


# Session 1:
# Production - Yield and Fibre Quality

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# What is cotton?

**Cotton is the overcoat of a seed that is planted and grown to keep the producer broke and buyer crazy. The fibre varies in colour and weight and the man who can guess the nearest length of a fibre is called a cotton man by the public, a fool by the farmer and a poor businessman by his creditors.**

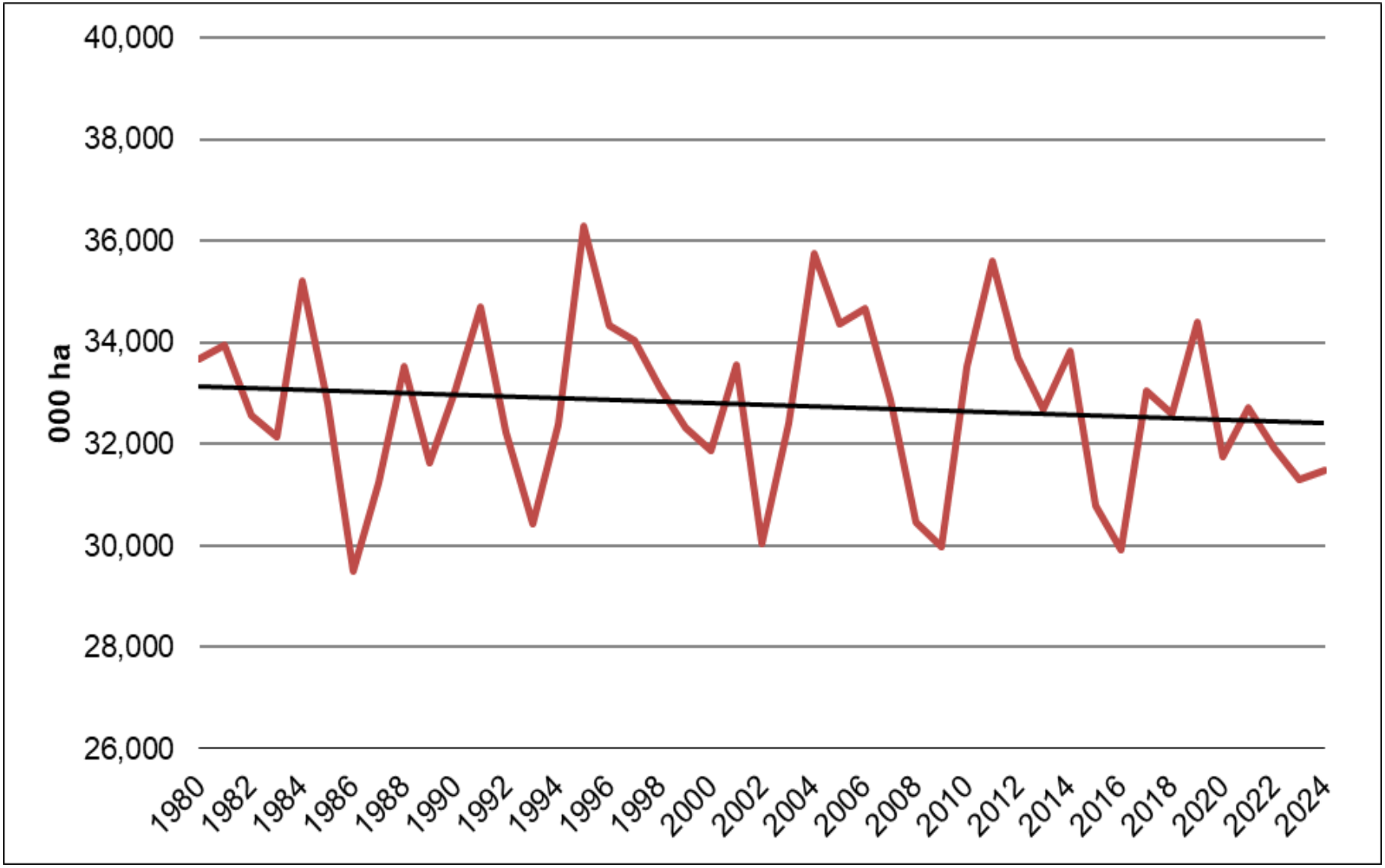
**The price of cotton is fixed in New York and goes up when you have sold and down when you have bought. A buyer working for a group of mills was sent to New York to watch the cotton market and after a few up; deliberation wired his firm to this effect -**

**“ Some think it will go up; some think it will go down. I do, too. Whatever you do will be wrong. Act at once.”**

**Cotton is planted in the spring, mortgaged in the summer and left in the field in winter.**

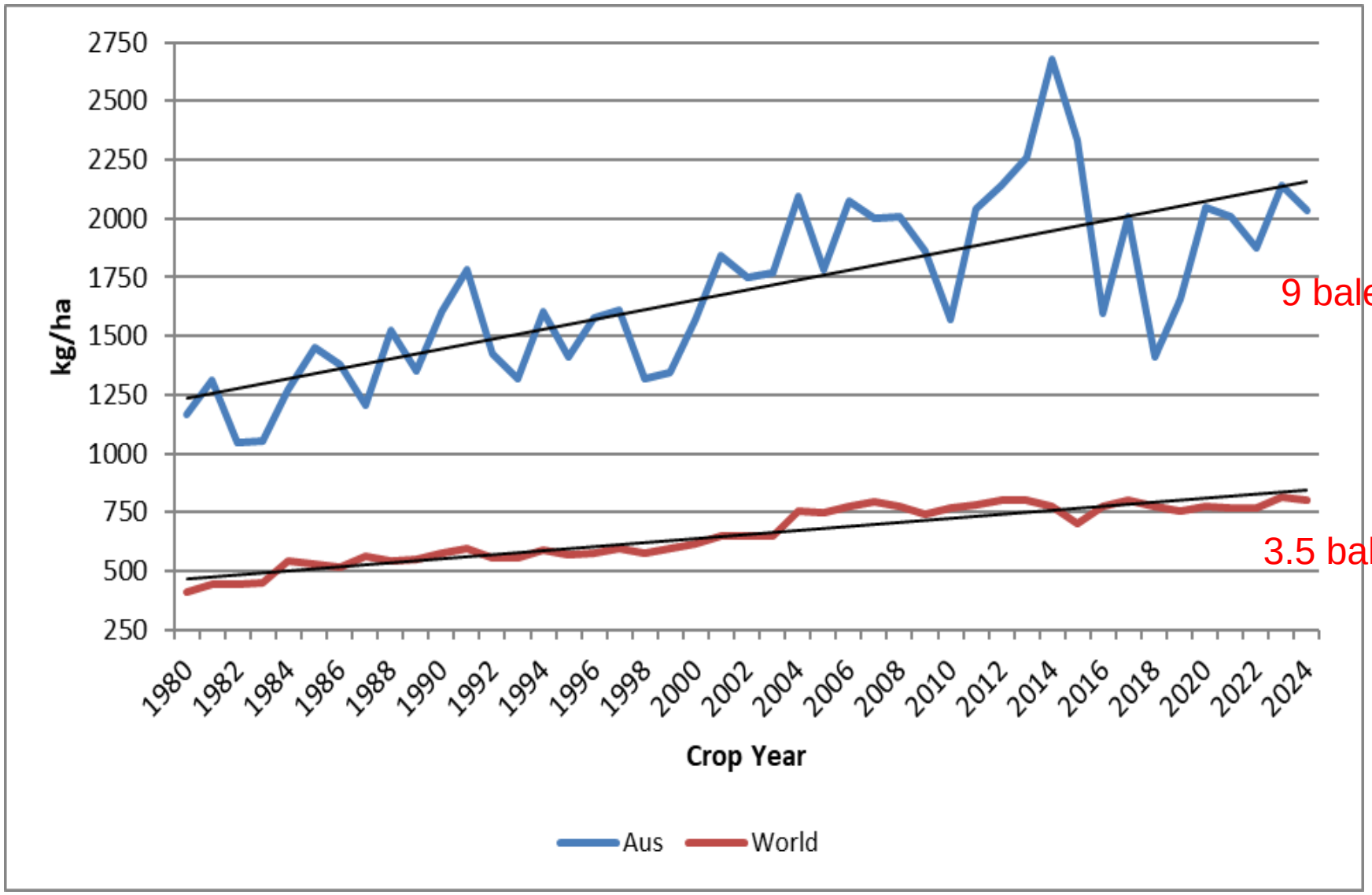
*Reprinted from the Boston News Bureau.*

