Secrets of High Yields

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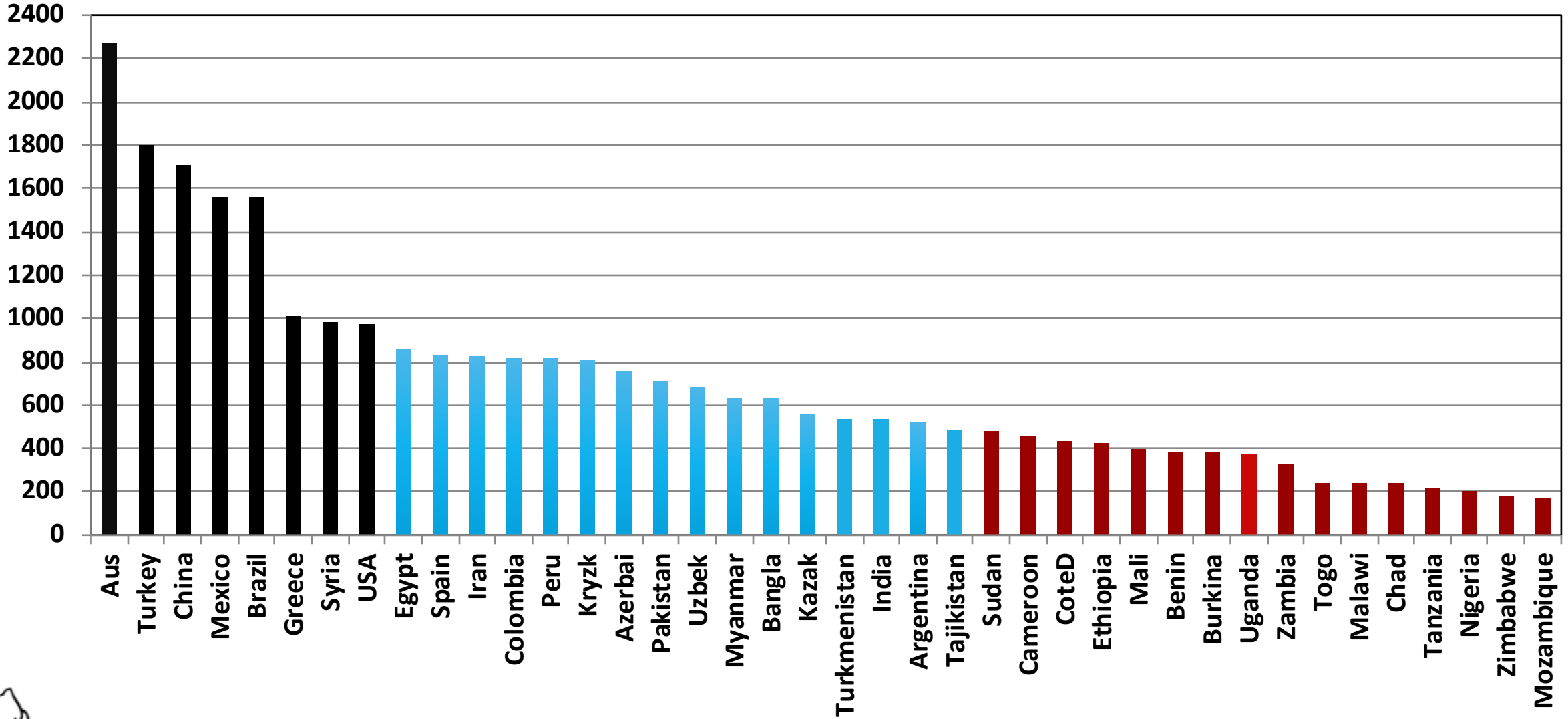
International Cotton Advisory Committee
Washington DC

YIELD (Kg/ha) 2017



Potential Yield (Aus) = 3,500 Kg lint/ha

Theoretical Yield = 5,034 Kg lint/ha

Reported Yield (China) = 5,005 Kg lint/ha

-Ref, www.nzweek.com (2013)

