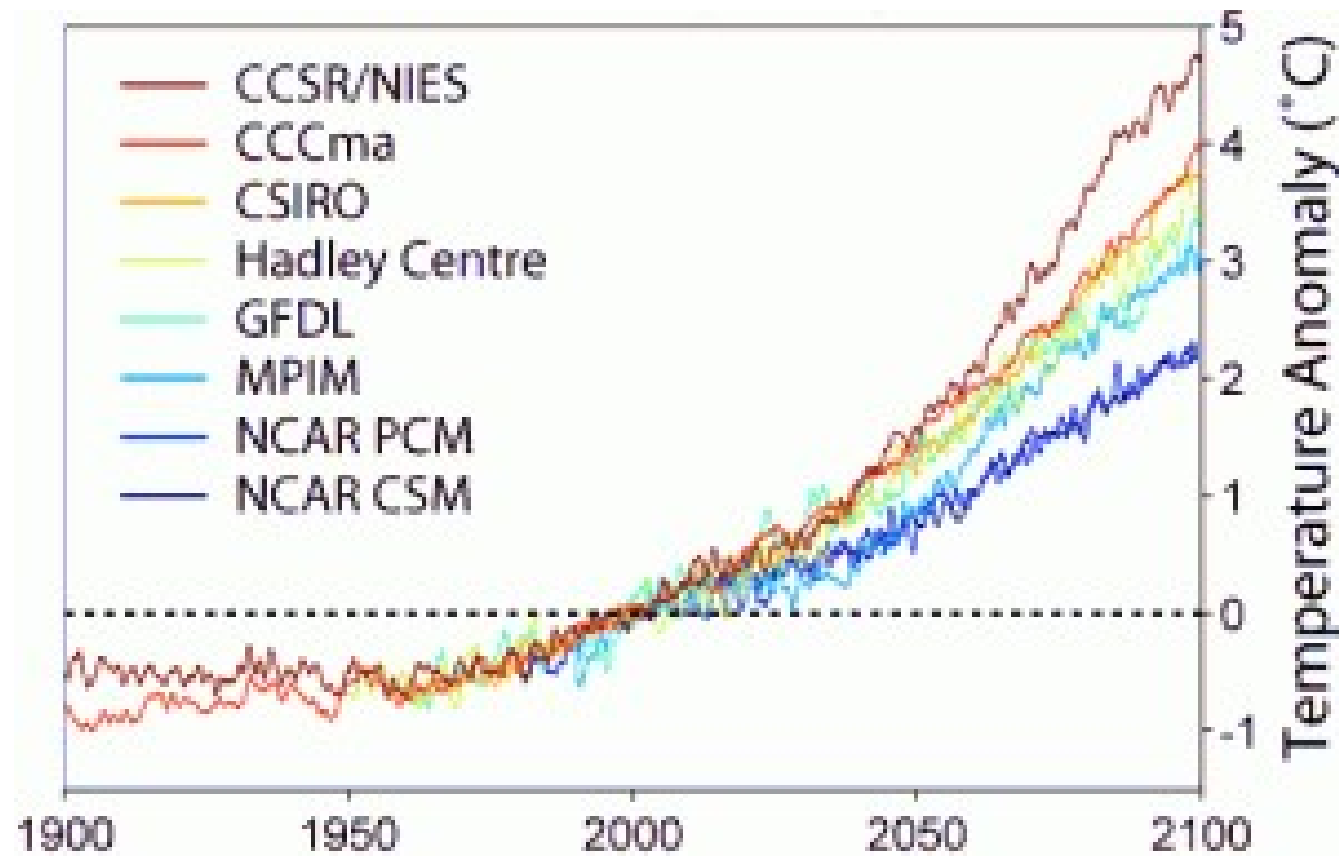
Frequency of extreme events ↑



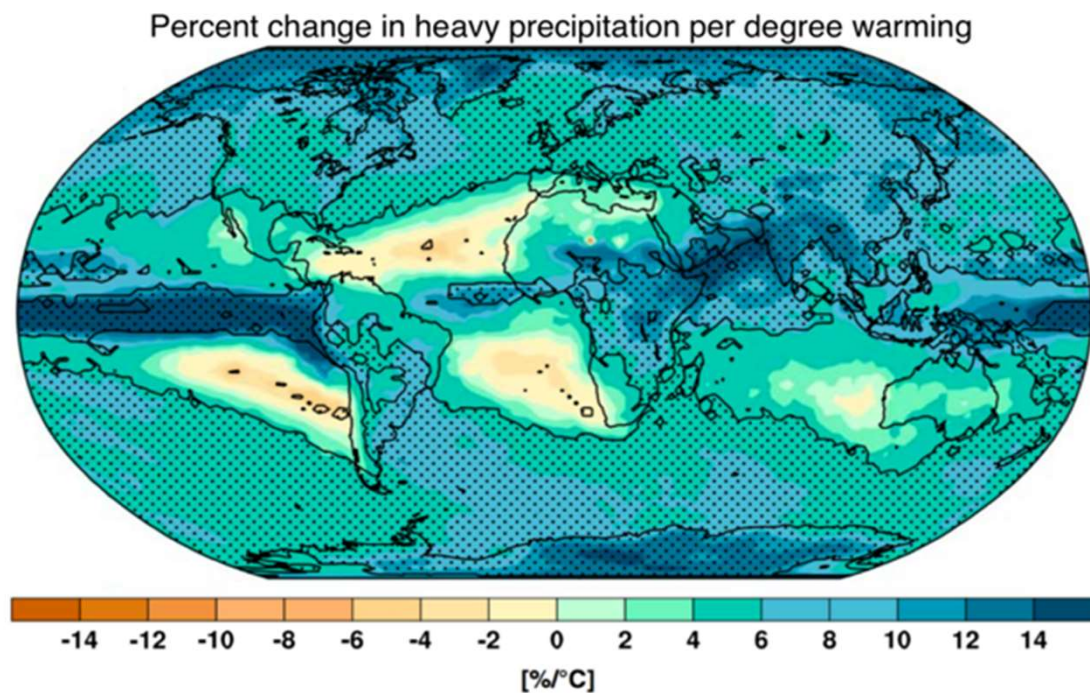
Atmospheric CO₂ Concentration



Global Warming Projections



Rainfall Patterns Are Strongly Influenced by Global Warming



Fischer et al., Geophysical Research Letters, 2014



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Top 3 Effects on Cotton