# Area

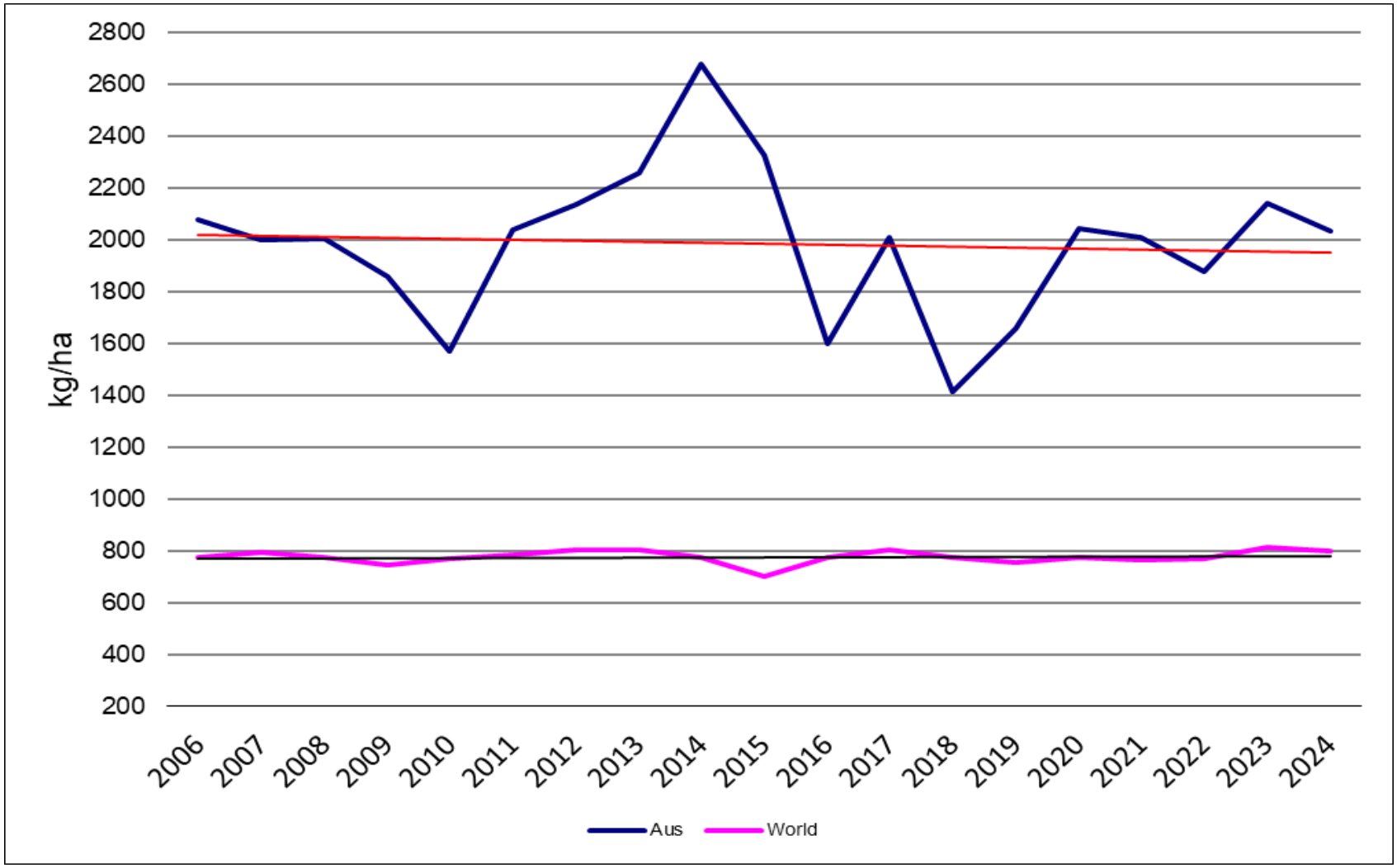



World Cotton Statistics, ICAC

# Yield

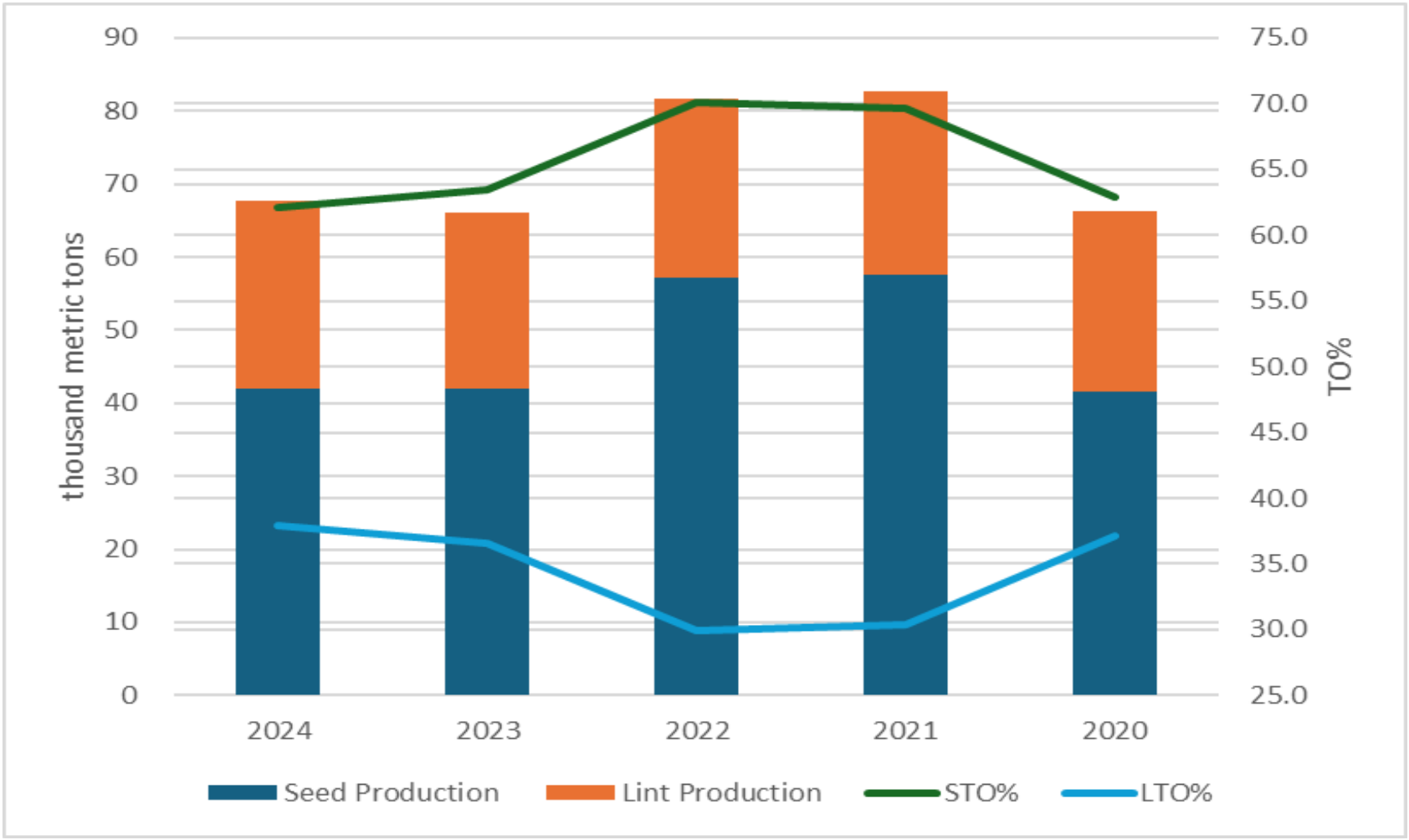



World Cotton Statistics, ICAC




it has been theoretically shown that cotton could consistently yield 3500 kg lint $ha^{-1}$ and as much as 5000 kg lint $ha^{-1}$ (15- 22 bales)

# Seed vs Lint Production

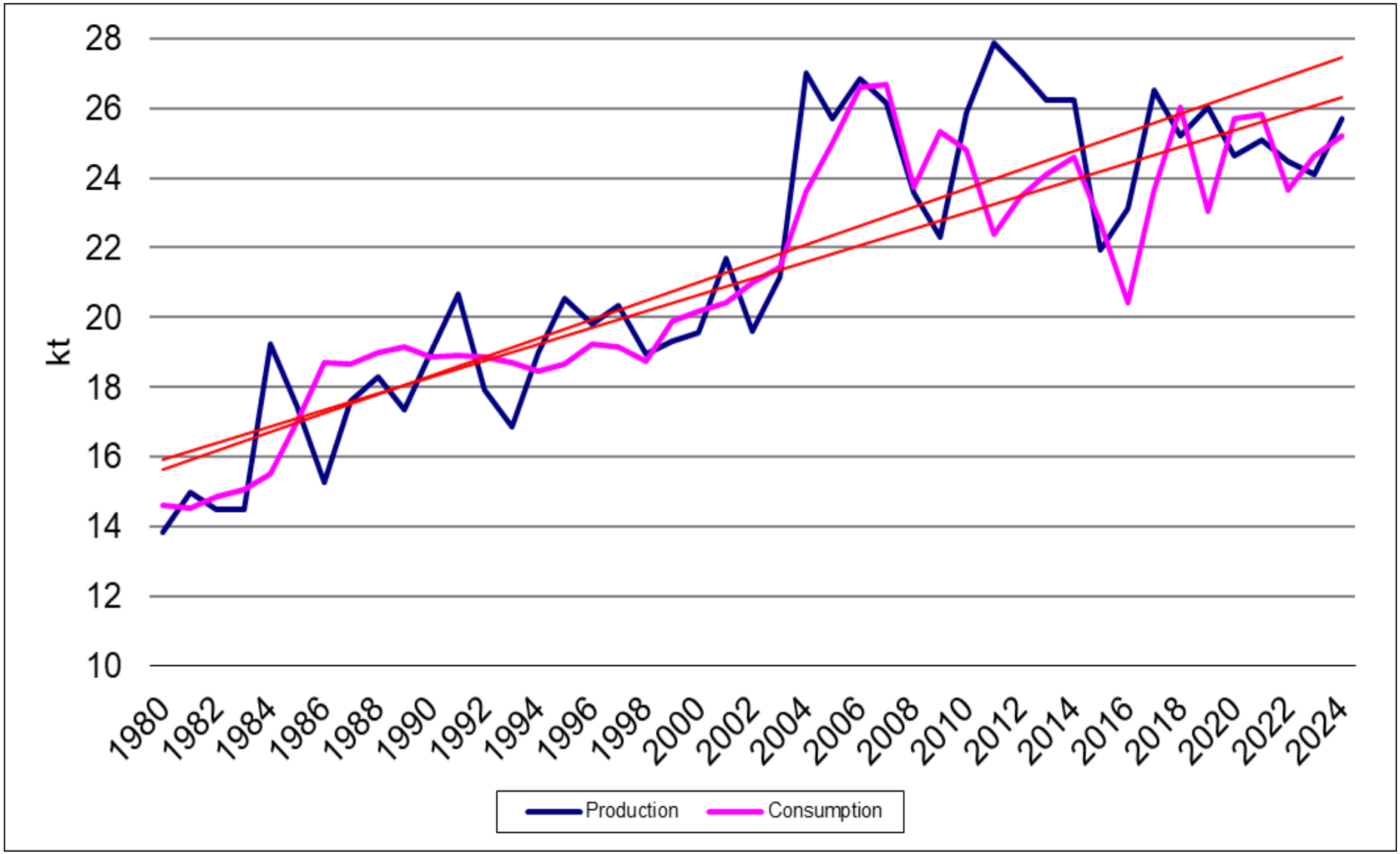


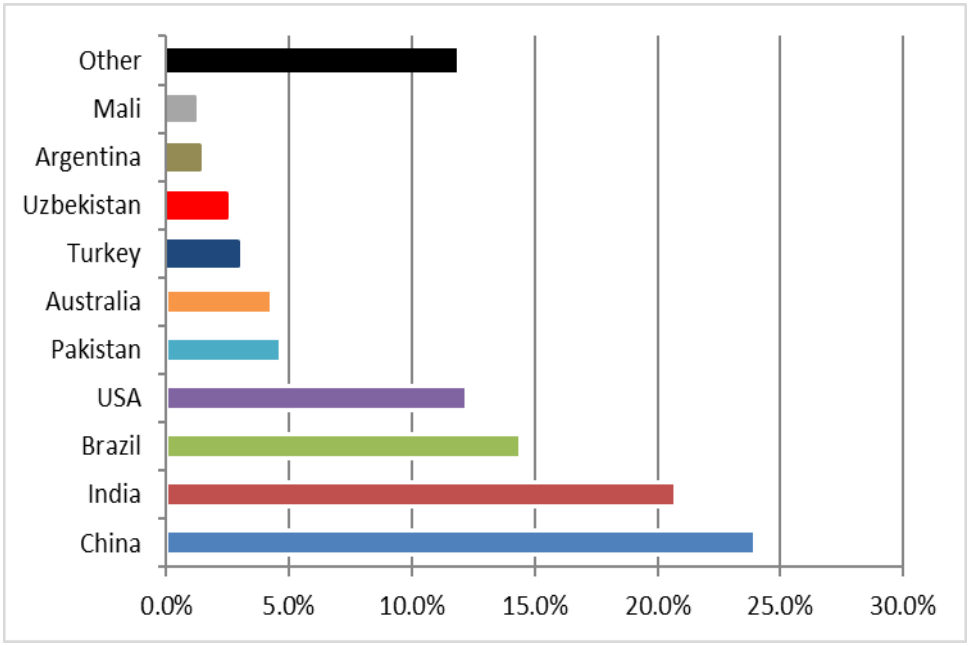

Avg 65.6% seed & 34.4 % lint & Seed-to-lint ratio of 1.94 (Higher than the average value of 1.50)
Australian average 1.28

# Seed vs Lint Challenges

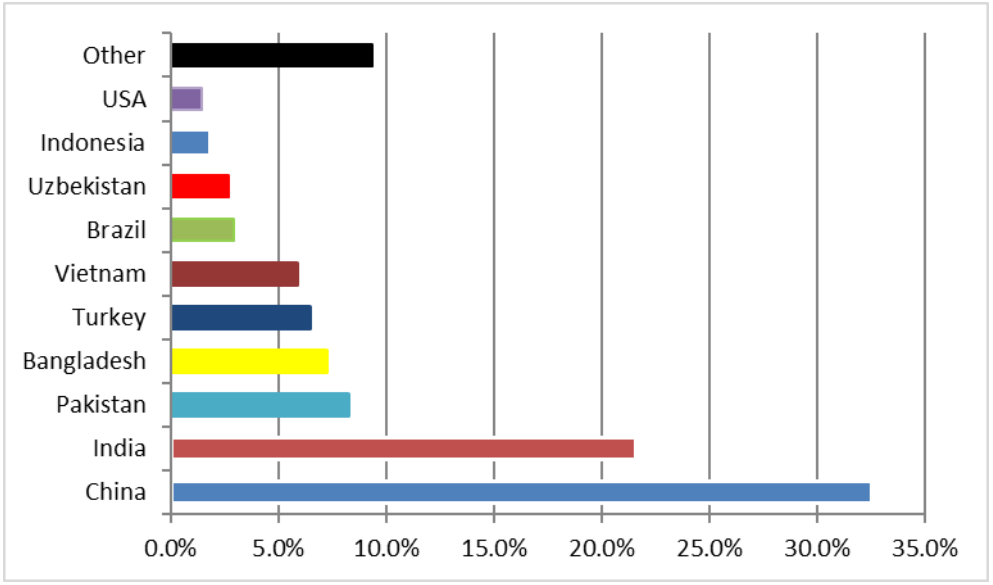
- The lint is the main and most economically valuable product of cotton, accounting for more than 85% (~ 7 times) of the crop value.
- The seed accounts for about 15% of the cotton crop revenue from products such as animal feed, oil, etc.
- However, breeding efforts to improve lint yield has altered the ratio and the size of the cotton seed. Number of seeds per kilogram increasing
- Resulting in a decrease in seed index (weight of 100 seeds in gram)
- Large = ≥ 13 g, Medium 10-13 g & small < 10 g
- Small seeds may impact cotton in different stages of its production and post-production processes such as ginning, germination and vigour.