Uptake, distribution and redistribution of NPK is crucial

Constable and Bange, 2015

Yields/ha

Bolls/plant x
plants/ha x
boll wt x
ginning%

The Six Main Secrets

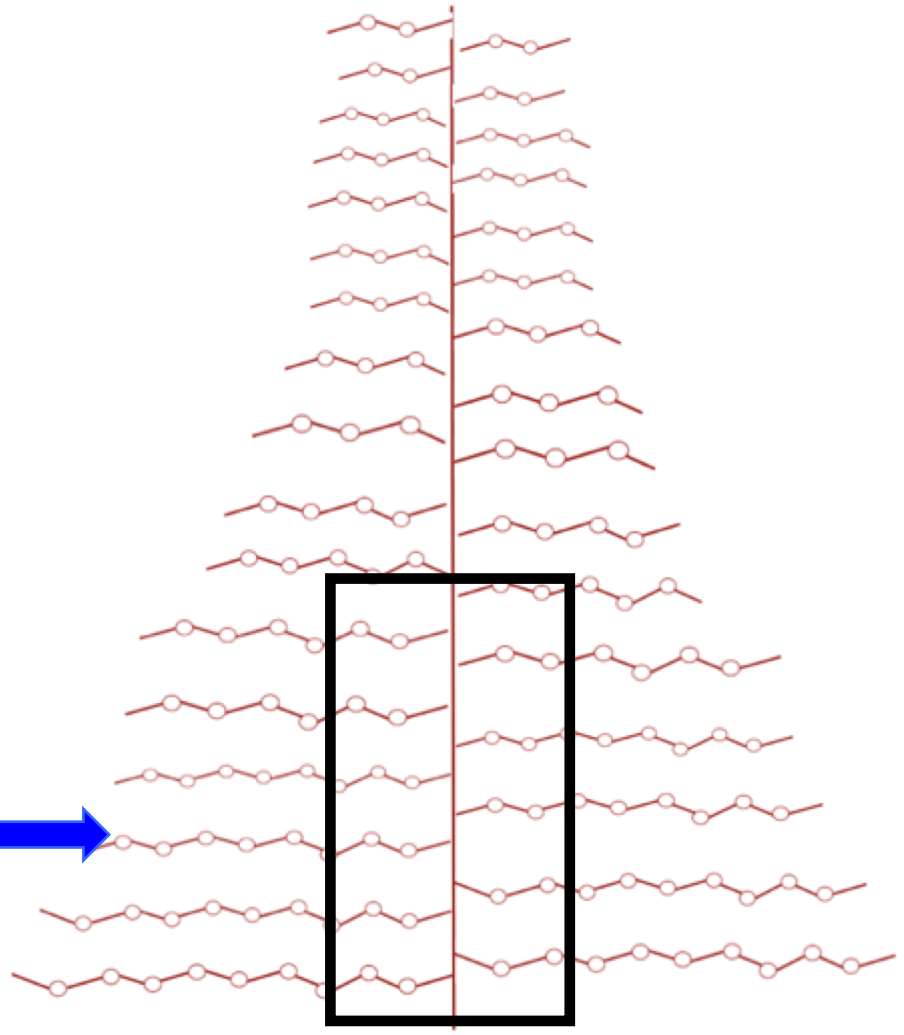
Breeding

1. Compact Architecture
2. High ginning%
3. High harvest index

Management

1. High density + Canopy Management
2. Precision Management
3. Short critical window

Breeding



Plant type was unsuitable for pickers

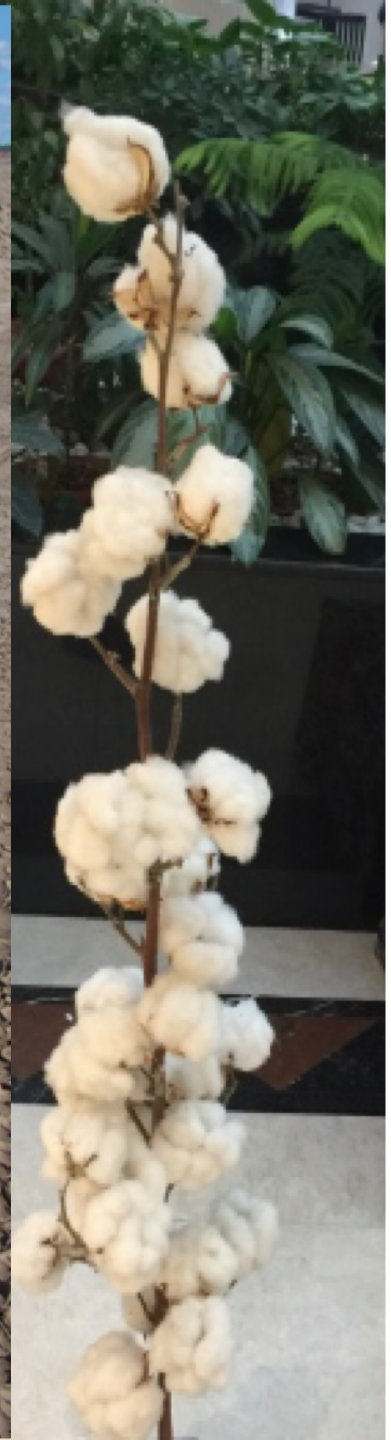
Objective: Breeding plants for the Picker