1. Temperature anomalies
2. Erratic rainfall patterns
3. Higher CO2 emissions



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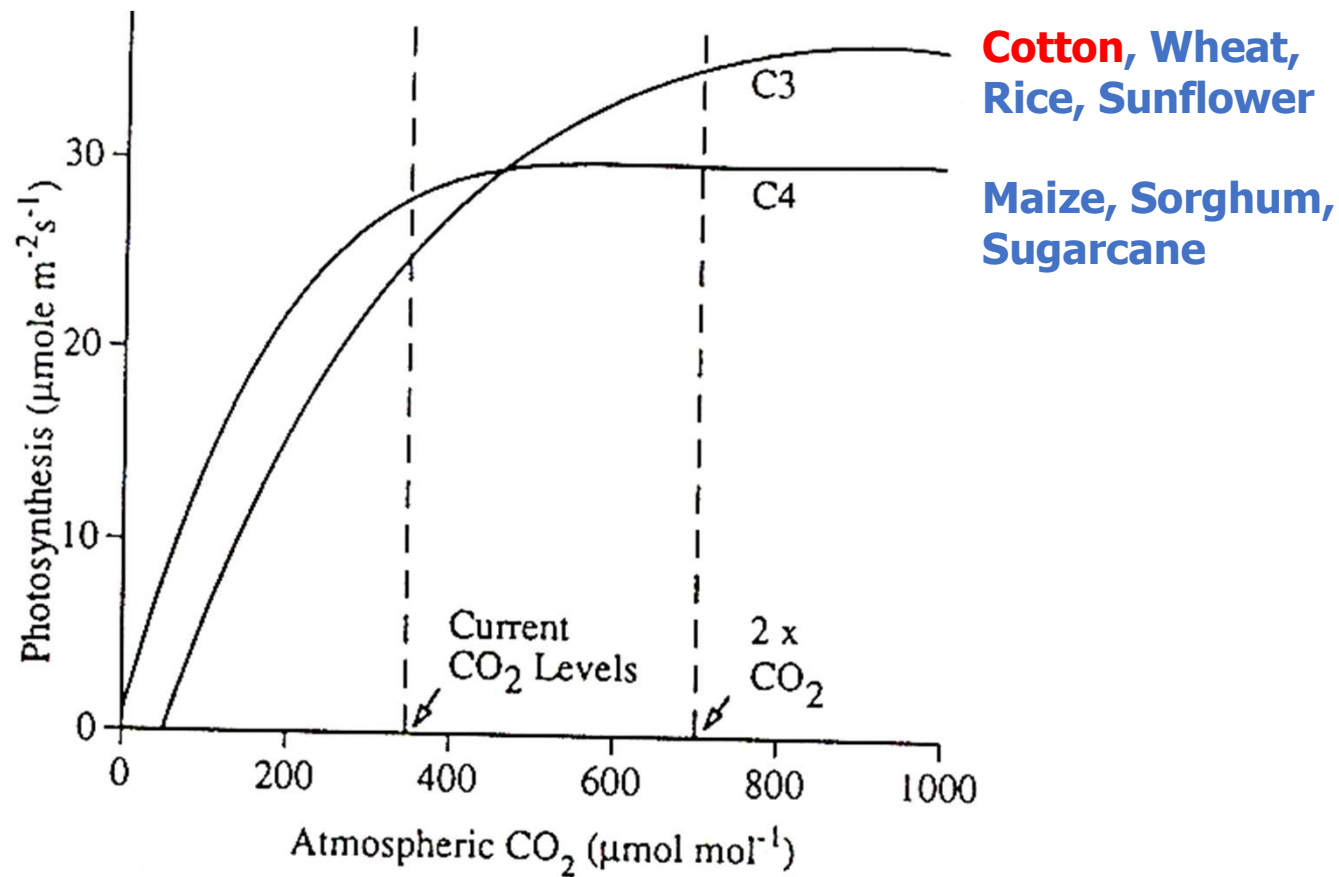
Impact of CO₂ and Elevated Temperatures on Cotton



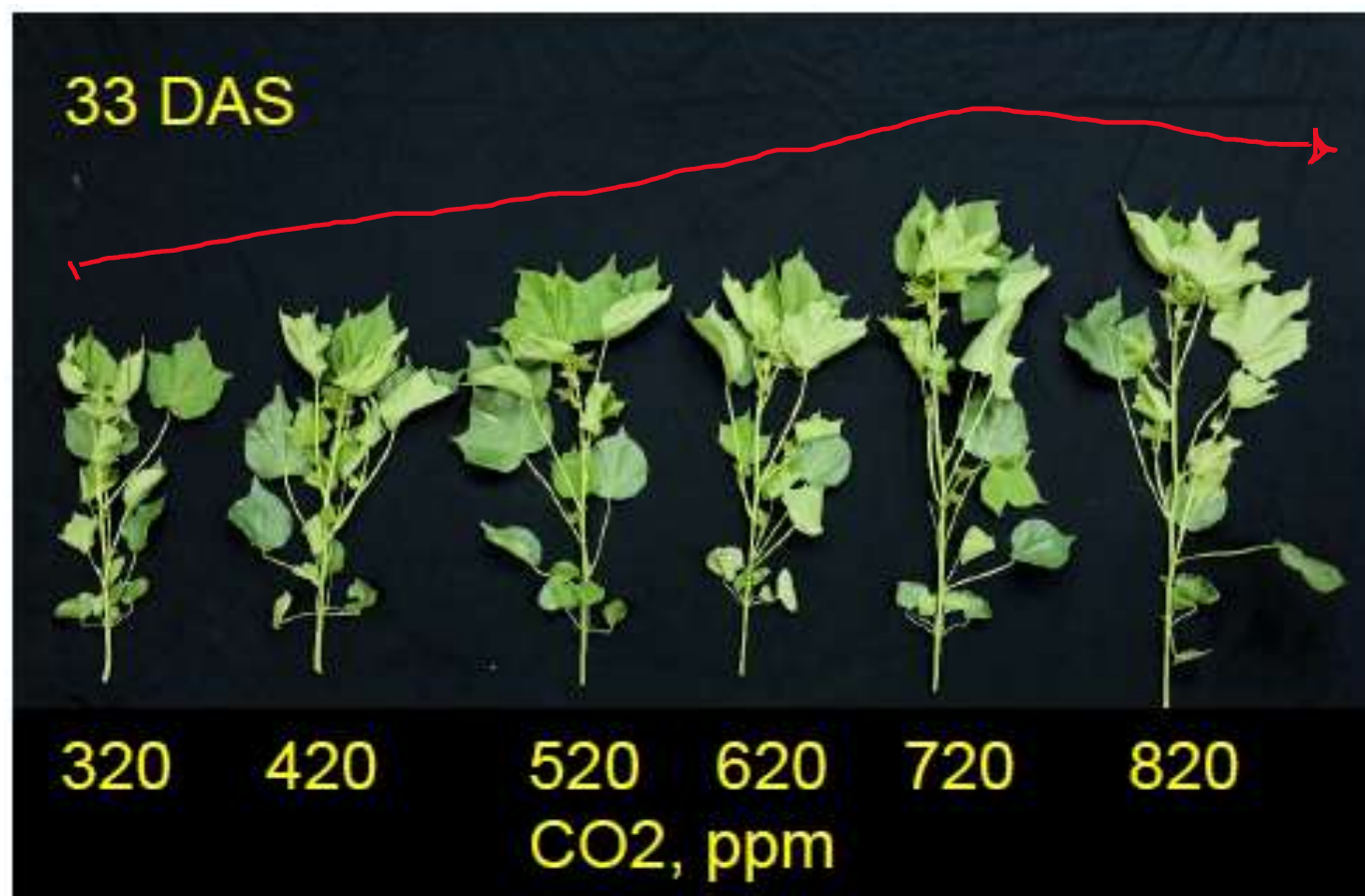
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Cotton is a C3 plant