# Upland Cotton Production & Consumption



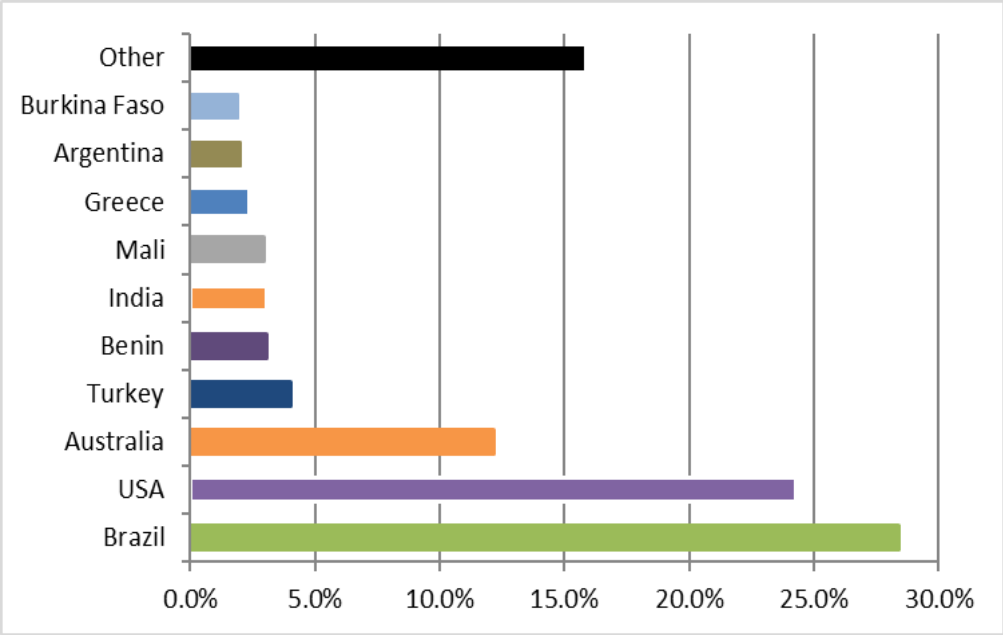


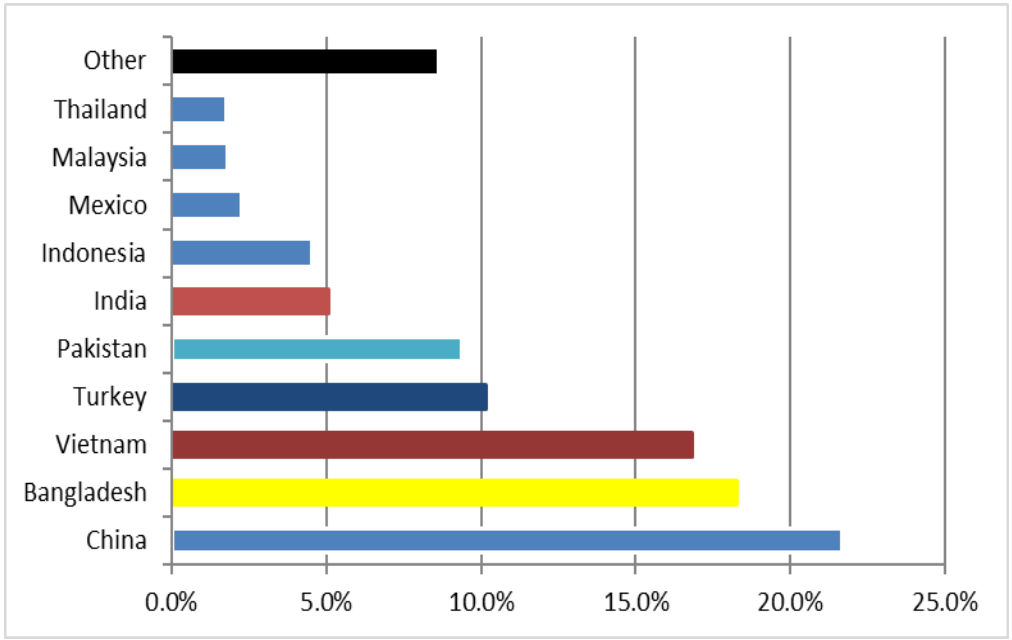

# Major Producing & Consuming Countries




**World Cotton Statistics ICAC**

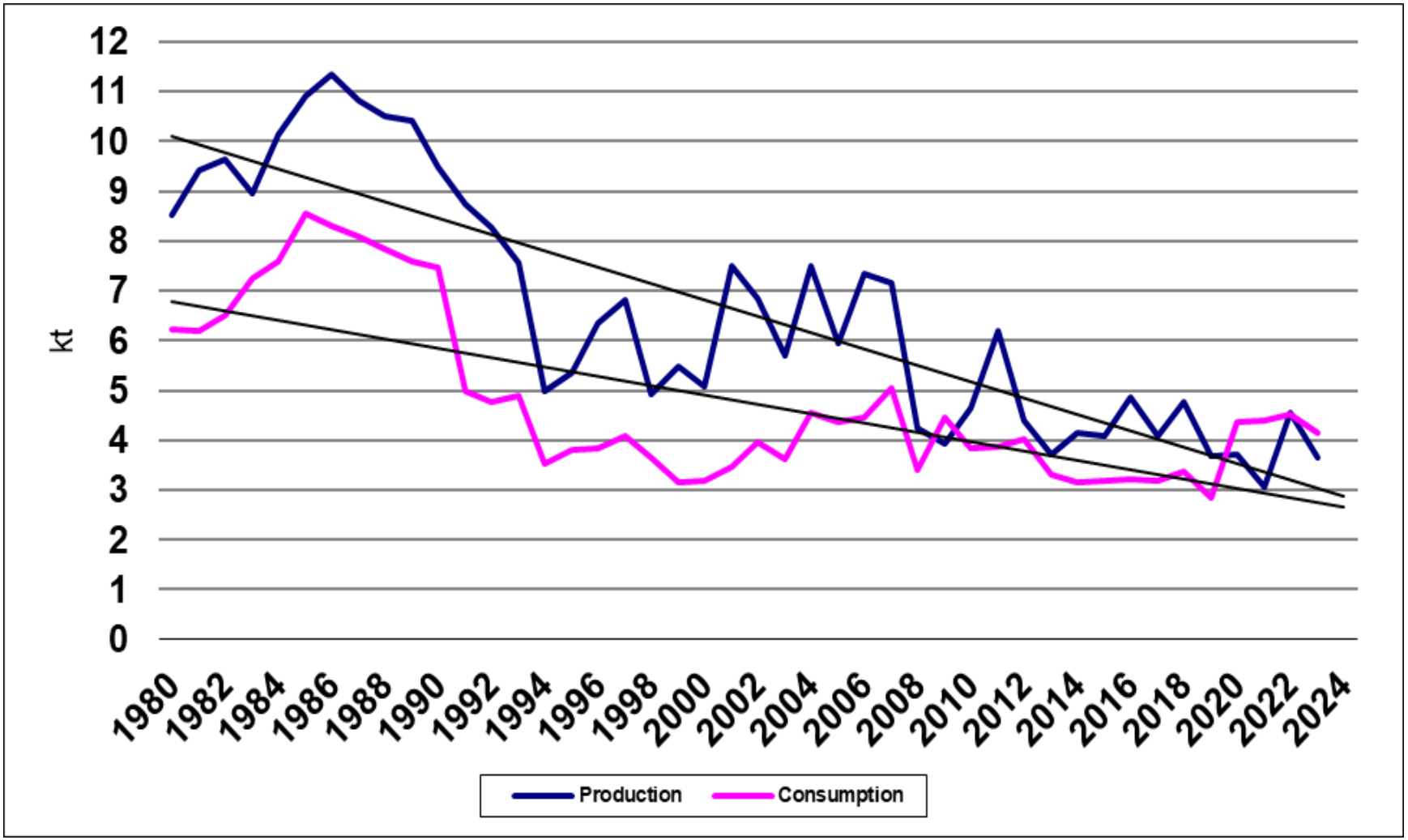
# Major Exporting & Importing Countries




**World Cotton Statistics ICAC**

# ELS Cotton Production & Consumption




World Cotton Statistics, ICAC

# Challenges

- Small % of total cotton production ~2-3%
- Conventional
- Roller Ginning
- Low Margin of Error
- Expensive

# Organic Cotton

In 2021 production of organic cotton was 342,265 MT grown on 621,691 hectares.

- 1.4% of cotton production

- 1% of Area

Grown in 19 countries.

India grew the most, followed by Turkey, China, Kyrgyzstan, Tanzania.

Prices 5-13% higher than conventional

Organic market values at USD 51.8 billion

Textile Exchange

# Challenges

- Low Yields - 375 kg/ha
- Seeds & Organic Inputs
- Labour Intensive
- Weak Scientific Support
- Uncertain Premium
- Tedious Certification
- Difficult Traceability
- The GM Paradox
- Three years to convert from conventional to certified organic

# Naturally Coloured Cotton

White

Green

Shades of brown

# Challenges

- Low Yields
- Low Production (~20 000 kg)
- Poor Fibre Properties
- Limited Colours
- Instability of Colours
- Contamination
- Low Market Demand

# Identity Programs

Identity programs apply different sets of social, environmental and economic standards in their production processes.

- ~28% of cotton production
- BCI now BC
- ABR
- myBMP
- CMIA

# Circular Economy

In 2022 production of recycled cotton was 300 MT (mainly mechanical but some chemical).

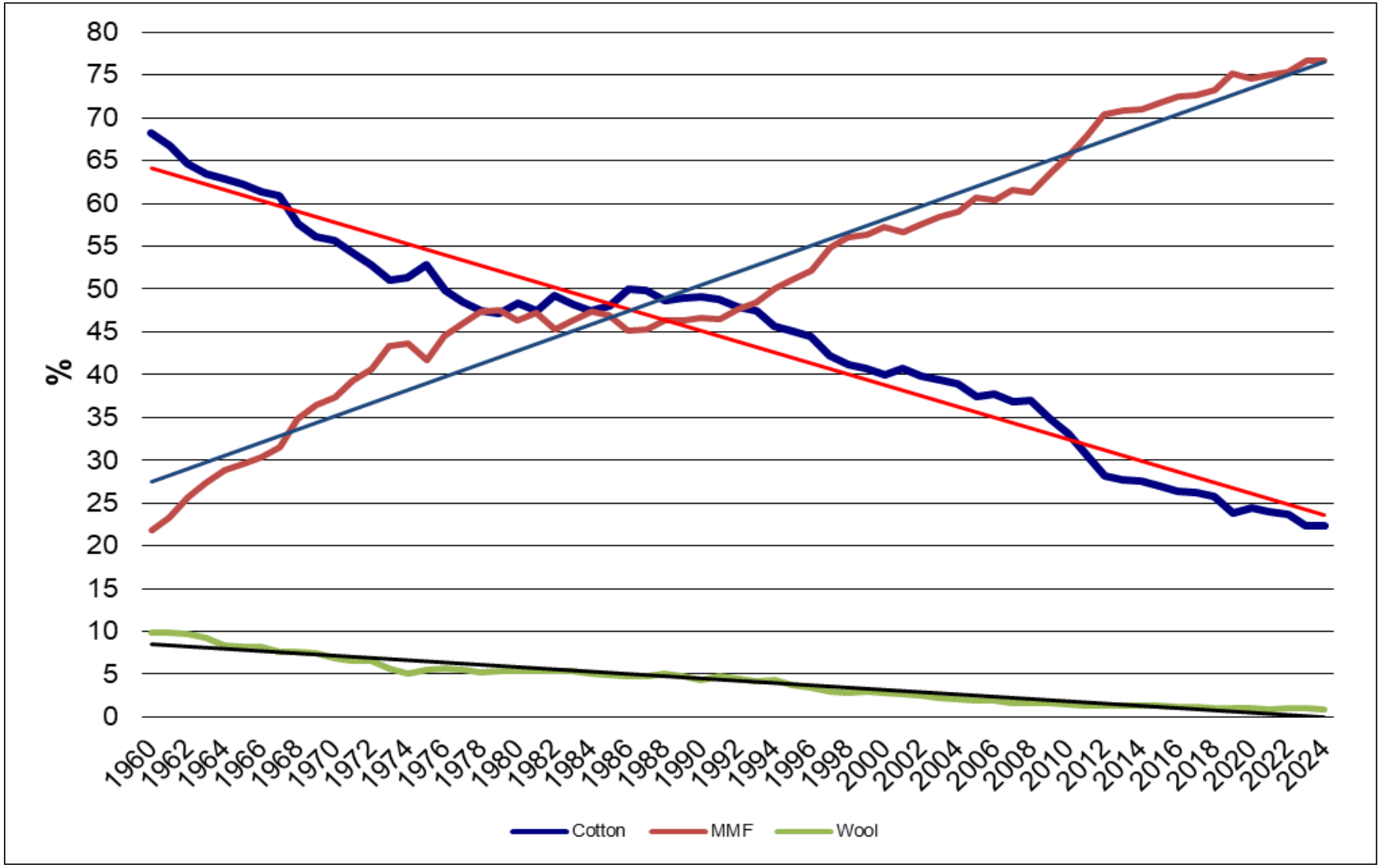
- 1% of cotton production

Mainly in Bangladesh

Challenges

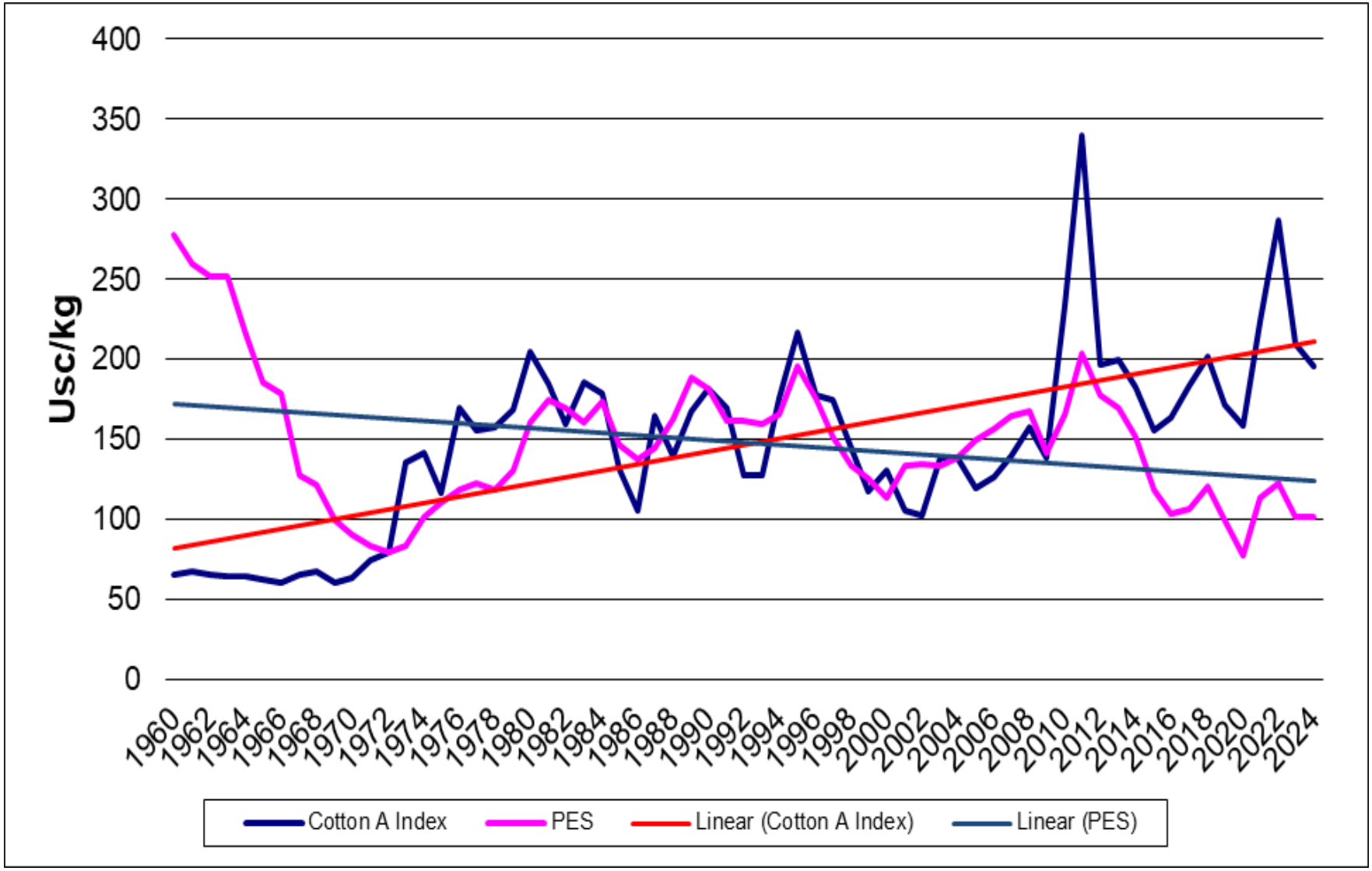
- Mostly blended with other fibres to be made into new yarn for strength and durability.
- The content of recycled cotton will depend on the end-use. uniformity.
- Recycled yarn cost is generally higher than virgin cotton and could possibly be cost-prohibitive.
- Testing instruments are made for ginned, virgin cotton. Sometimes, testing results can be skewed due to the difference in fiber packing and orientation.
- The risk of contamination is high.