100 cm tall

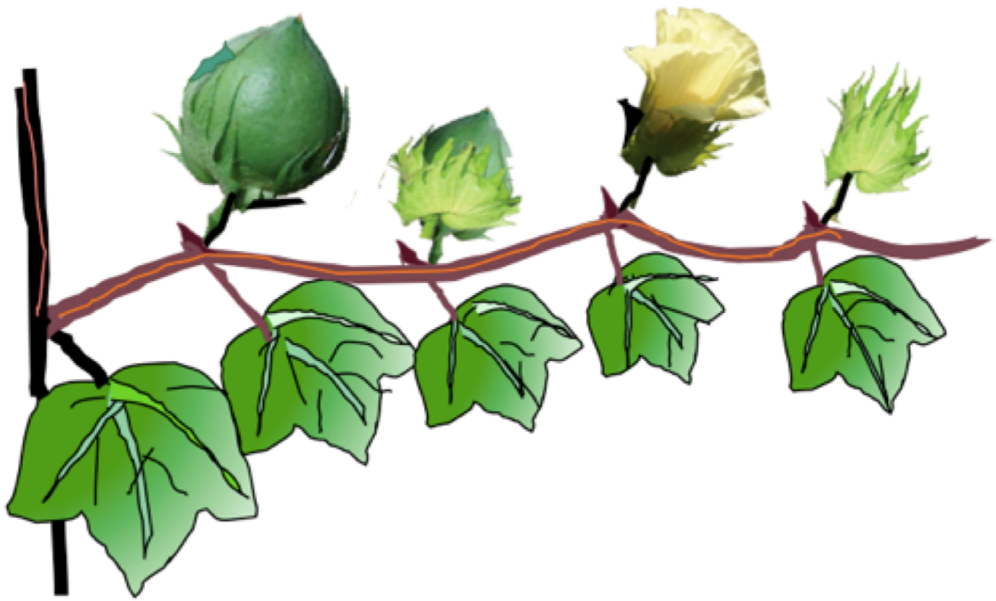
70 cm wide

One-time picking

Photo: James Quinn



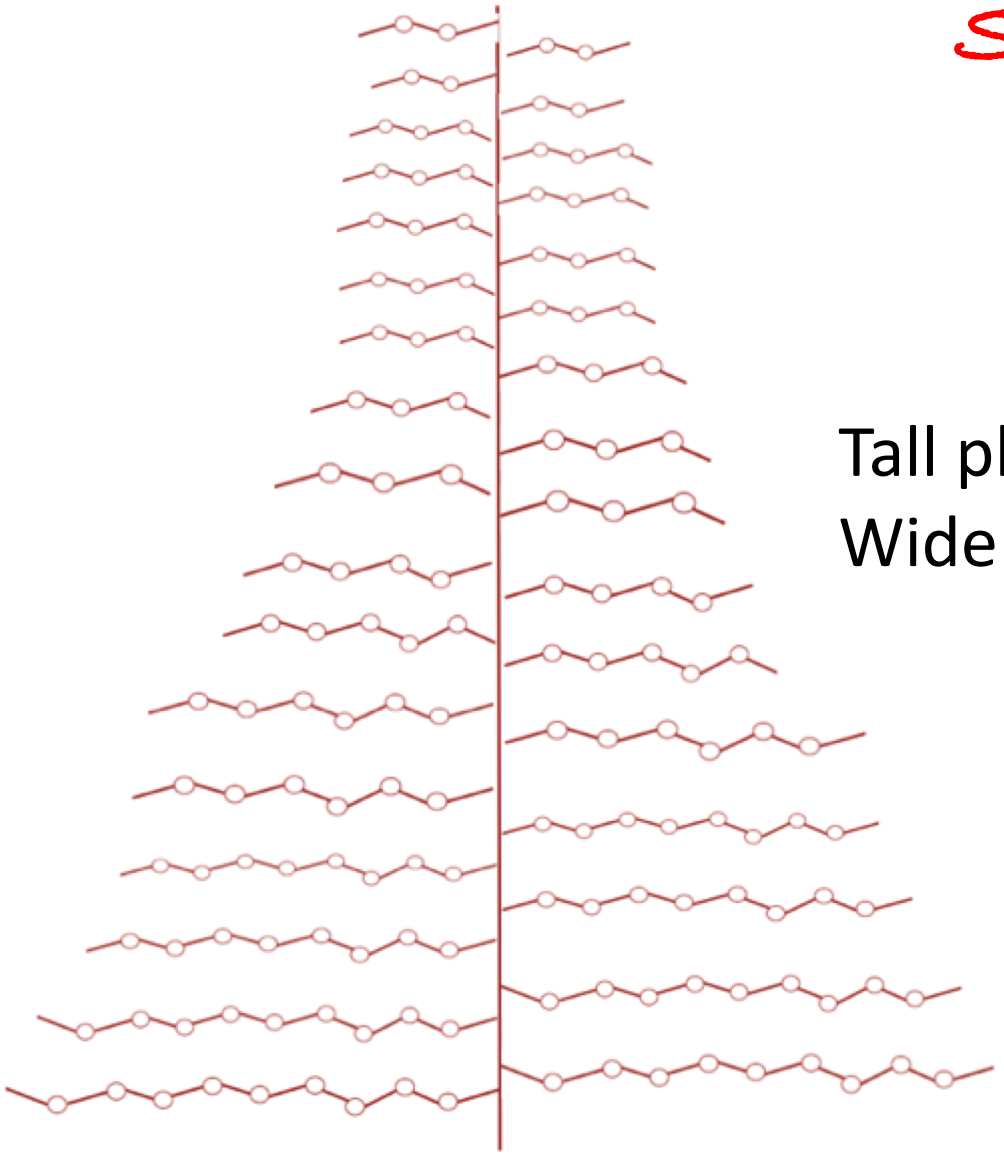
60% 30% 10%



Fruiting Branch

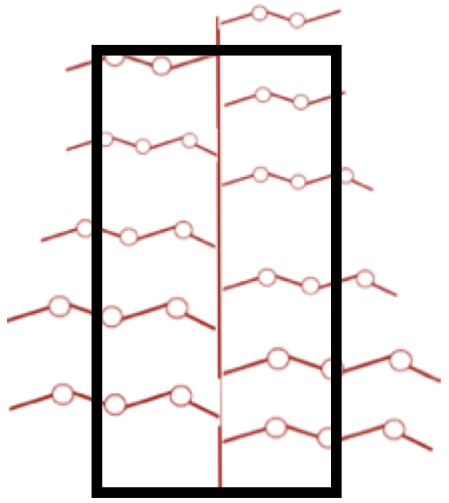
Secret-1 Compact architecture

Breeding



Tall plants
Wide branches

Compact plants
Narrow branches

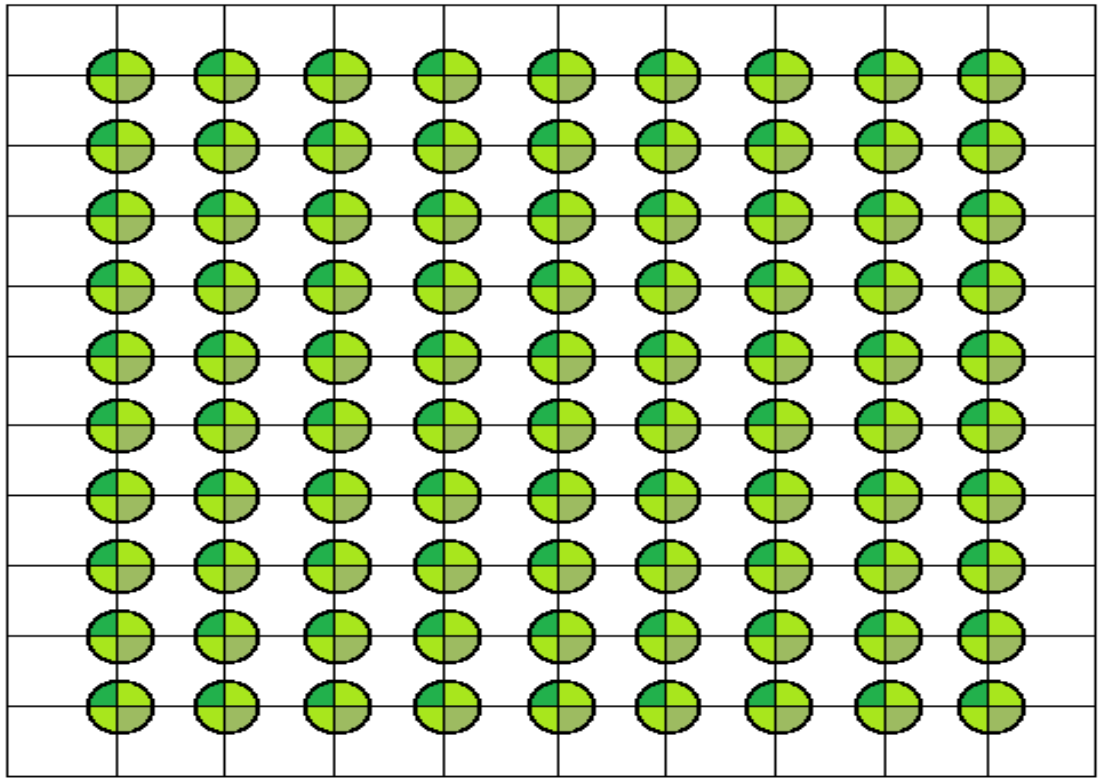


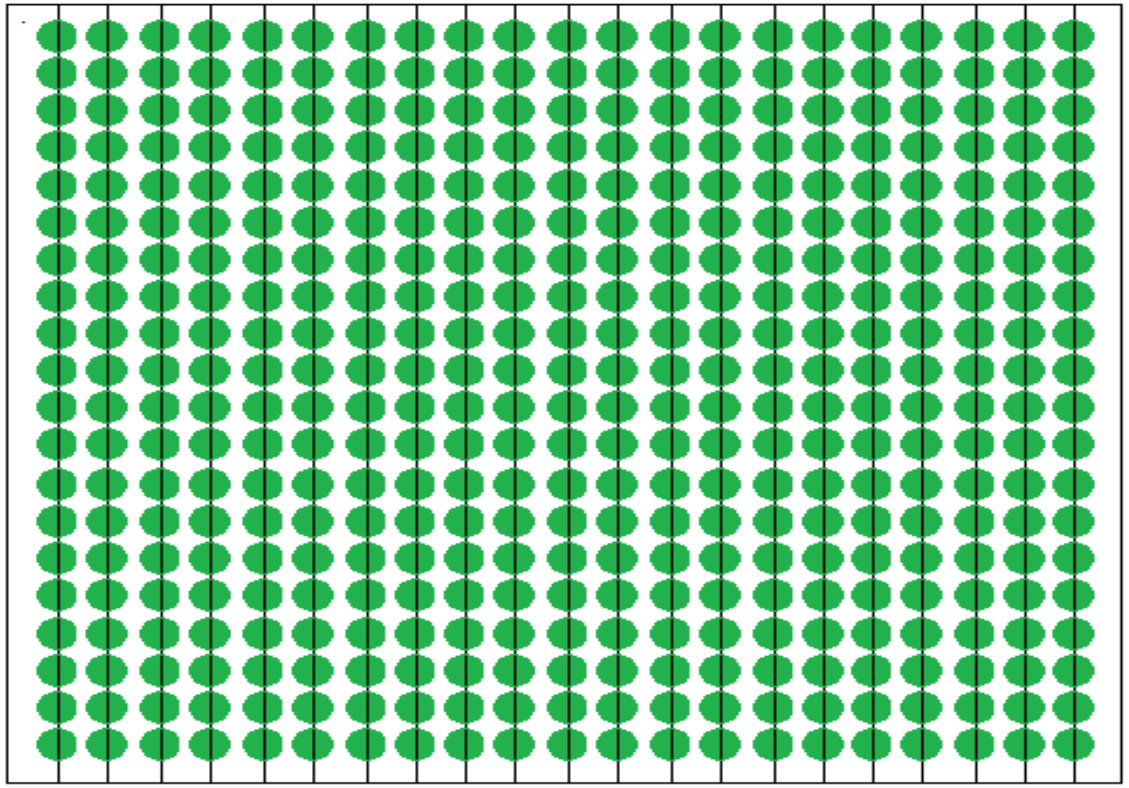
Inefficient

Efficient

Photo: Mubvekeri, Zimbabwe

Secret-1a High Density





Spacing 90 x 90 = 11,111 plants /ha = 80 bolls/plant = 40 Q/ha