It can use high levels of CO₂ (900 ppm) for photosynthesis

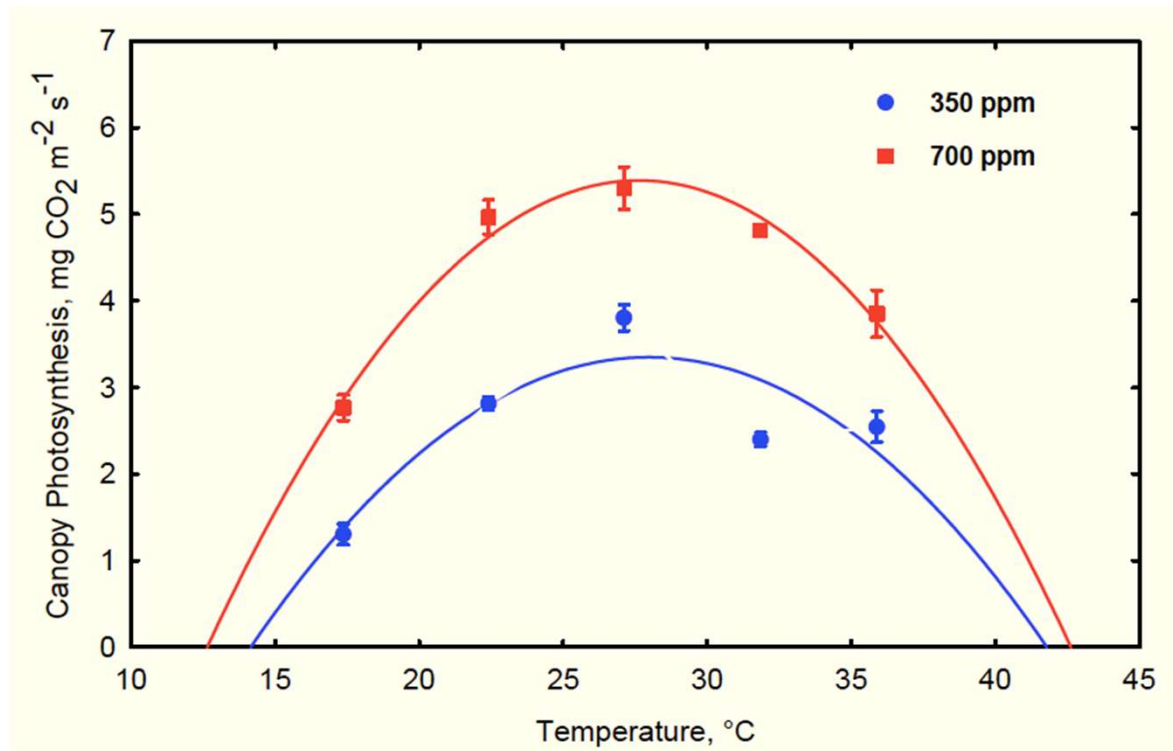


Cotton grows well even at 820 ppm of CO₂



Scientific Studies

Higher CO₂ Levels Benefit Cotton but High Temperatures Can Lower Cotton Yields



Optimum Temperature °C

28-30

Germination

27-35

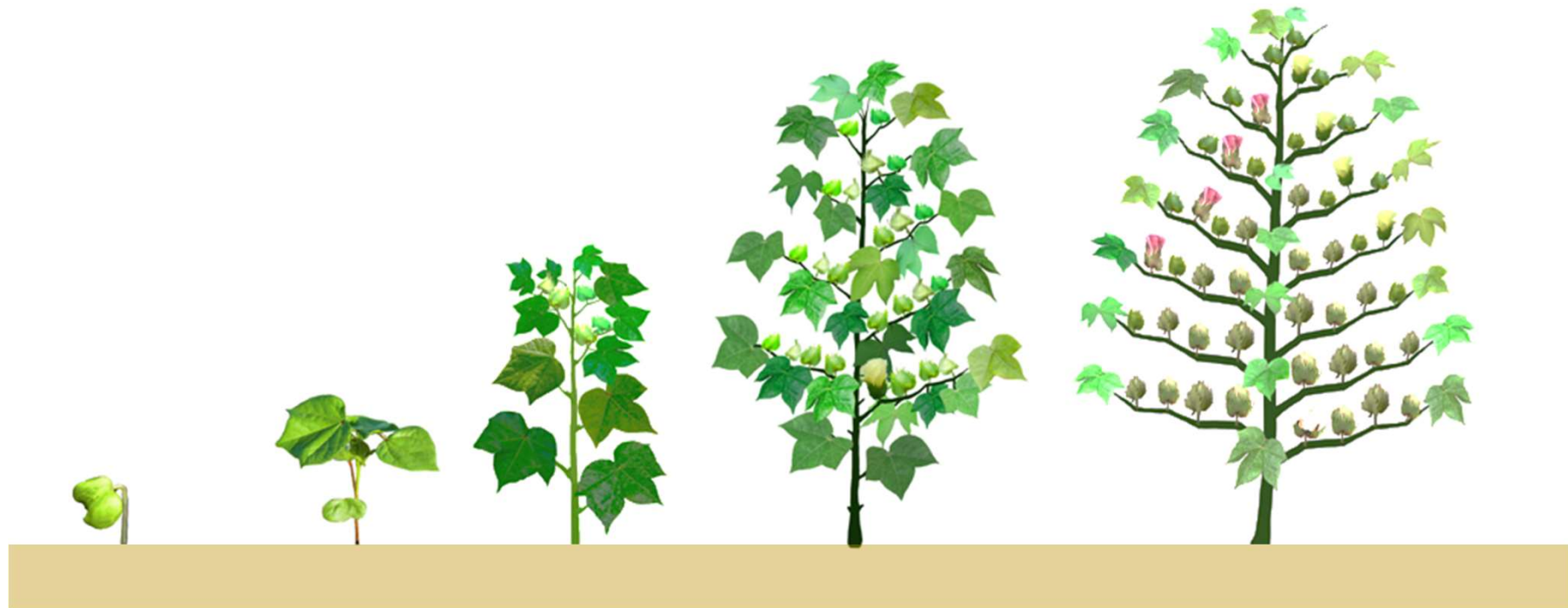
Seedling growth

27-32