# Cotton Market Share




World Textile Demand, ICAC

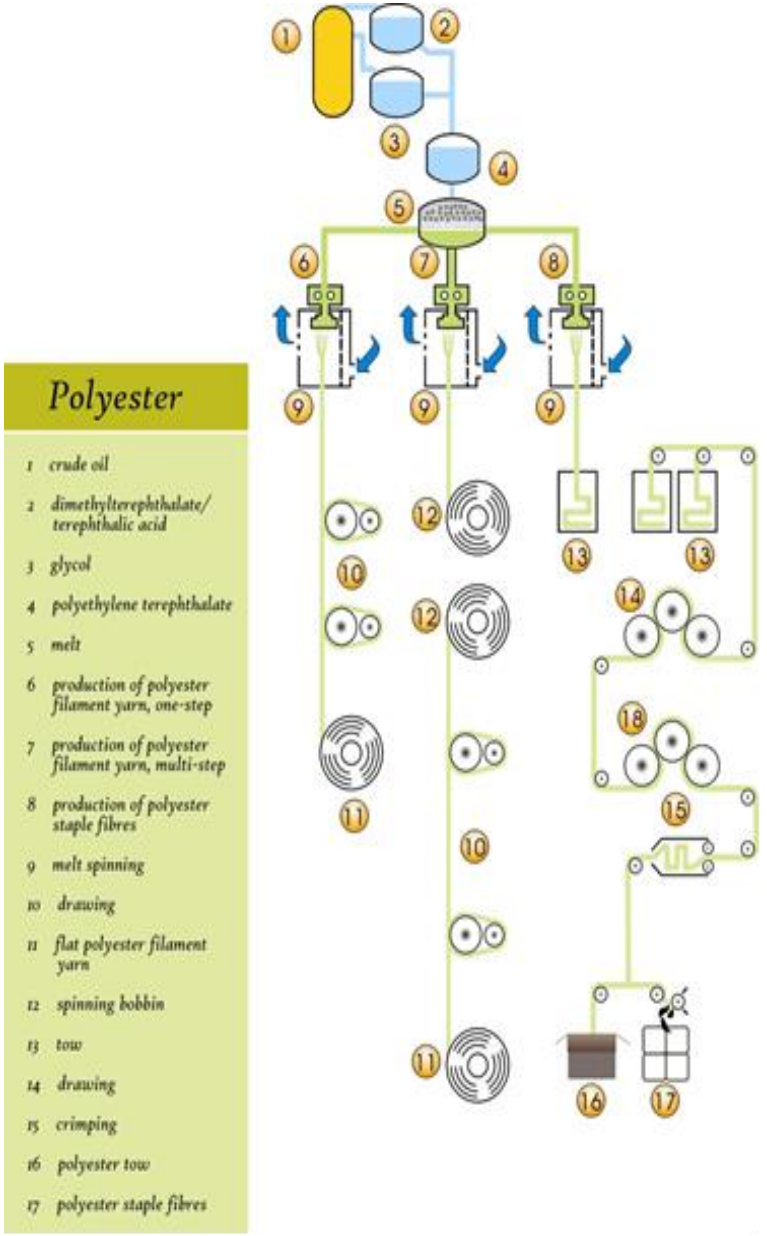
# Price Comparison



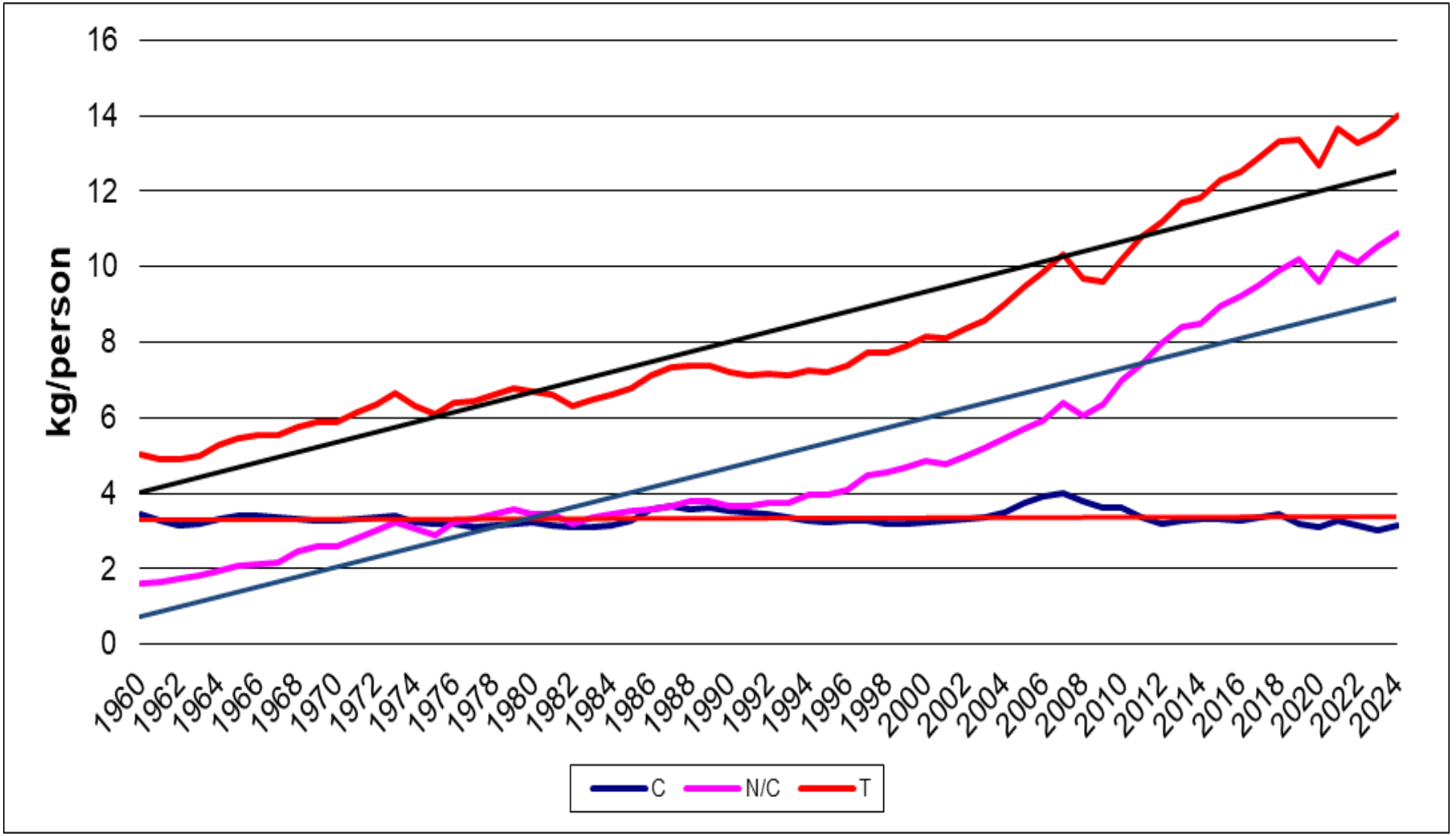

World Textile Demand, ICAC

# Benefits of using Polyester

Fibers are extremely strong.
Can be in filament or staple form
Cut to length with required diameter
Add finishes and colour.
Very durable.
Resistant to most chemicals.
Stretching and shrinking.
Wrinkle resistant.
Mildew and abrasion resistant.
Hydrophobic in nature.
Quick drying.
Easily washed and dried.
Retains its shape.
Good for making outdoor clothing for harsh climates.