Spacing 90 x 60 = 18,500 plants /ha = 54 bolls/plant = 40 Q/ha

Spacing 60 x 10 = 166,667 plants /ha = 6 bolls/plant = 40 Q/ha

Spacing 40 x 10 = 250,000 plants /ha = 4 bolls/plant = 40 Q/ha

Low density

90 x 30 cm (India & Africa)

76.5 x 8 cm (Australia)

High density

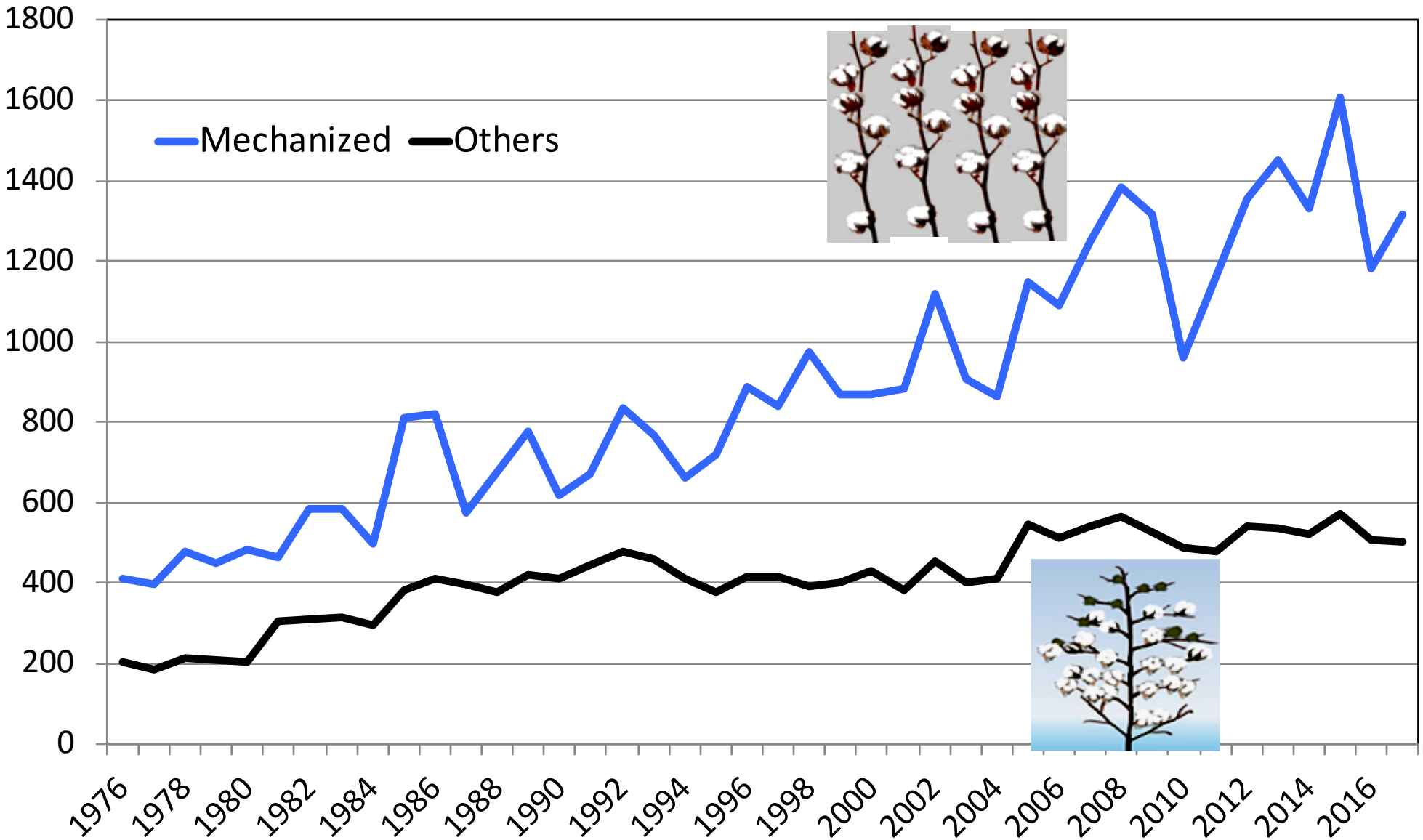
High Density
High Yields + Good Quality

1. More plants /ha
2. Few Bolls per plant
3. Short duration
4. Only 40 days critical window
5. Good fibre quality
6. High ginning %
7. High harvest index