Square growth

24-27

Boll size and retention

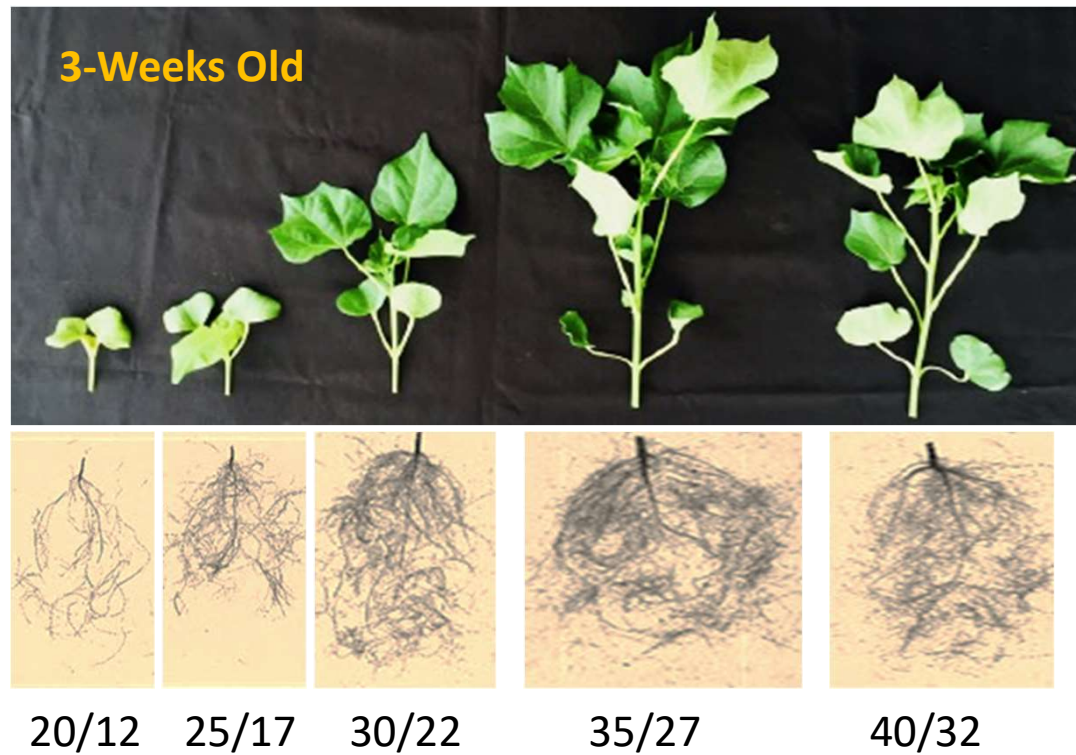


**>30°C reduces
germination%**

**>38°C impedes
growth rate**

**Min Temp (night) >27°C causes sterile
pollen, small bolls & boll shedding**

Seedling Growth at Different Temperatures

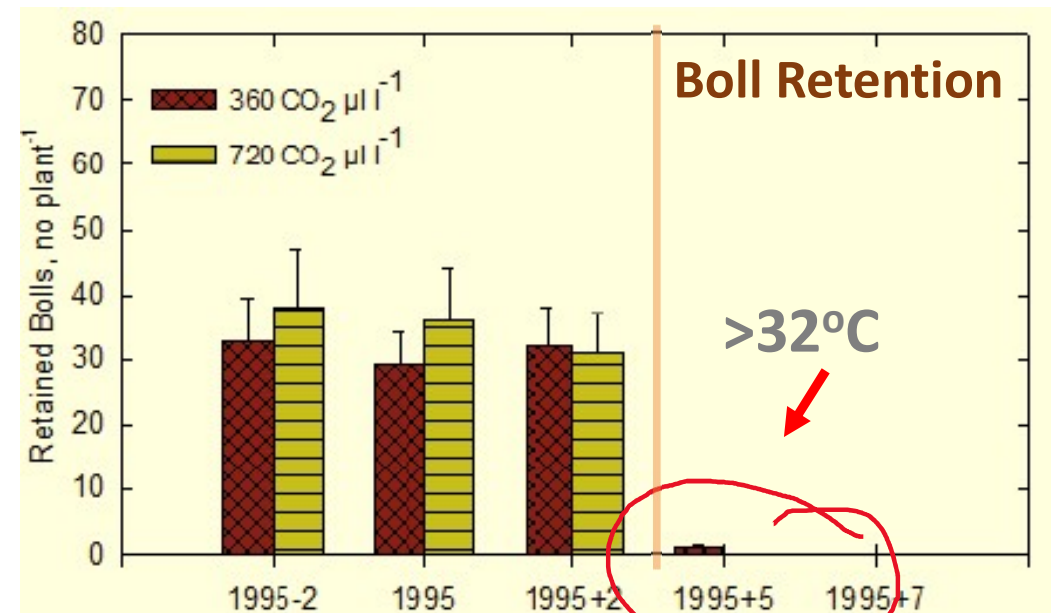
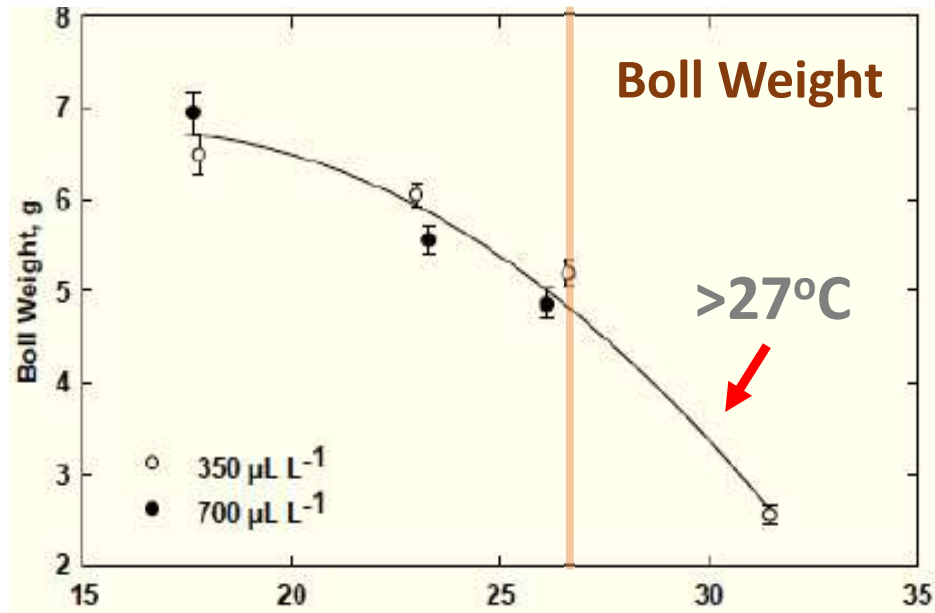