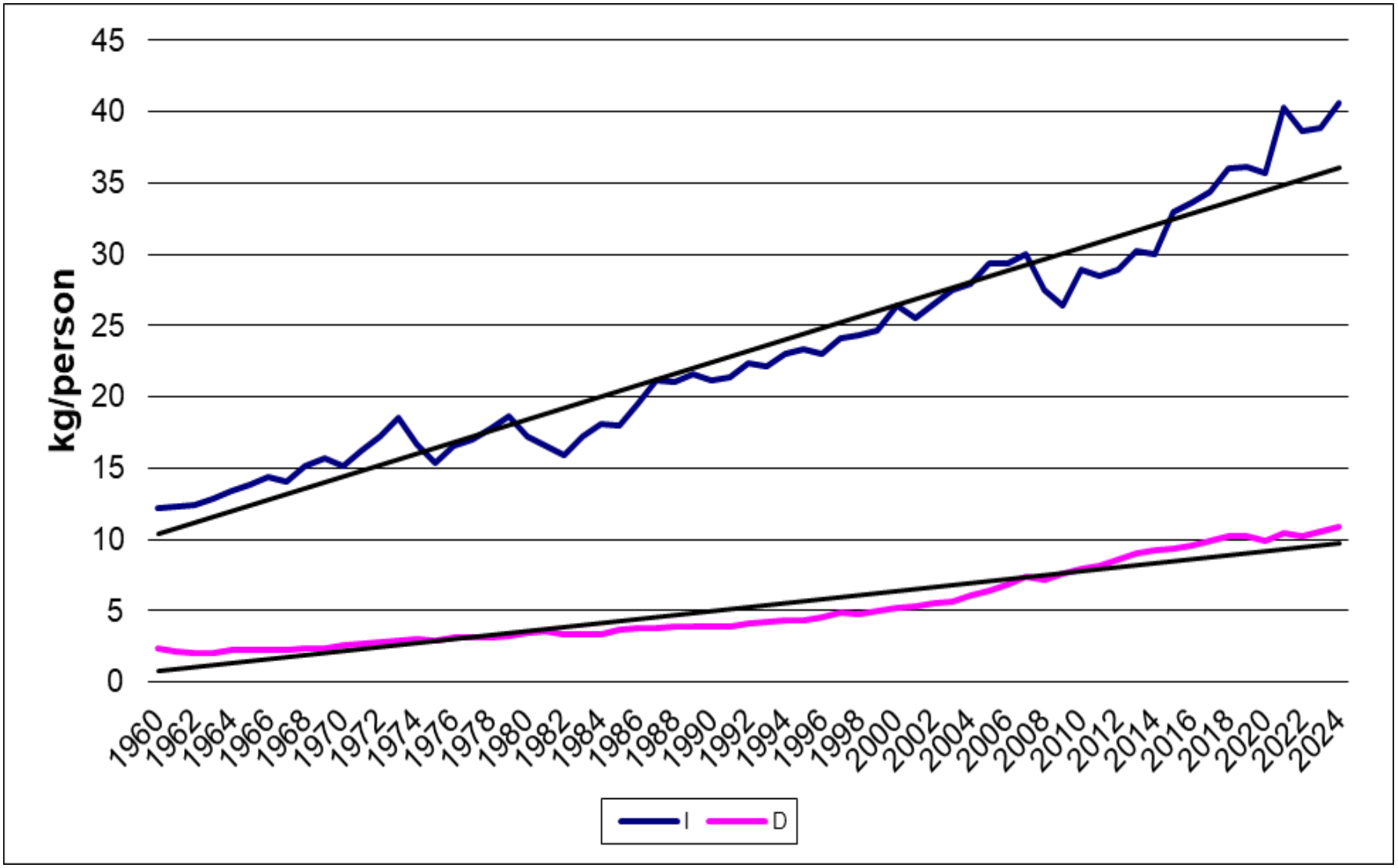


# Average Fibre Consumption




World Textile Demand, ICAC

# Comparison between Industrialised and Developing Countries



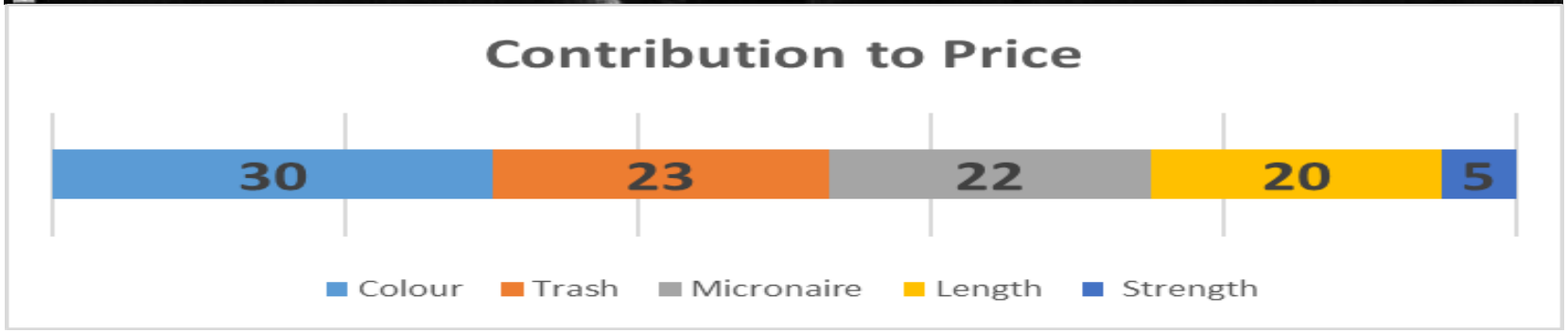

World Textile Demand, ICAC

# Raw Material Considerations

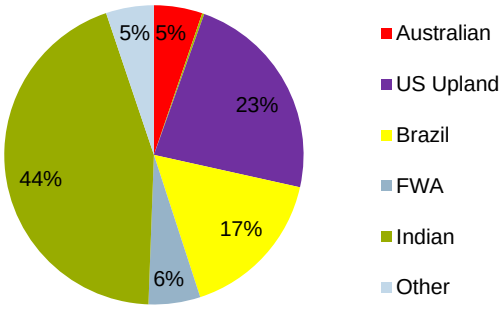
- Price
  - ✓ fibre accounts for ≥ 70% of yarn manufacturing costs.
- Fibre quality must be accurately known to guarantee yarn quality.
  - ✓ imported cotton
  - ✓ using fibre from long-time storage
  - ✓ avoid fibre undesirable for producing required end-use
- Availability of supply and Reliability of supplier.
  - ✓ consistent lay downs based on fibre quality is essential for efficient mill operation.
- More emphasis on blending and mixing.
  - ✓ control nep count, ends down, noil, waste, yarn and fabric quality and processing performance
- Adjust technical specifications.
  - ✓ spinning system, TPI, noil % etc.)
- It’s a short staple plant - can easily switch production to MMF.

# Important Fibre Properties

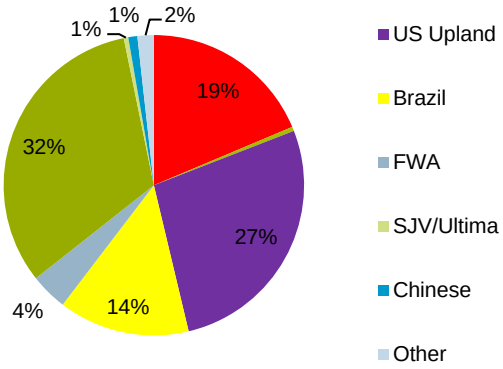
| Ranking | Ring | Rotor | Air - jet |
|---|---|---|---|
| 1 | Length | Strength | Length |
| 2 | Strength | Micronaire | Trash |
| 3 | Micronaire | Length | Micronaire |
| 4 | Trash | Trash | Strength |
| ? | Other | Other | Other |

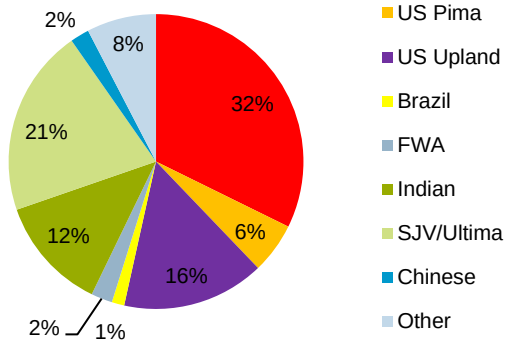
**≤30Ne (≥20 tex)**




**30-39Ne (20-15 tex)**




**40-59Ne (15-10 tex)**

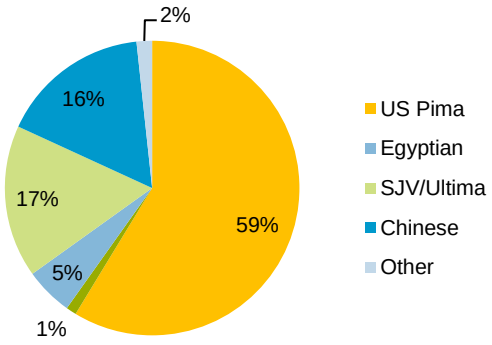



Coarse

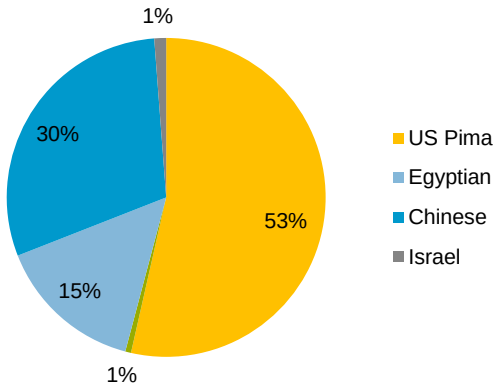
Commodity Yarn

Fine

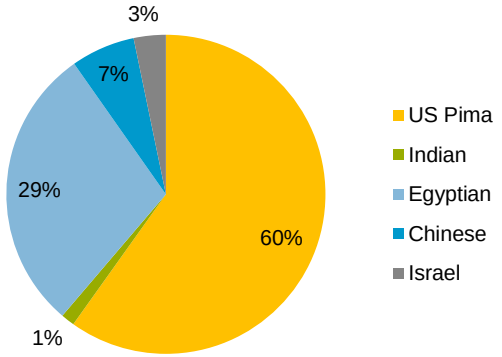
**60-79Ne (10-8 tex)**




**80-104Ne (8-6 tex)**




**≥105Ne (≤6 tex)**



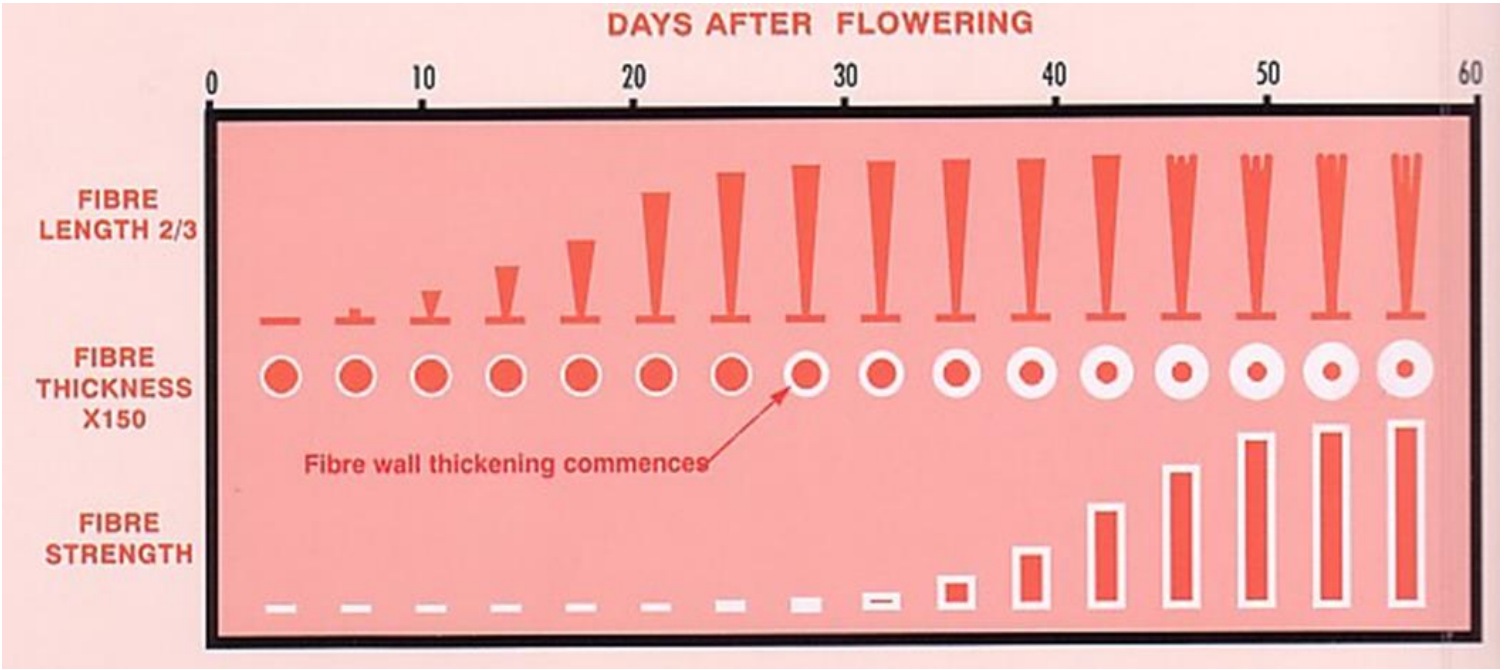

Very Fine

# Requirements for Commodity and Fine Count Yarns

| Fibre Property | Upland | Long Staple Upland | Extra Long Staple |
|---|---|---|---|
| Staple Length (UHML) | > 1.13 inch; 28.7 mm (1.1/8 inch; 36/32nds) | > 1.24 inch; 32 mm (1.1/4 inch; 40/32nds) | > 1.36 inch; 34 mm (1.7/16 inch; 46/32nds) |
| Length Uniformity | > 81 | > 83 | > 85 |
| Short Fibre Index (%) | ≤ 9.0 | ≤ 7.0 | ≤ 4.0 |
| Strength (grams per tex) | > 29 | > 33 | > 38 |
| Micronaire | 3.8 - 4.6 | 3.7 - 4.2 | 3.5 - 4.1 |
| Maturity Ratio | > 0.85 | > 0.85 | > 0.85 |
| Fineness (mtex) | 160 - 180 | 160 - 180 | 140 - 160 |
| Neps (neps/gram) | < 250 | < 200 | < 180 |
| Trash | 3 | 2 | |
| Grade | Not Grade but rather Rd & +b | | |

# Smart decisions for fibre quality

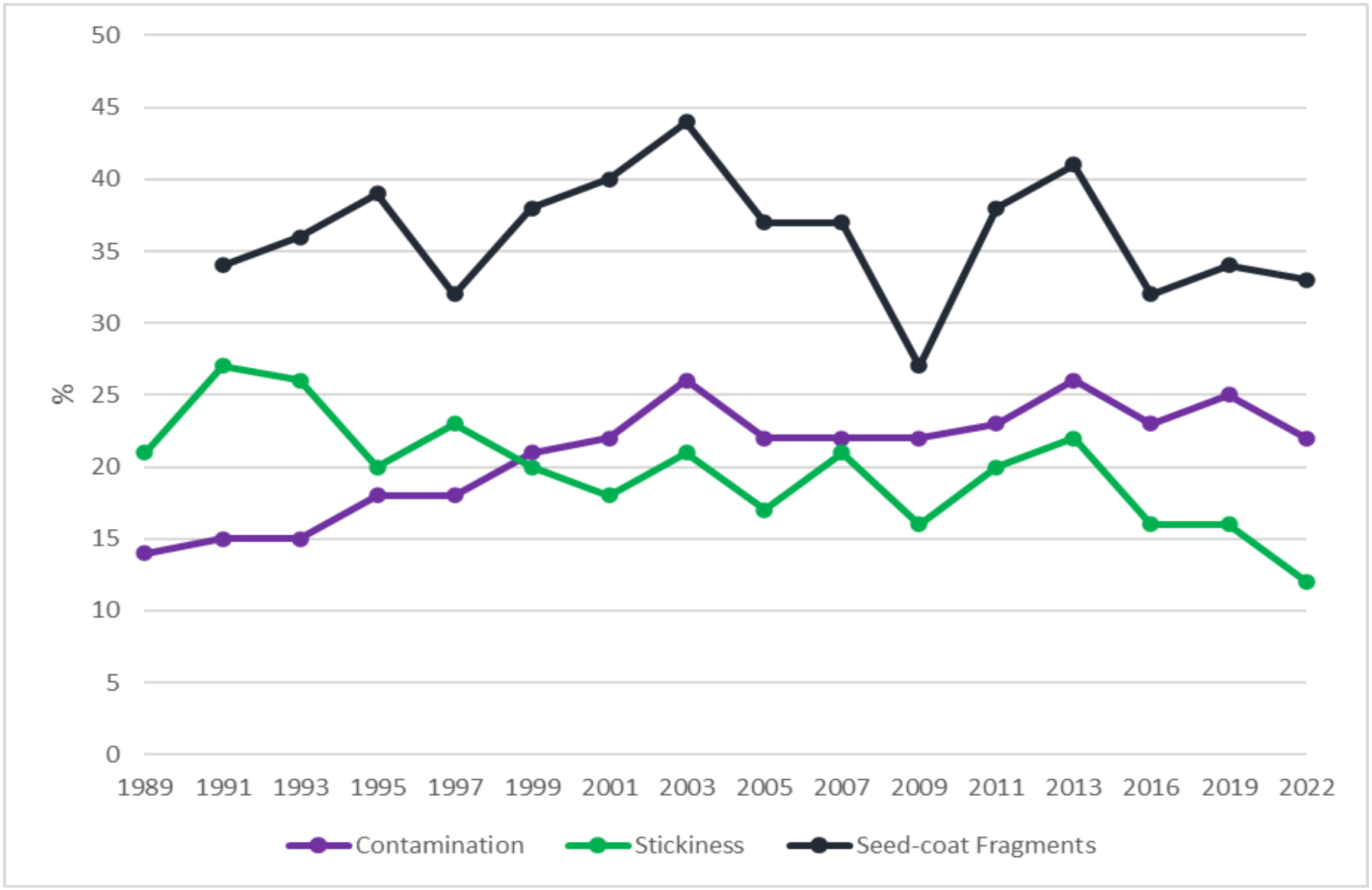
1. Choose the right variety
2. Nutrition
3. Irrigation system and schedule to optimise fibre elongation in first weeks of flowering.
4. Management for uniform crop setting in later weeks of flowering.
5. Practices to minimize harvest of immature bolls.
6. Good defoliation (product, rate and time) and a timely harvest