High Density

Yield Growth in High Density Countries

Australia
Brazil
China
Mexico
Israel
Turkey
USA



Message

1. Compact plant architecture +
2. High Density +
3. Canopy Management +
4. Short (40 Days) critical window

give high yields plus good quality

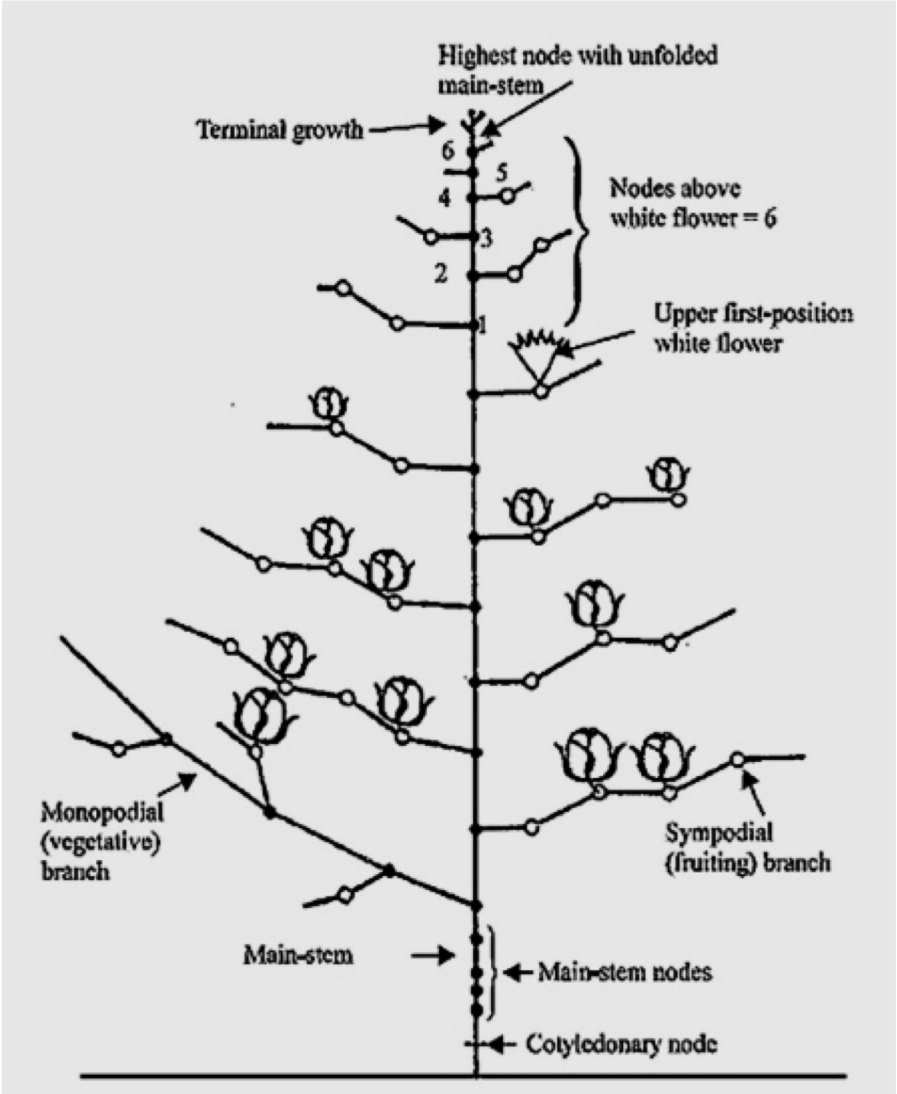
'Picker-breeding' catalyzed the big change !!

The Cotton Plant

Secret-2 Canopy Management

Nodes above the first flower

Cut-out



Canopy management

Plant training practices are done for canopy management and also to facilitate nutrients to be redirected to fruiting parts.

- **Restricting plant height:**

Aeration and ventilation in the high density crop is ensured by controlling the plant height to 65-70 cm. 100% compliance