Day / Night Temperatures °C



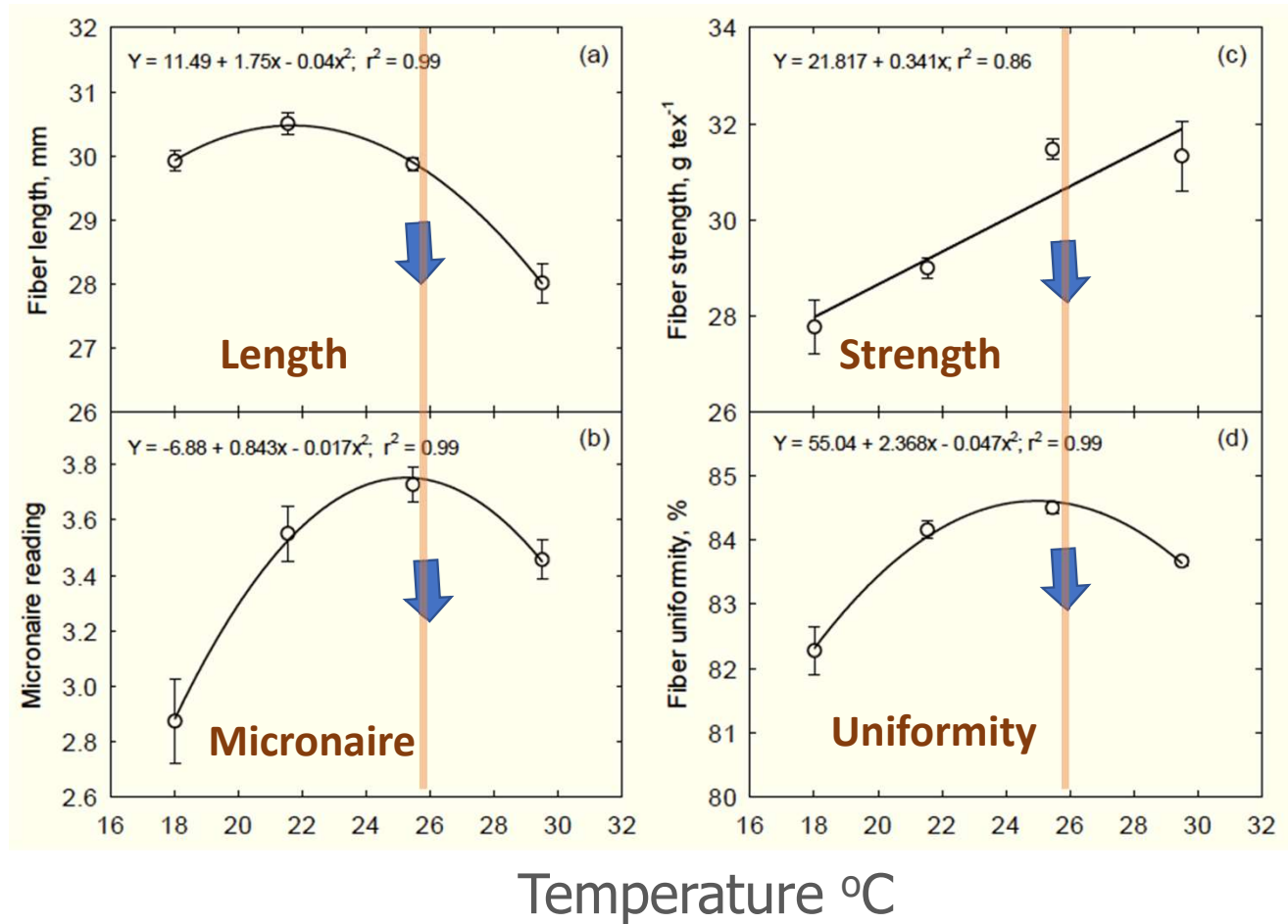
Higher Temperatures Decrease Boll Weight & Cause Poor Boll Retention