# Nutrition

- The requirements of N in terms of plant growth, health, yield etc. of cotton are well understood.
- On the other hand, the requirements of N in terms of fibre quality are not that well understood.
- Extensive research and trials have shown that high levels of N application rates can affect fibre quality negatively:
  - ✓ Lower micronaire due to a decrease in maturity
  - ✓ Lower grade due to a decrease in brightness
  - ✓ Lower Lint Turn out %
  - ✓ Higher incidence of Stickiness
- NUE = $\frac{\text{Lint produced (kg ha}^{-1})}{\text{N fertiliser applied (kg ha}^{-1})}$
- **An NUE greater than 18 indicates that insufficient N has been added and an NUE below 13 that too much N has been applied**

# Contamination




ITMF Contamination Surveys 1989 - 2022

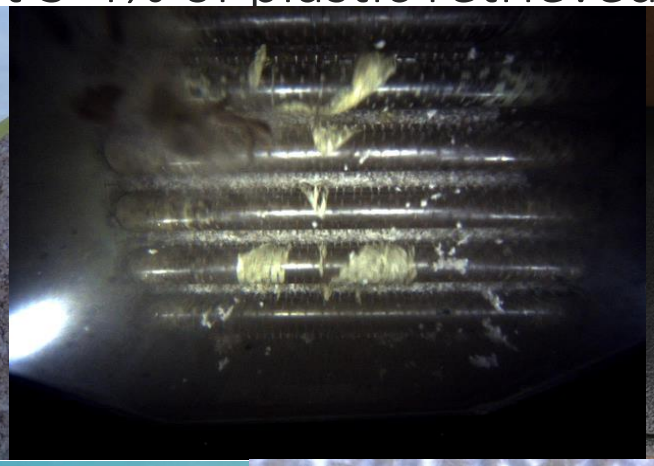
# Contamination

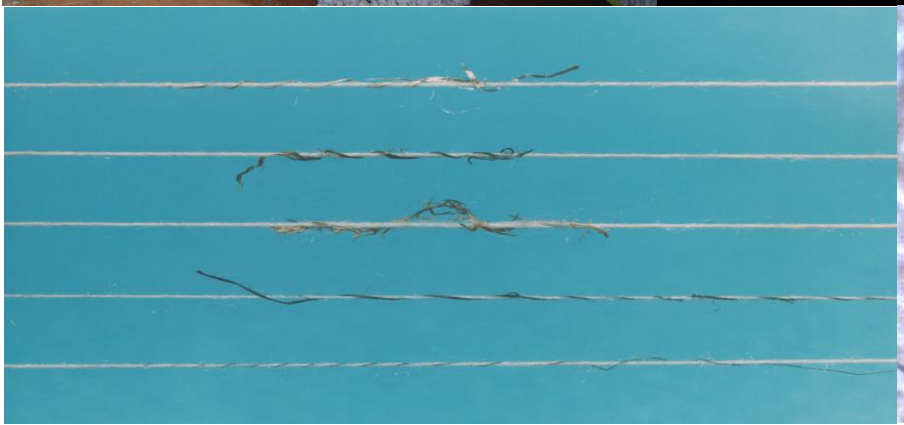
Modules are covered with an engineered polyethylene film.

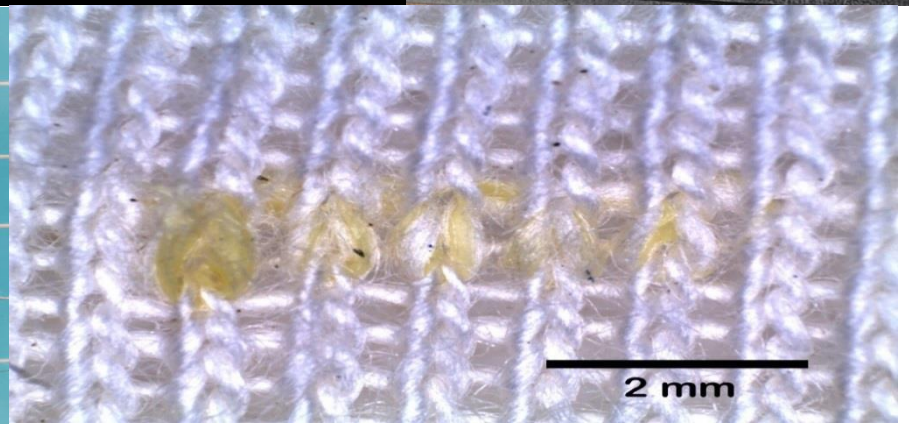
Gins forced to adopt unwrapping systems.

Sensors in the module hood and on the gin stand can assist in detecting and elimination the incidences of plastic contamination.

Studies by USDA suggest 3-4% of plastic retrieved in lint.



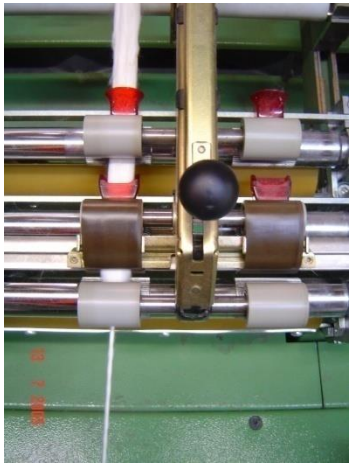


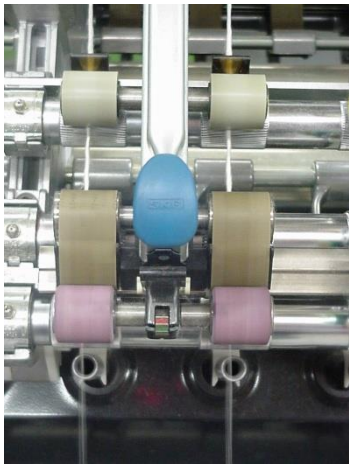


# Stickiness (SLW & Aphids)

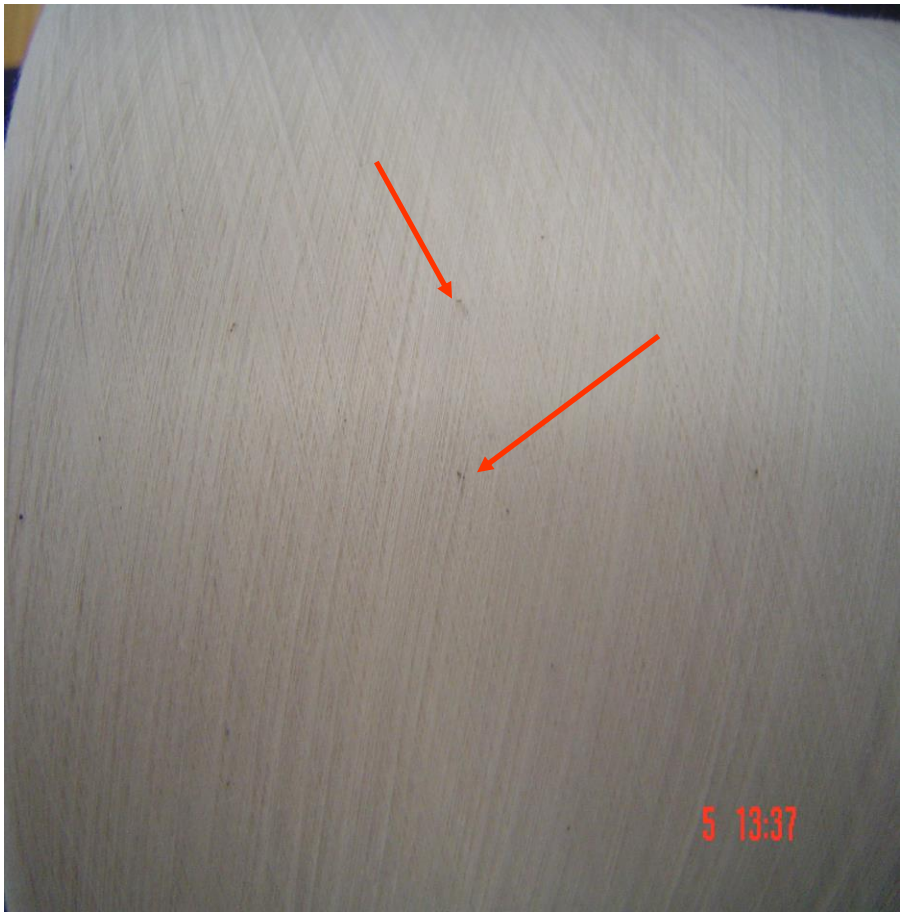

Fig. 2. Sticky deposits on the draw frame creel drive rolls.

Fig. 3. Sticky deposits on the drafting section of the draw frame.