- **Topping:** 100% compliance
- **Removal of vegetative branches:**

Compliance in 50-70% of the farms

- **Removal of unproductive plant parts:**

100% compliance

- **Removal of early fruiting branches:**

100% compliance

- **Bt-cotton in local varieties:**

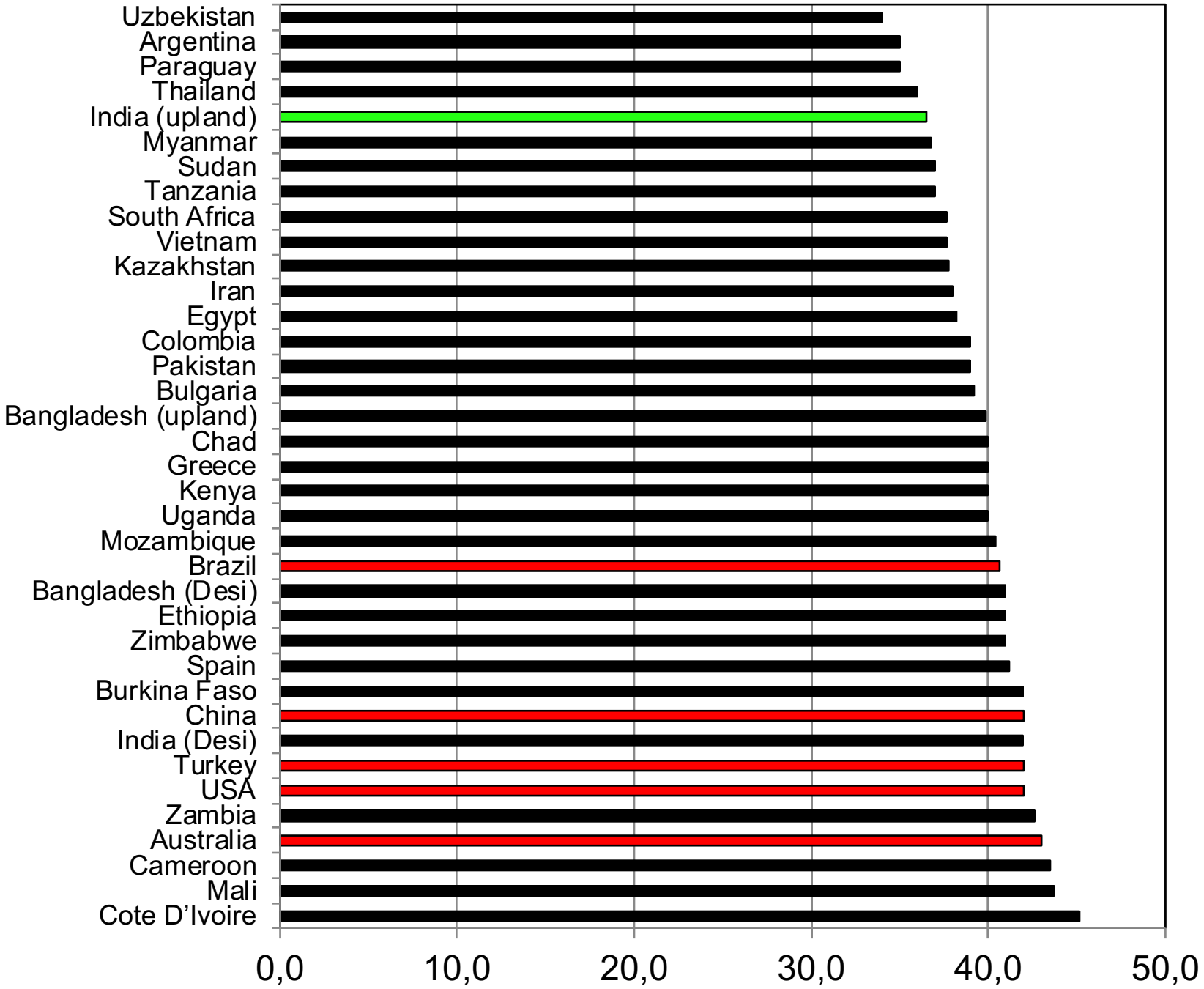
Bt-cotton technology is introduced into the locally adapted varieties for effective bollworm protection.

Canopy Best practices

- >110,000 to 220,000 plants/ha
- 10-15 bolls/plant
- CROP DURATION: 140-160 days
  40 veg + 70 fruiting + 40 maturation
- Short critical window
- Efficient management of insect pests, nutrients, water and light
- High yields

India & Africa

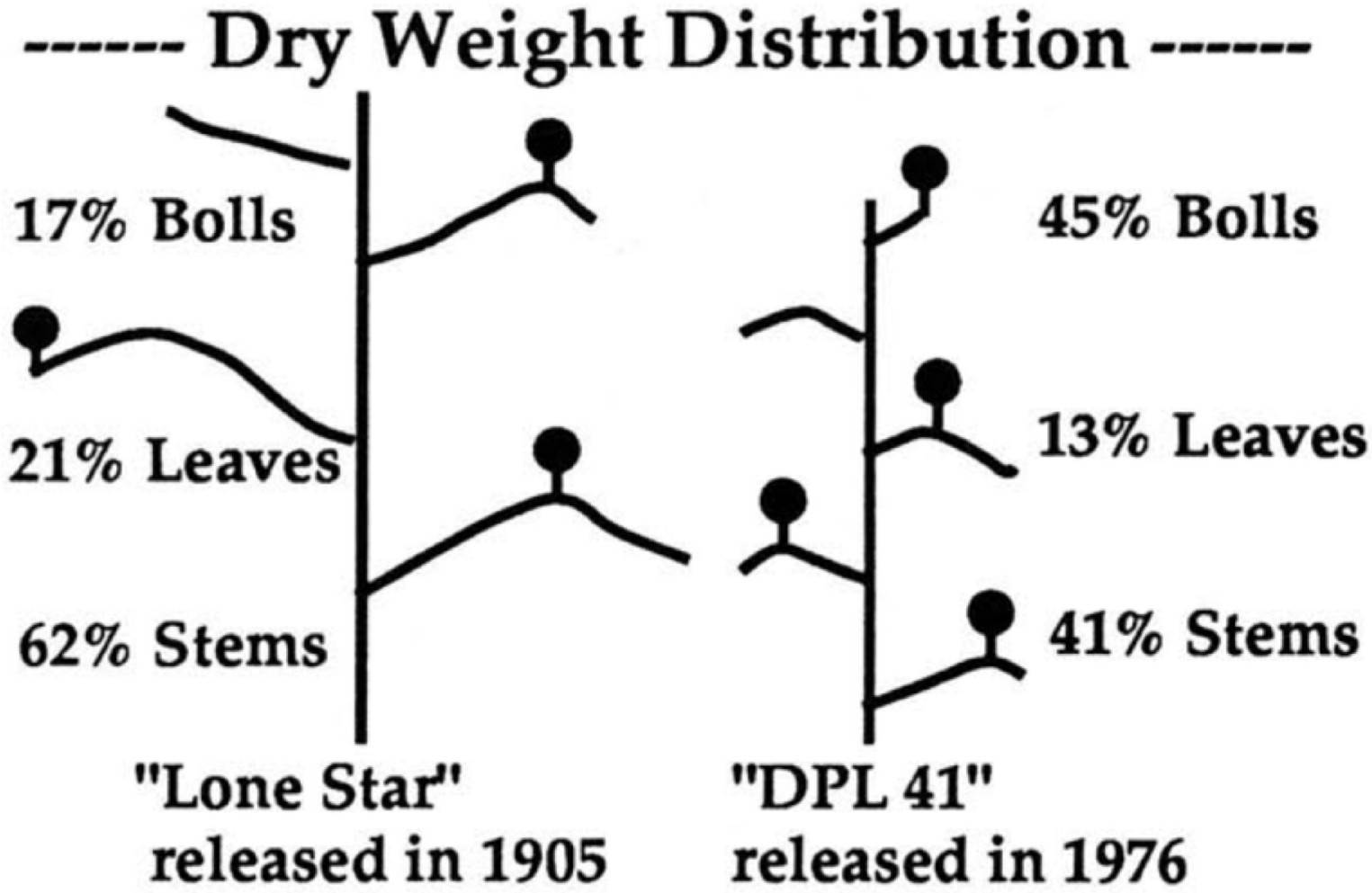
- 11,000 to 40,000 plants/ha
- 45-60 bolls per plant
- CROP DURATION: 180-240 days
  50 veg + 120 fruiting + 40 maturation
- Long critical window
- Complicated management
- Low yields