Optimum 24-27°C

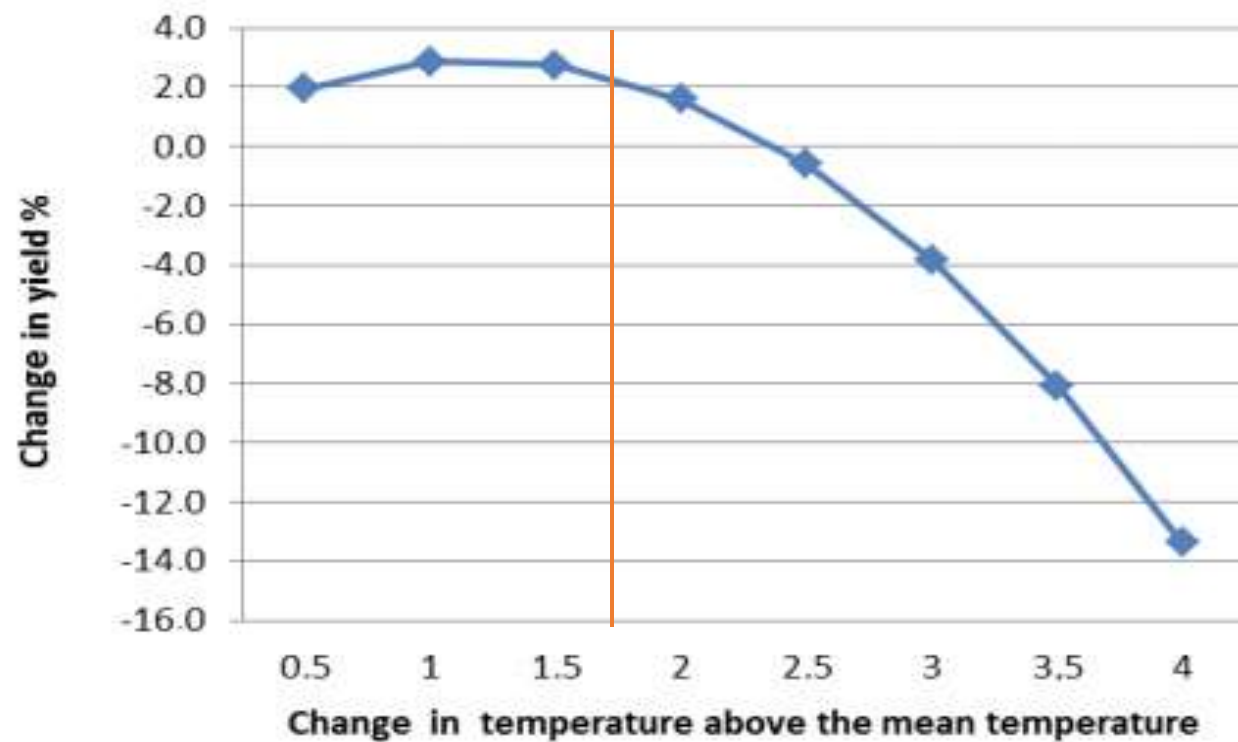


Fibre Qualities

Higher Temperatures Affect Fibre Quality



Global Warming Will Decrease Seed Cotton Yield in Burkina Faso



Predicted Climate Change, GDP Interactions Across Africa

Subregions	GDP (% Change/Year)			
	1° C	2° C	3° C	4° C
North (n = 7)	-0.76 ± 0.16	-1.63 ± 0.36	-2.72 ± 0.61	-4.11 ± 0.97
West (n = 15)	-4.46 ± 0.63	-9.79 ± 1.35	-15.62 ± 2.08	-22.09 ± 2.78
Central (n = 9)	-1.17 ± 0.45	-2.82 ± 1.10	-5.53 ± 1.56	-9.13 ± 2.16
East (n = 14)	-2.01 ± 0.20	-4.51 ± 0.34	-7.55 ± 0.63	-11.16 ± 0.85
Southern (n = 10)	-1.18 ± 0.64	-2.68 ± 1.54	-4.40 ± 2.56	-6.49 ± 3.75
Whole of Africa (n = 55)	-2.25 ± 1.52	-5.01 ± 3.30	-8.28 ± 5.12	-12.12 ± 7.04

Source: Adapted from Economic growth, development and climate change in Africa, published by the African Climate Policy Centre (ACPC) of the United Nations Economic Commission for Africa (UNECA)



Water Requirements of Cotton



2-3 mm/day



6-8 mm/day

Cotton Needs 600-700 mm Water (6-7 million litres per hectare)

2-3 mm/day



6-8 mm/day



WATER REQUIREMENT
15% at early season
85% at mid season

Early season

Mid season

Late season



10

20

30

40

50

55

60

65

70

90

140

Days after planting

Kg/day/ha Nitrogen 0.5

4.0

0.5



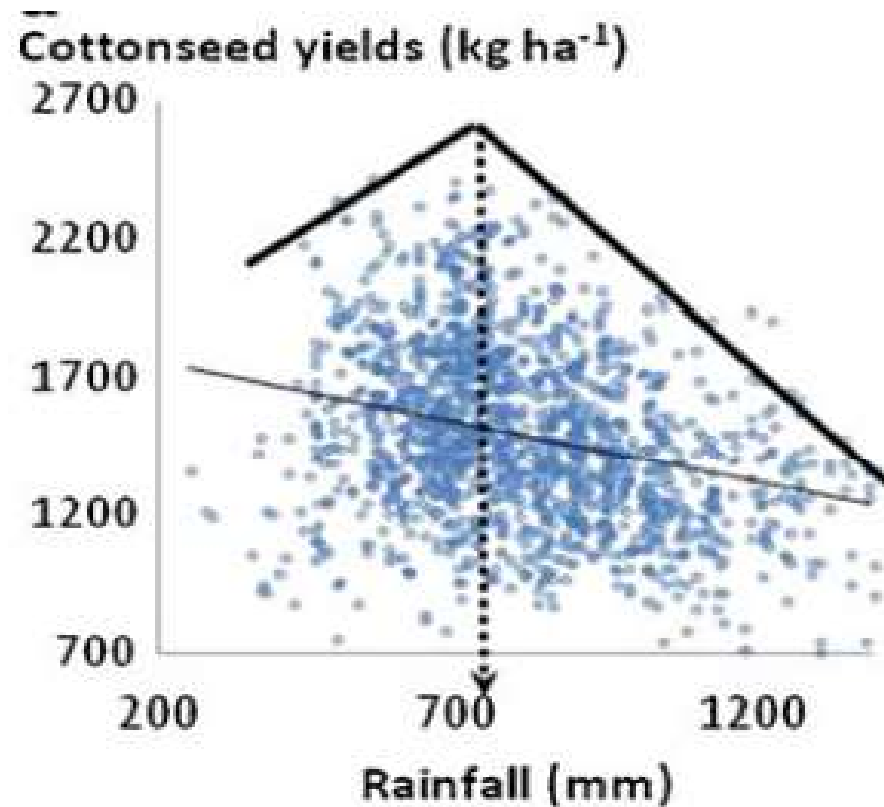
40 Days CRITICAL WINDOW

NUTRIENTS
20% at early season
80% at mid season



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45-year Data in Cameroon



But Is It All Gloom and Doom for Cotton?



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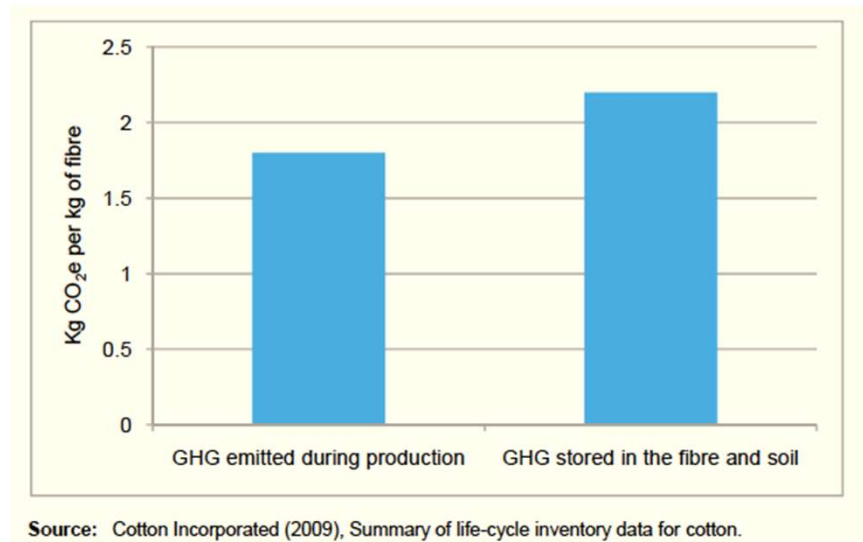
The Role of Cotton in Mitigating Climate Change Effects