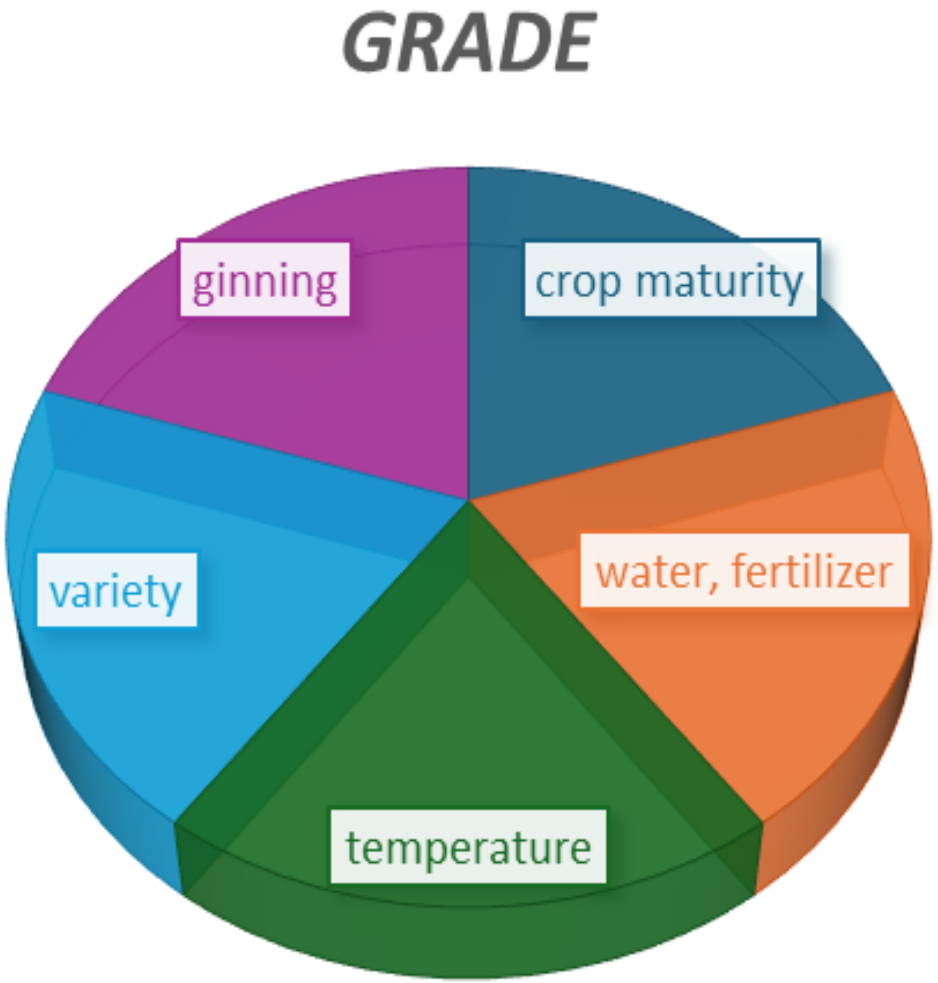




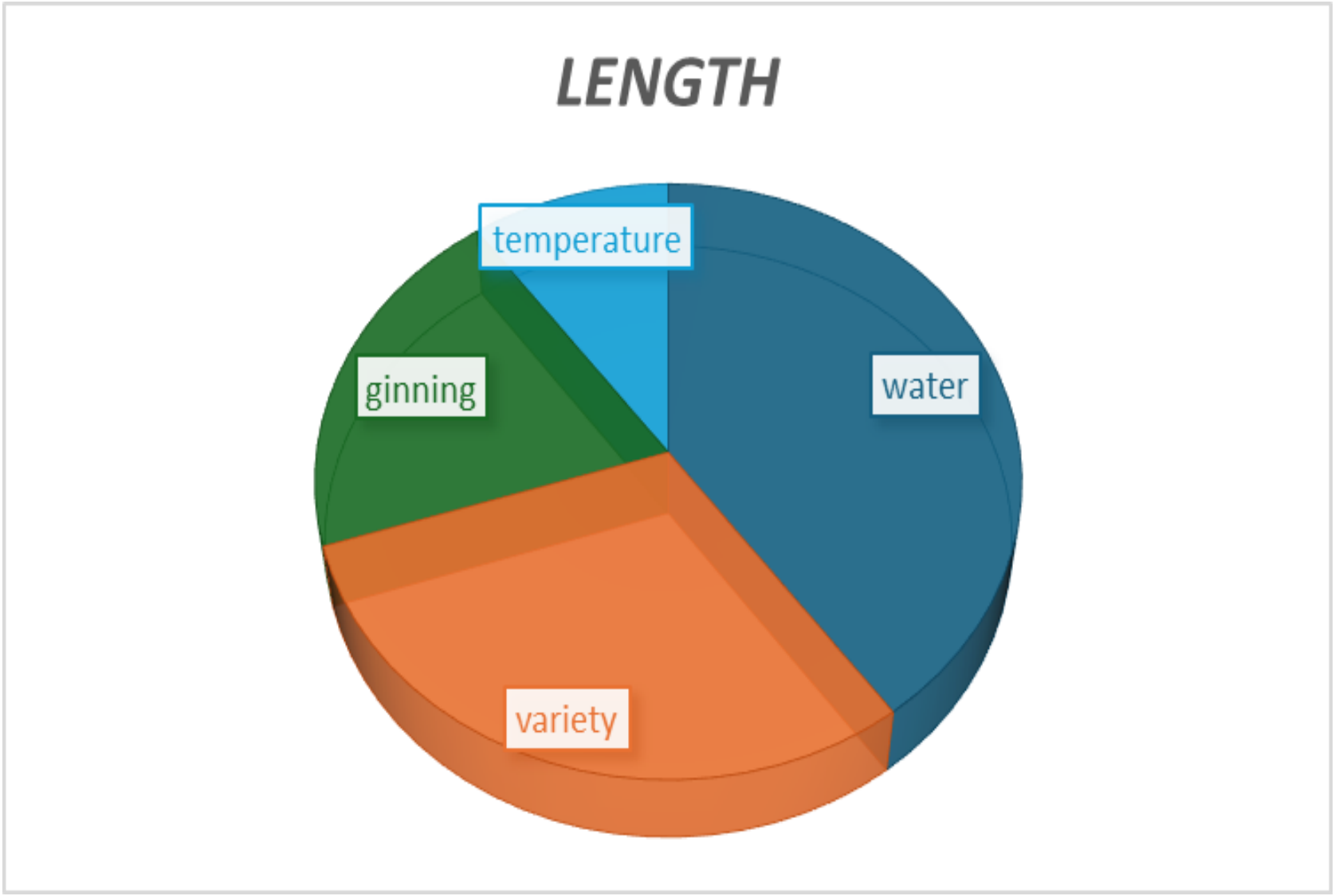
# Seed Coat Fragments (SCF)



# Factors affecting grade



# Factors affecting fibre length



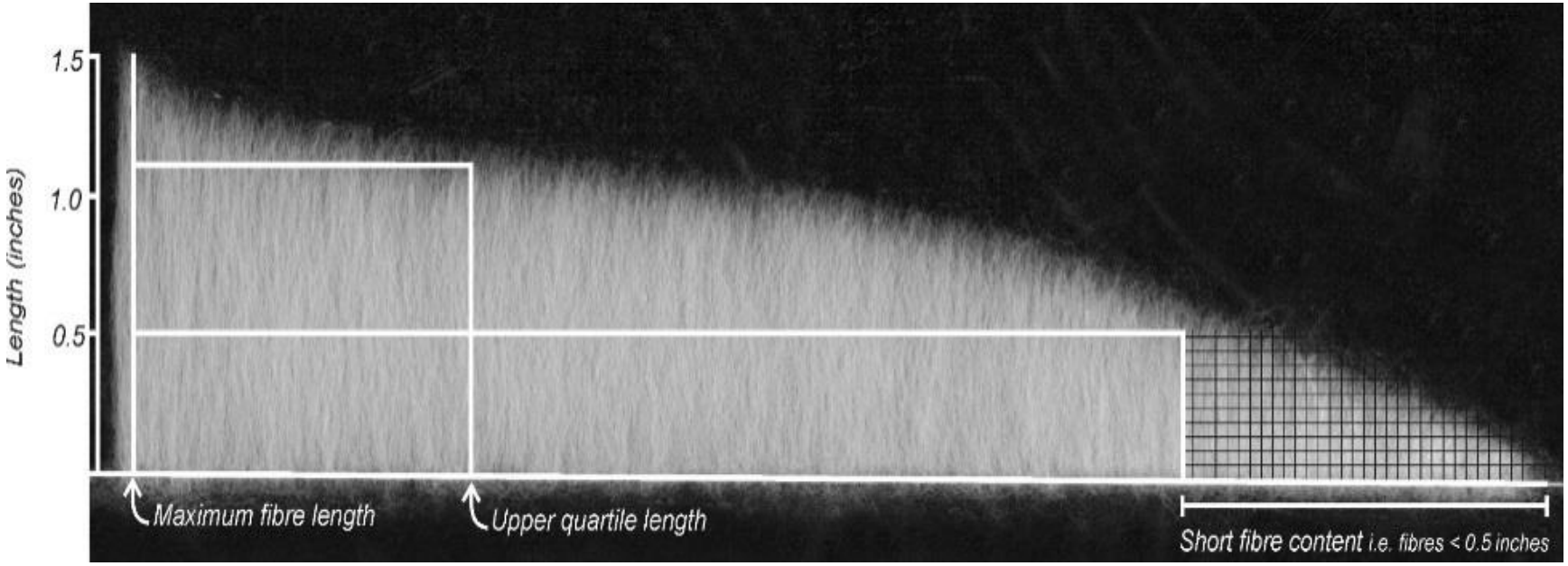
# Short Fibre Content (SFI)

Fibres shorter than 12.7 mm (about 0.5 in).

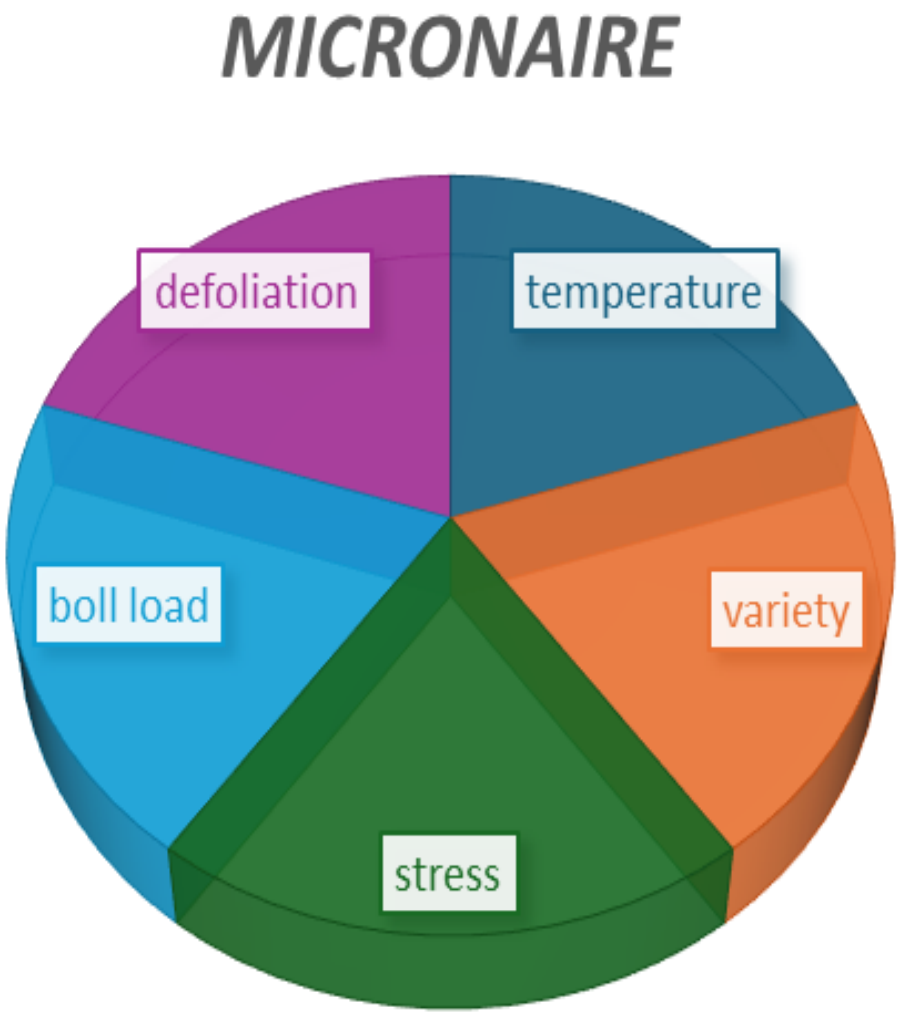
Reduce Processing Performance.

Deterioration in yarn quality.

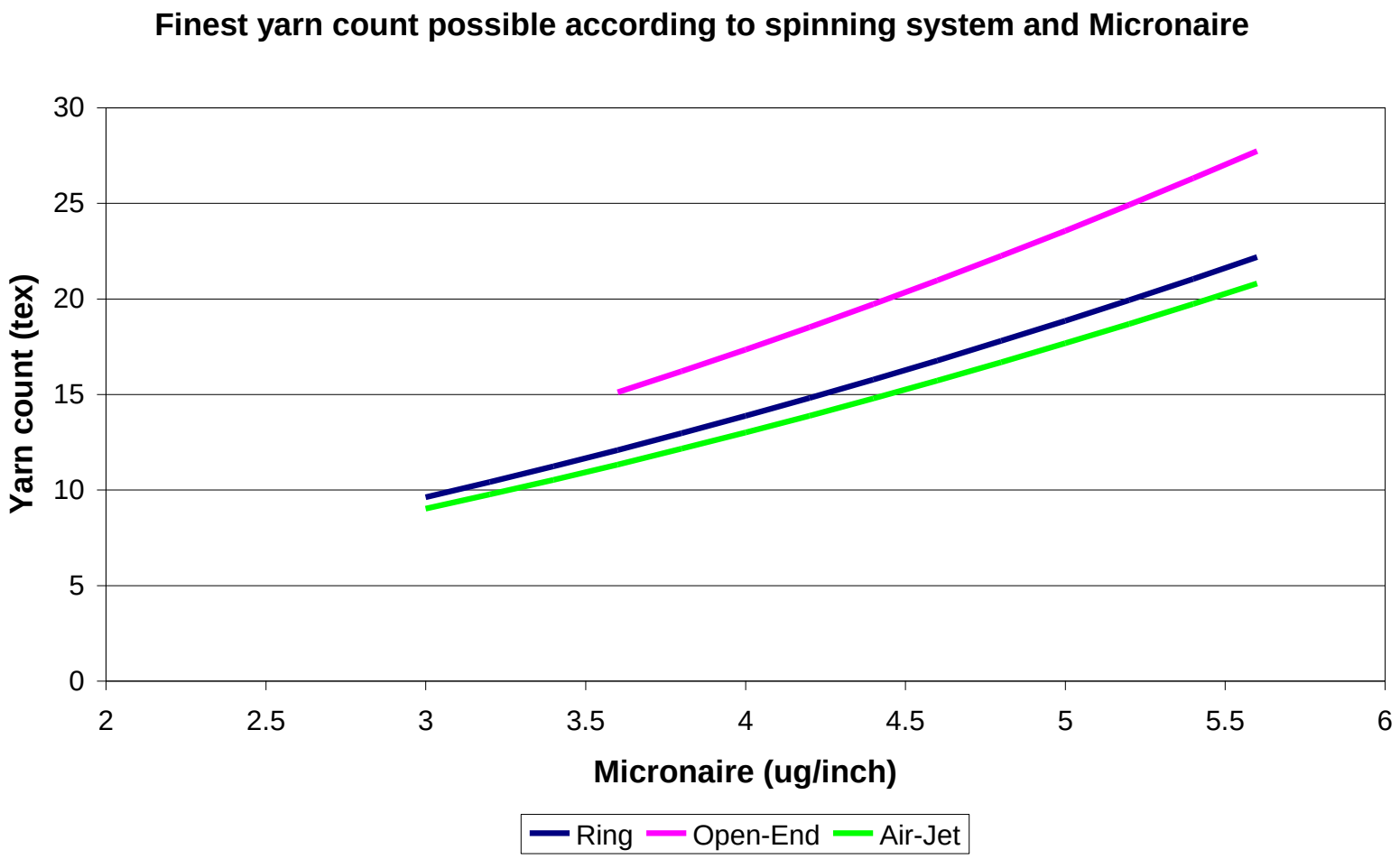
Affect fabric appearance.