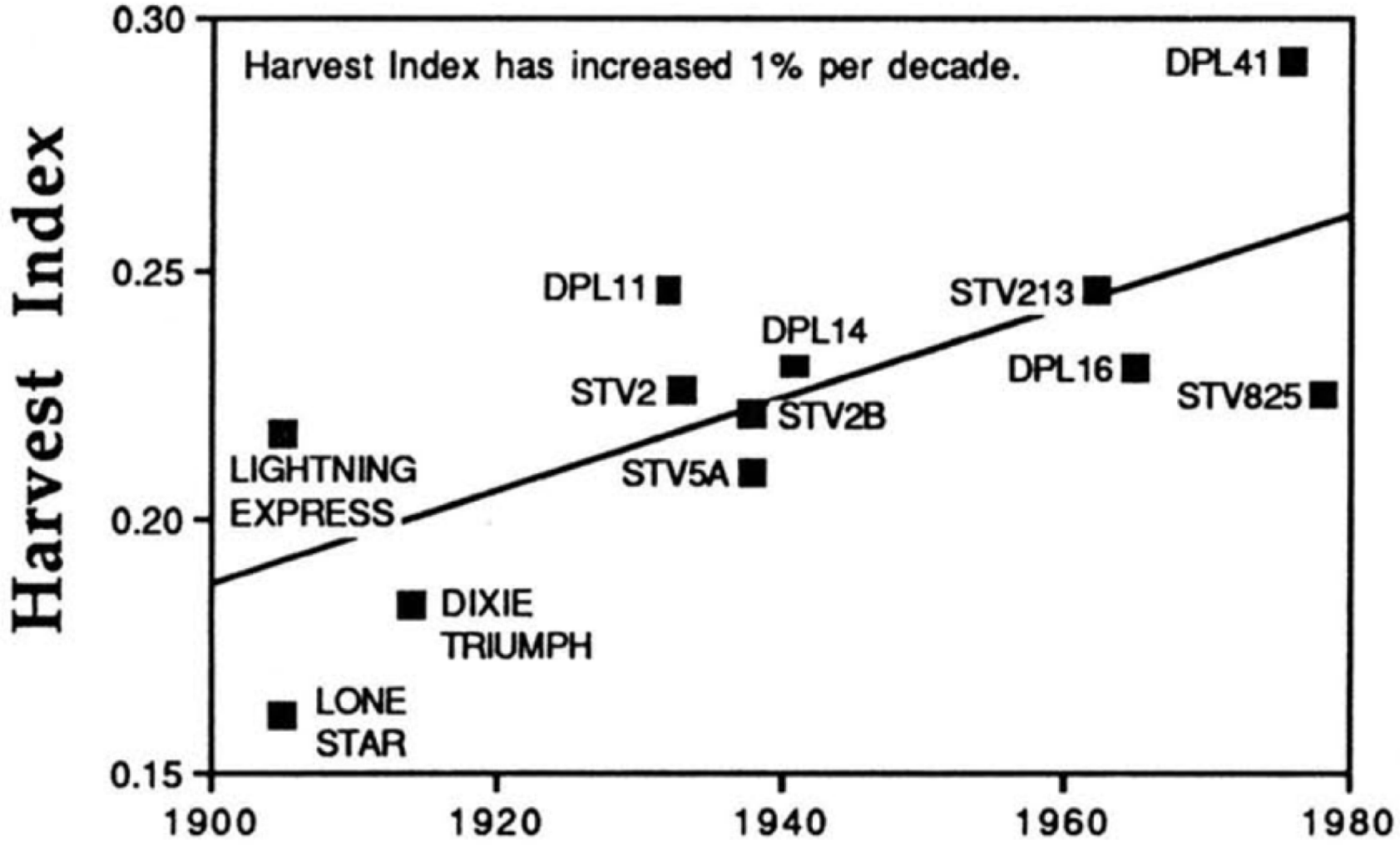


Secret-3 High ginning%

Australia	43%
Africa	43%
USA	42%
Turkey	42%
China	42%
Brazil	41%
India	**35%**

Secret-4 Harvest Index





40% INCREASE IN HARVEST INDEX IN 80 YRS

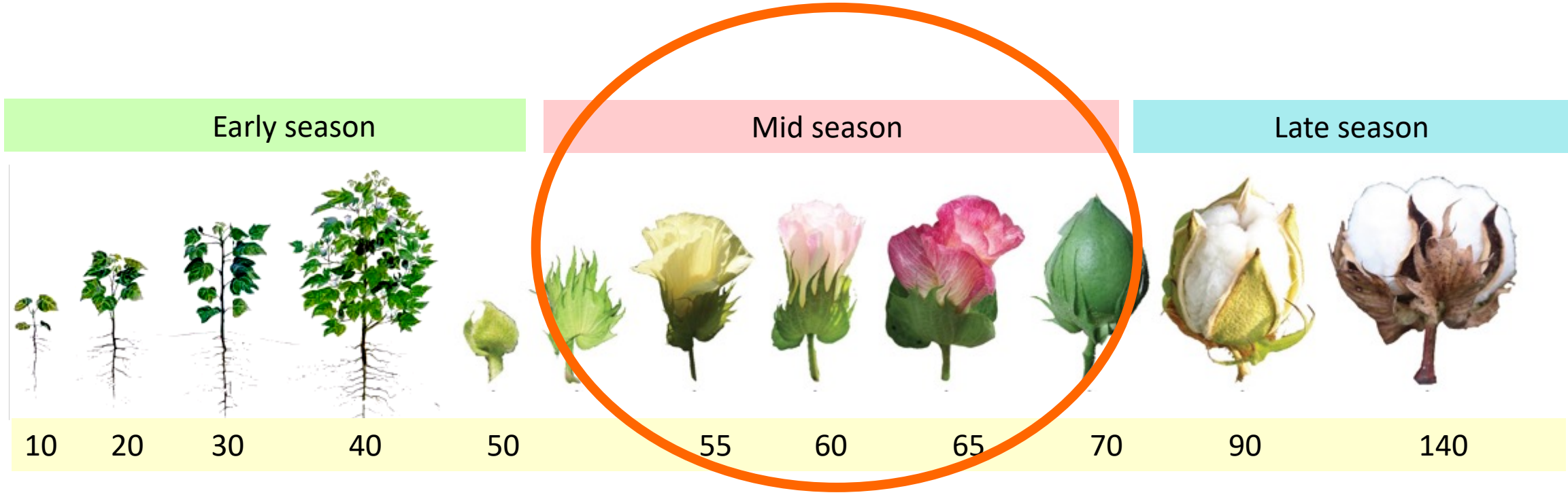
Harvest index: Africa **0.2** compared to **0.45** of the top 5 countries