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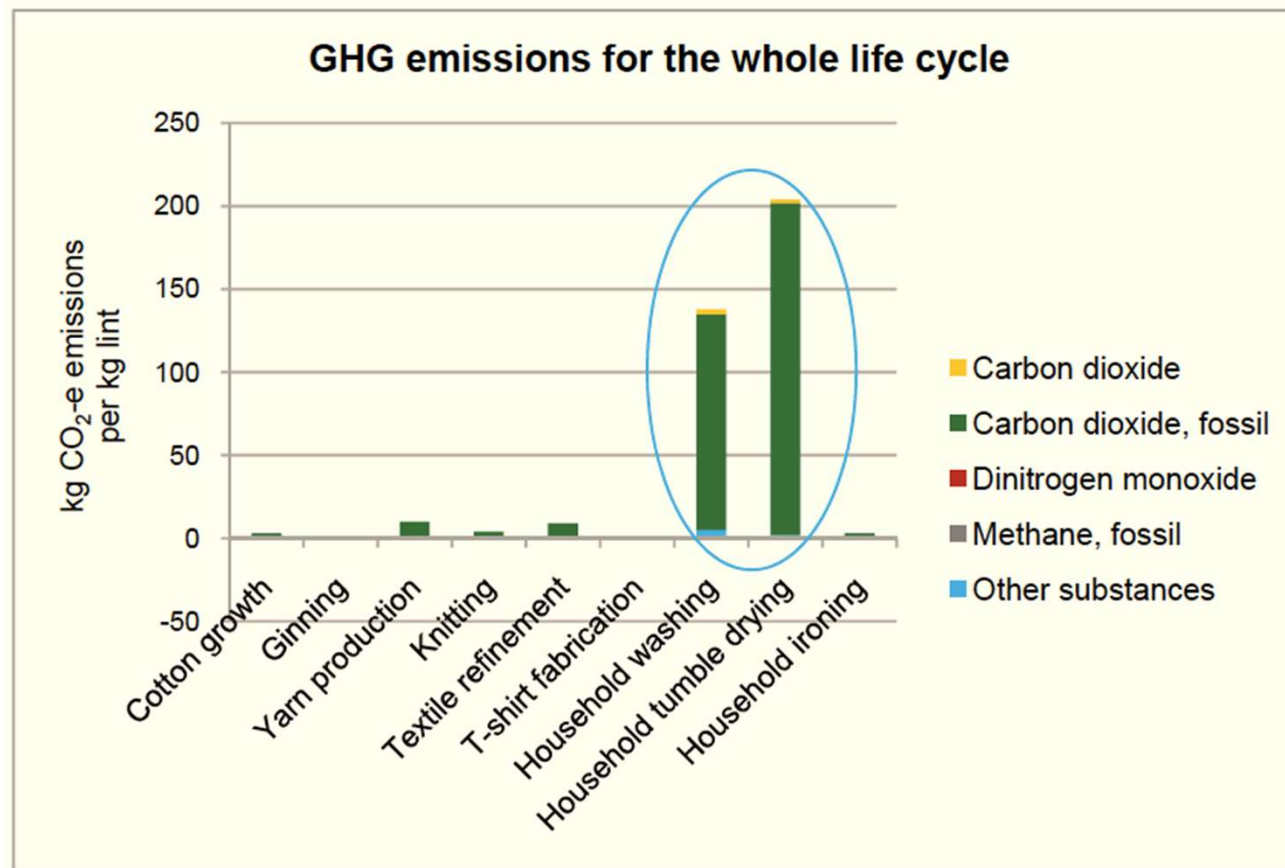
Cotton Is Special in Reducing Atmospheric CO₂



- Plants absorb CO₂ and sequester carbon in their biomass
- Cotton plants do more...they use CO₂ and H₂O to create cellulose
- Cotton fibres are 96-98% pure cellulose (C₆H₁₀O₅)_n
- Cotton sequesters 0.5 Kg additional CO₂ per Kg fibre produced
- Cotton is a C3 plant and has great capacity to use CO₂
- Organic cotton has very low carbon footprint



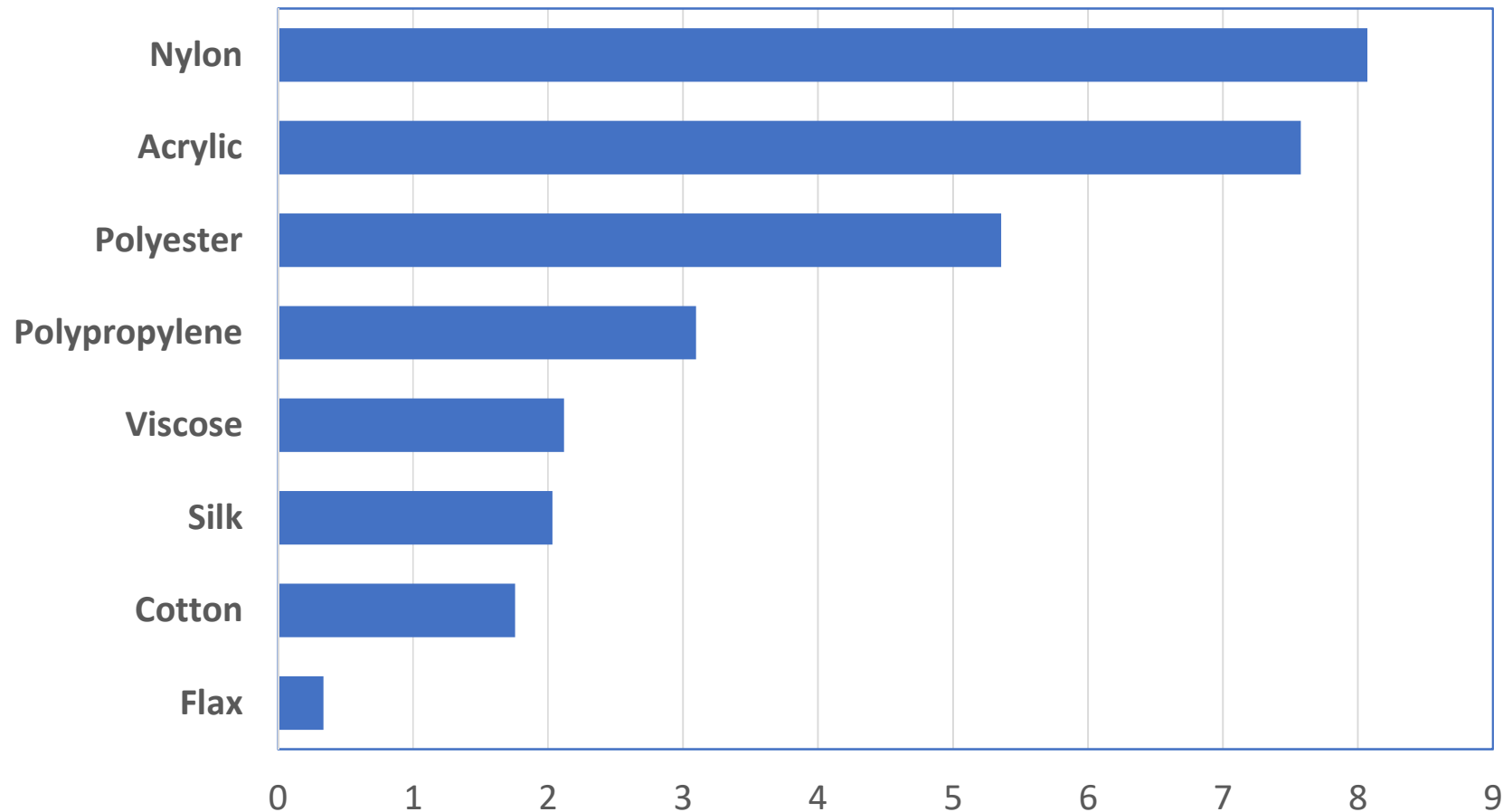
CO₂ eq Emissions in Life Cycle of a T-Shirt



Grace (2009). The impacts of carbon trading on the cotton industry.