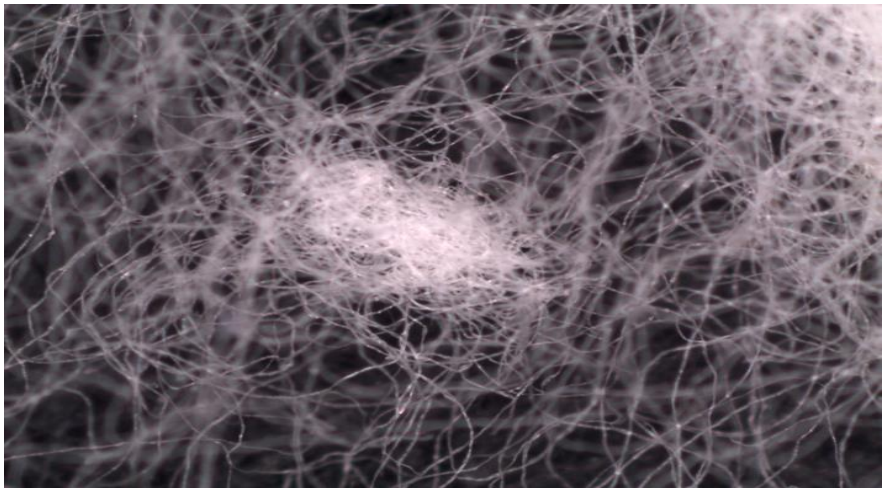


# Factors affecting micronaire



# Micronaire

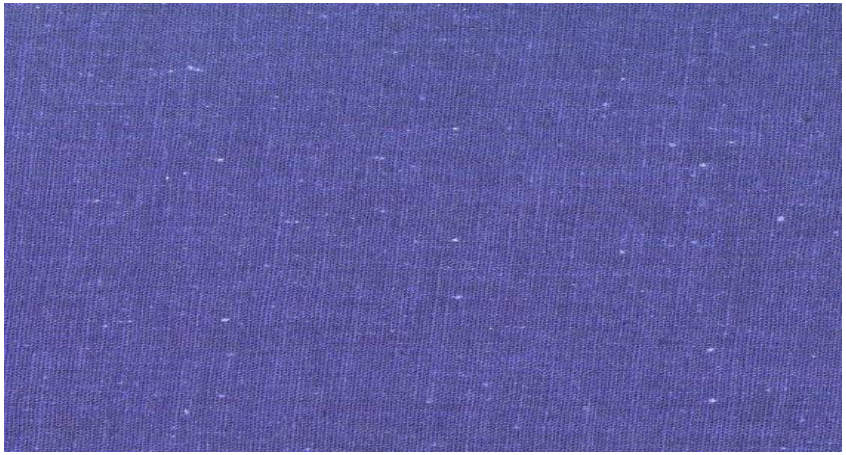

Finest yarn count possible according to spinning system and Micronaire
Yarn count (tex)
30
25
20
15
10
5
0
2
2.5
3
3.5
4
4.5
5
5.5
6
Micronaire (ug/inch)
Ring
Open-End
Air-Jet

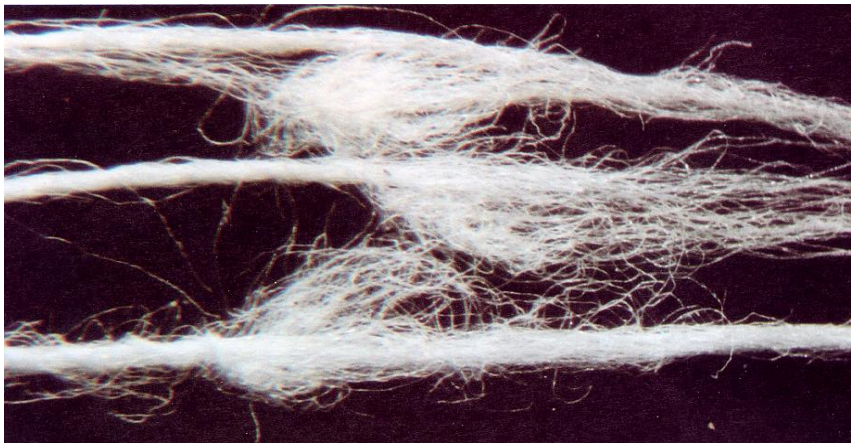


# Neps

- Small knot of entangled fibres

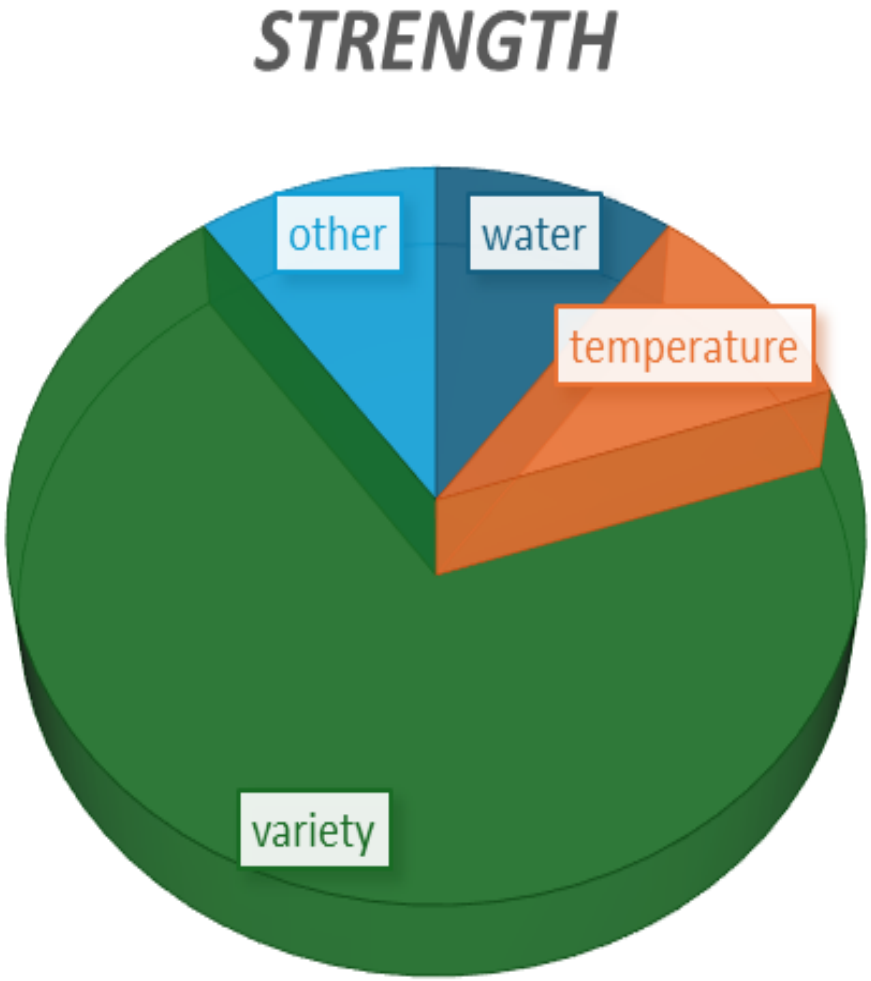
- Adversely affect the appearance of yarns





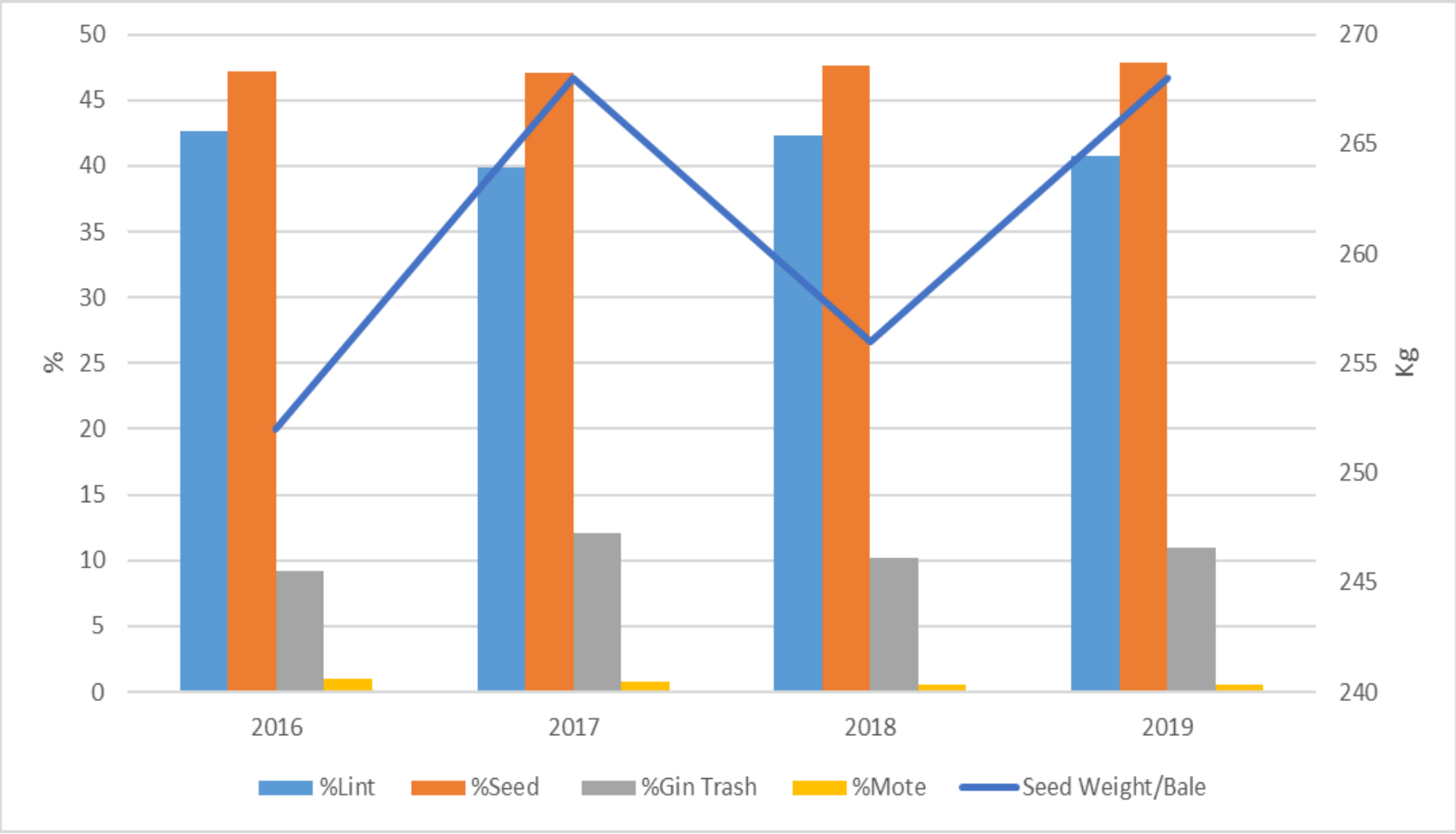
Causes fabric to be downgraded or rejected

# Factors affecting fibre strength



# Lint Turn Out %

# % Breakdown




Average Trash = 191 metric tons

# Turnout !!

Does it mean something

Anecdotally speaking NO - Yield is key…

Commercially YES when comparing your own cotton.

For example,

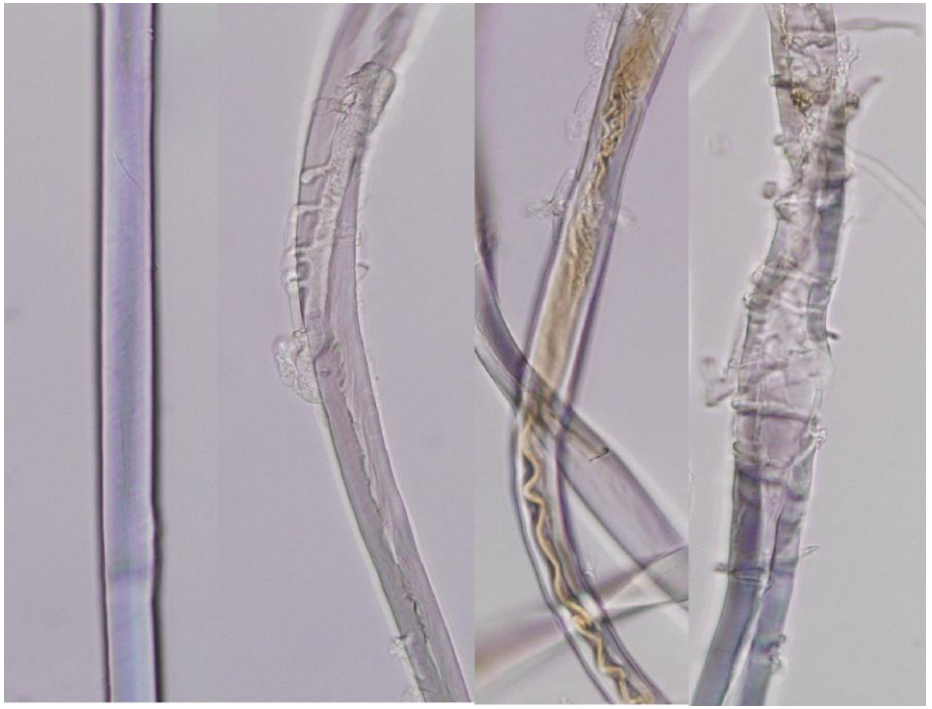
1,000,000 kg x 41% LTO = 410,000 kg (1806 bales)

1,000,000 kg x 42% LTO = 420,000 kg (1850 bales)

Difference at $650 a bale is **$28,600 excl seed**

All cottons contain microorganisms; but their presence does not cause any adverse effects on fibre quality under normal growing and storage conditions. However, conditions of high temperature and moisture can result in biologically damaged cotton.

## Cavitoma



# A Final Word

- There is essentially no ***high- or low-quality*** cotton but rather only ***good*** quality which meets requirements in terms of price, performance, characteristics and the intended use.
- Obtain accurate and reliable information of the cotton you intend or have already purchased (HVI,CSITC,ICA-Bremen, etc.)
- Colour Grade should be replaced with Rd & +b
- Improved education, training, learnings
- Maintain strict testing regimes and retain records
- Consider Custom Ginning

# Thank you

Disclaimer : Please note that the comments and observations are my personal opinions and do not necessarily reflect the industries I operate in.

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