Secret-5 Precision Management

Crop Management: Soil, Water & Nutrients

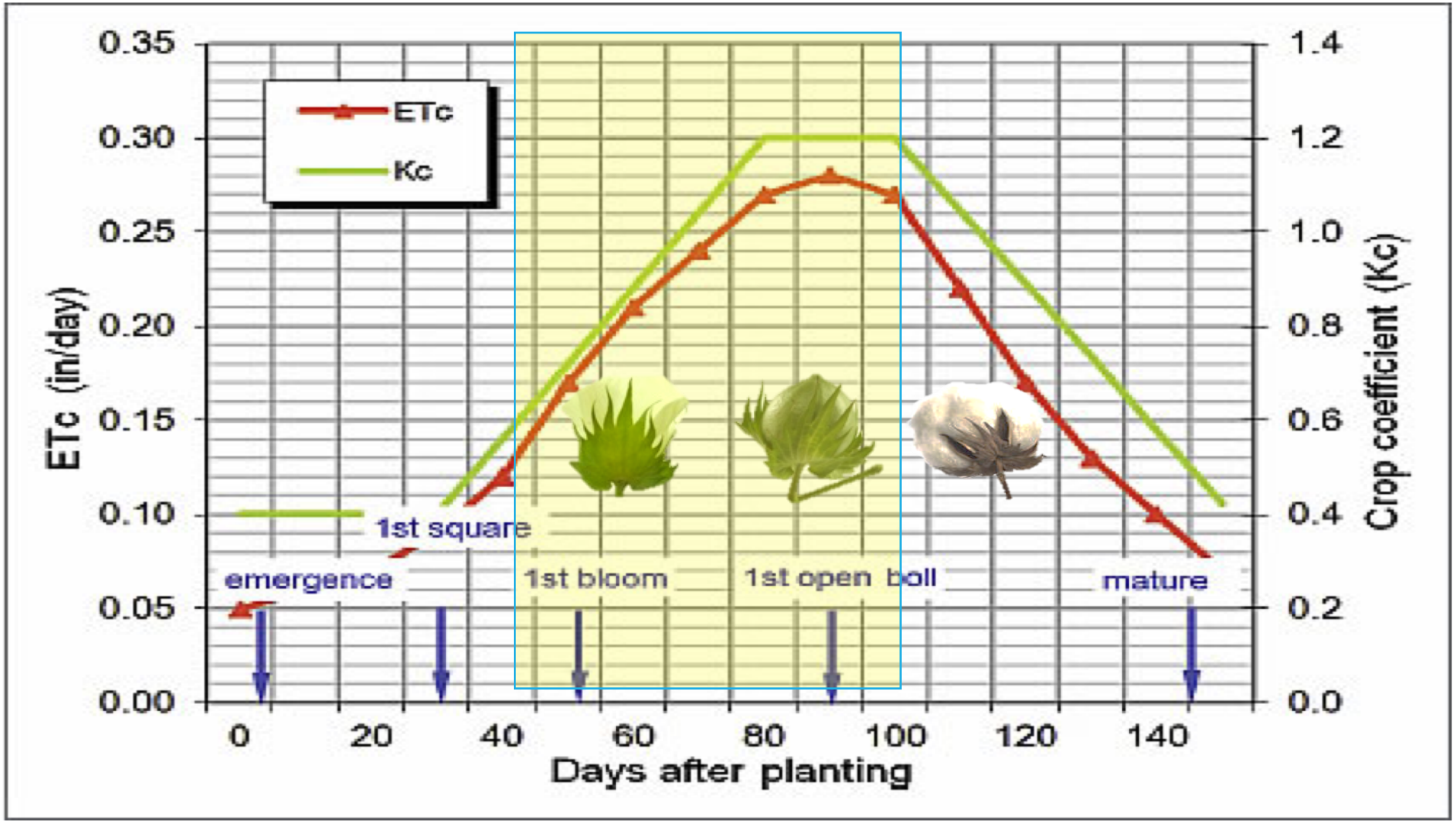
Australia:	MyBMP
USA:	COTMAN
China:	Canopy Trimming
Turkey:	Balanced Diet
Brazil:	Zero Tillage
India:	Hybrids

Cotton plants need
80% of water and nutrient requirement
During fruit formation (critical window)



Critical Stages: Flowering + Green boll stage

Water stress at critical stage causes 30-70% yield loss



http://www.cottoninc.com/fiber/agriculturaldisciplines/engineering/irrigation-management/cotton-water-requirements/

Secret-6 Short critical window
for efficient crop management & good uniform fibre quality

THE CRITICAL WINDOW ATTRACTS BOLLWORMS

1. **India and Africa have a longer 80-90 days critical window**
2. **Management is a nightmare**
3. **Water & nutrients usage is indiscriminate and soil degradation is high**

Intelligent Pest Management

1, **Natural Control is Nature's gift**: Conserve it

2. **Your intervention can cause Insect pests** (varieties, insecticides, fertilizers, cropping systems)

3. **All insects pests are not harmful**. Some minor pests are useful insects

4. **Effective Passive Pest Management**

5. **Insecticide for 'eco-window'** and not for pest

Insecticide Misuse & Resurgence

Pyrethroids: Cause Helicoverpa and whitelfly resurgence

Fipronil: Causes whitefly resurgence

Pyrethroid+OP: Hormoligosis and outbreaks

Spinosad: Causes Mealybug resurgence

Organophosphates: Switching off towards vegetation, resurgence of some sucking pests

Methomyl & Thiodicarb: Cause leaf reddening

THE FOUR VARIETAL TRAITS

1. Compact architecture & high harvest index
2. Short duration (140-160 days)
3. Resistance to sucking pests
4. High ginning%

THE FOUR STEPS IN PLANTING

1. Stale seed-bed
2. Seed treatment
3. Precision planting (row orientation and 10cm spacing)
4. Planting on ridges

THE FOUR MANAGEMENT INTERVENTIONS

1. Canopy management
2. Square & boll retention management
3. Ecological engineering for stress management
4. Timely termination and crop residue management

THE FOUR PRODUCTION PRACTICES

1. Legume cover-crop/ inter-crop / crop-rotation
2. Mulching & minimum tillage
3. Water harvesting & precision irrigation
4. Precision nutrient management

Thank You