Cotton Emits Fewer CO₂ eq of GHGs per Kg of Fibre in Production



Cotton Biodegrades in Soil in 12 Week; Polyester Does Not

Recycled Polyester T-Shirt



Recycled Polyester T-Shirt



Cotton Jersey, Bleached, Softened



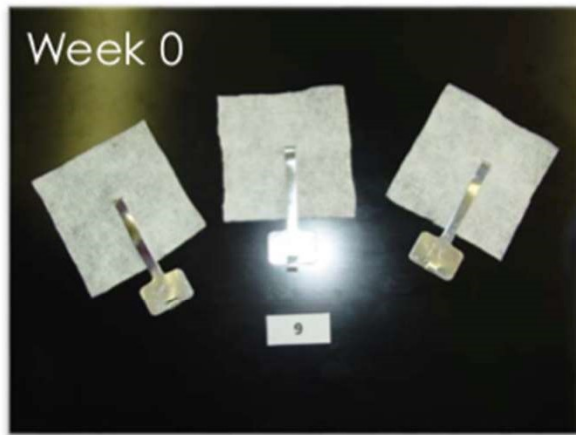
Cotton Jersey, Bleached, Softened



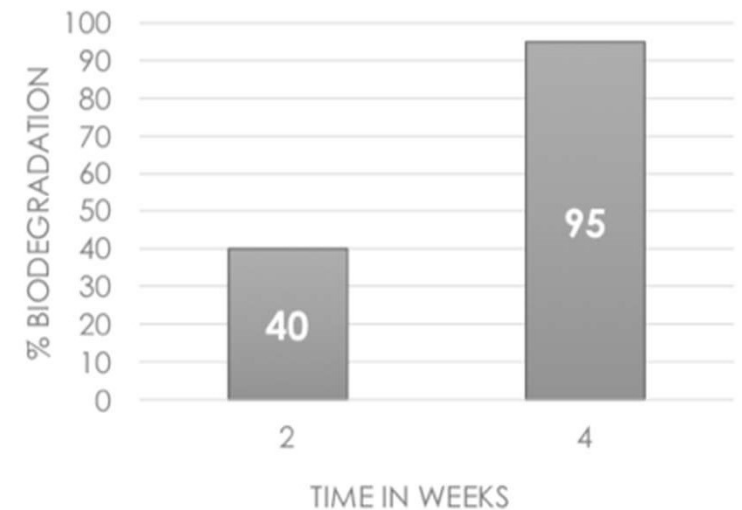
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Source:
Cotton Works

100% Purified Cotton Composting (ASTM D6400)

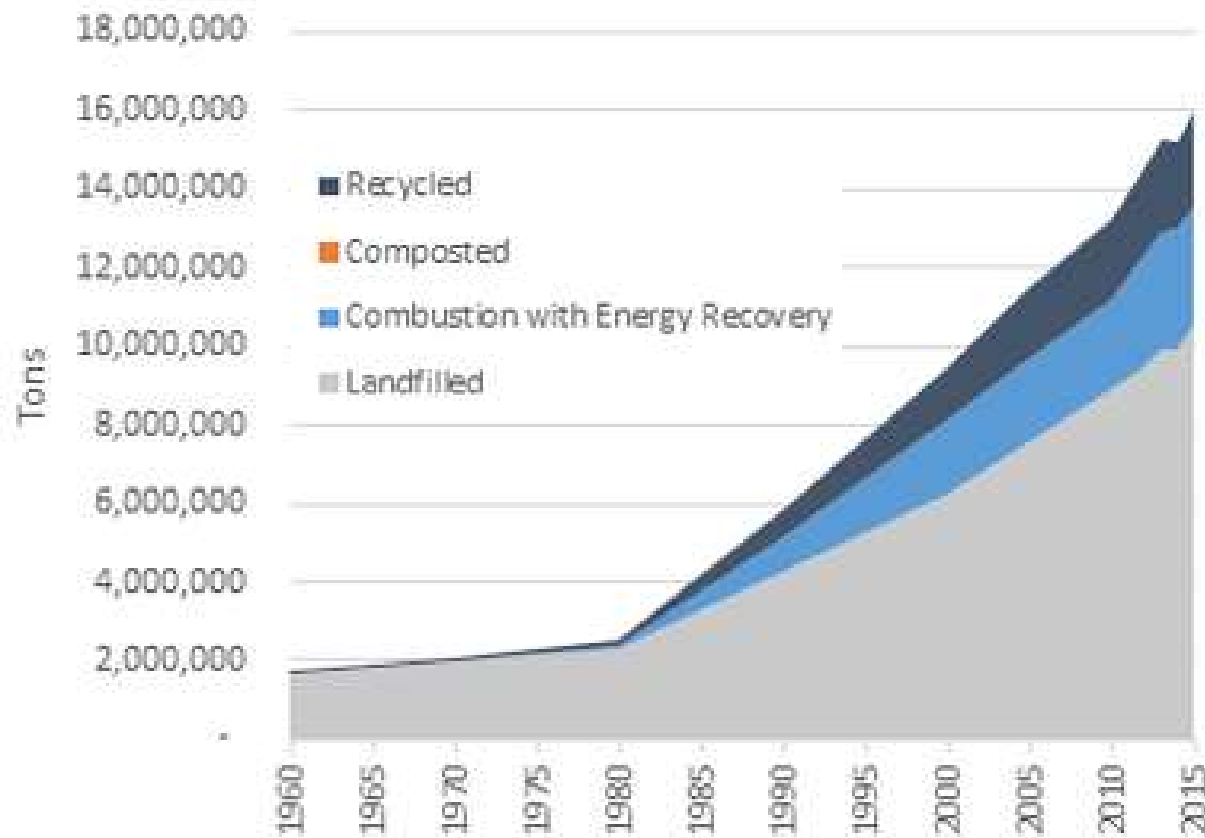


Sample #9



Cotton wipes biodegrade quickly in a composting container 100% cotton: 92 – 95% in four weeks
Blend: Cotton biodegraded; Polypropylene did not

Textile Waste Management 1960-2015



In 12 weeks the landfills will be left with only the poorly degradable synthetic textiles



What Can We Do to Make Cotton Resilient to Climate Change?

- Breed temperature-tolerant cultivars
- Reduce dependence on fertilisers & chemical pesticides
- Rejuvenate soil health through regenerative agriculture practices
- Promote cotton as a carbon-sequestering crop and an eco-friendly biodegradable fibre



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“Climate change is moving faster than we are. We must listen to the Earth’s best scientists.”

Antonio Guterres
UN Secretary General



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Thank You



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