World’s Most Promising Cotton Yield Technologies & their Potential to Raise Production

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World’s most promising yield technologies

- agronomy
  - farmer production education
  - investment capital
  - precision application
  - no-till (with herbicide tolerance)

- genetic improvement
  - edaphic stress
  - metabolic efficiency
  - seed resource reallocation
  - plant architecture
  - hybridization
In addition to basic farming expertise, any technology advancement requires adjustments to entire production system.

e.g. Introduction of high priced Bt-cotton seed to eastern China:
- lower seeding rates
- disease susceptible foreign variety
- yield boost caused K deficiencies
- 2 pests no longer controlled
Supplemental irrigation raises Water Use Efficiency in rainfed cotton but requires investment in water delivery systems.
Optimum agronomic management:
1970’s  farm scale recipe
1990’s  field scale
2000’s  soil type scale
2010’s  10 m² scale

Precision Application
apply inputs as needed

minimize stress and evaporation

preserve rainfall & soil
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  - hybridization
Highly diverse *Gossypium* diploids wild plants

4 plants crossed making 2 *Gossypium* tetraplids

Man domesticated the long fiber mutants

Breeding further narrowed germplasm

Genetic Diversity Lost
Plants are immobile so evolved to tolerate stress.

DNA tools allow breeding with wild cotton for soil borne stresses:
- nematodes
- diseases
- drought
Plants are immobile so evolved to tolerate stress. DNA tools allow breeding with wild cotton for soil borne stress: nematodes, diseases, drought.

In addition to the multiple breeding tools, we could reach back in time to the rapid evolution of the fiber and make it better the 2nd time around.

Sequenced Cotton Genome
We have the tools to breed seed with MORE fiber & oil, LESS protein.
Biotech adopters benefit from all the ancillary benefits of a robust, professional local seed industry PLUS the trait.

Adapted from David Zilberman, U.C. Berkeley
& their potential to raise production

- China
- India
- USA
- Africa

Raise Production
Climate Disruption creates uncertainty as to how well India benefits from yield technology.

Seed has had a huge impact:
- Bt-cotton insect control
- locally adapted hybrids

Anticipate future seed benefits:
- no-till facilitated by glyphosate herbicide tolerance.
- higher stand density facilitated by lower cost hybrid seed production and apomixis hybrids
Water supply limitations are not solved with drought tolerance.
- Western China adopting USA production system.
- Eastern China likely not, maybe no-till with Herbicide Tolerance

As the first adopter of USA-centric innovations we will benefit greatly, IF their development is funded.

Supplemental irrigation in the rainbelt is expanding rapidly but West Texas water supply is uncertain.
The modal fertilizer rate in Africa is Zero!

Slight improvement in input resources, infrastructure and education would have a dramatic impact on African cotton yields.
Optimistic that cotton yield gains can satisfy some of the expanding global demand for textile fiber.