MAJOR HURDLES TO IMPROVING PRODUCTIVITY OF COTTON

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International Cotton Advisory Committee

COTTON YIELDS - WORLD

Kg/ha
900
750
700
650
600
550
500
450
400
350
300


COTTON YIELDS - WORLD

• World yields are in a period of NO or SLOW growth
• How long the period of NO or SLOW growth will last?
• What will increase yields?

COTTON YIELDS - WORLD

LONG TERM TREND IN COTTON YIELDS
COTTON YIELDS 07/08 - Regional Differences

<table>
<thead>
<tr>
<th>Region</th>
<th>Yield (Kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>1932</td>
</tr>
<tr>
<td>CH</td>
<td>1720</td>
</tr>
<tr>
<td>S. Africa</td>
<td>1440 - 1500</td>
</tr>
<tr>
<td>N. America</td>
<td>719</td>
</tr>
<tr>
<td>Europe</td>
<td>767</td>
</tr>
<tr>
<td>S. Asia</td>
<td>703</td>
</tr>
<tr>
<td>S. Asia</td>
<td>642</td>
</tr>
<tr>
<td>N. Asia</td>
<td>553</td>
</tr>
<tr>
<td>S. Asia</td>
<td>260</td>
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COTTON YIELDS - Reasons for Regional Differences

- Level of production technology/research
- Production conditions - favorable and less favorable
- Production systems - input supply
- Adoption of technology - weak extension

COTTON YIELDS - Reasons for Inter Country Differences

Same

COTTON YIELDS - Reasons for Intra Country Differences

Same

HURDLES FOR YIELD IMPROVEMENT

- Pest damage - some loss is there even under perfect pest control
- Natural shedding
- Picking losses
- Ginning losses

HIGH END YIELD IMPROVEMENT HURDLES

- Imbalance between auxin and anti-auxin hormones
- Imbalance between fruiting forms and carbohydrate supply
- C3 nature - photorespiration
- Higher light intensity
- Low CO2
**HIGH END YIELD IMPROVEMENT SOLUTIONS**

- Eliminate photorespiration, convert cotton into C₄
  (Problem: Same enzyme that catalyzes photorespiration involved in CHO fixation)
- Maintain balance between auxin and anti-auxin hormones
- No picking and ginning losses

- Methanol application
  - Increased CO₂ assimilation
  - Increase leaf conductance
  - Results controversial

**HIGH END YIELD IMPROVEMENT SOLUTIONS**

- CO₂ enrichment
  - Increased biomass - vegetative and yields
  - Increased water use efficiency
  - Increased root growth
  - Controversial results

**BIOTECH COTTON AREA - WORLD**

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
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<tbody>
<tr>
<td>96/97</td>
<td></td>
</tr>
<tr>
<td>97/98</td>
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<tr>
<td>98/99</td>
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<td>06/07</td>
<td></td>
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<tr>
<td>07/08</td>
<td></td>
</tr>
<tr>
<td>08/09</td>
<td>52%</td>
</tr>
</tbody>
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**BIOTECH COTTON AND YIELD IMPROVEMENT**

- As such NO, but through better crop protection YES
- Future approaches
  - Improve photosynthetic rate
  - Chloroplast efficiency - higher expression
  - Delaying leaf senescence (Loss of cell’s power to divide and grow)

**BIOTECH COTTON - 2008/09**

- Area = 48%
- Production = 54%
- Trade = 52%
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