



## PRESENTATION

Session: **Cotton Breeding, Production, Ginning**

Title: **Saw versus roller ginning and their potentials - a technological view on India**

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Presentations are available in the conference archive: <https://baumwollboerse.de/en/competencies/international-cotton-conference/speeches/>

### Conference Organization

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# Saw versus roller ginning and their potentials – a technological view on India

Vanessa Berghoff, GIZ India & Justin Kühn, ITA



Implemented by





# Agenda

1. Global Programme Sustainability and Value Added in Agricultural Supply Chains (India)
2. Technical Overview
3. Comparison of Saw and Roller Ginning
4. Latest developments in Ginning
5. Technical Usage and trading models
6. Future developments



# Global Programme Sustainability & Value Added in Agricultural Supply Chains

## Objective

Increasing sustainability in selected agricultural supply chains in our partner countries by

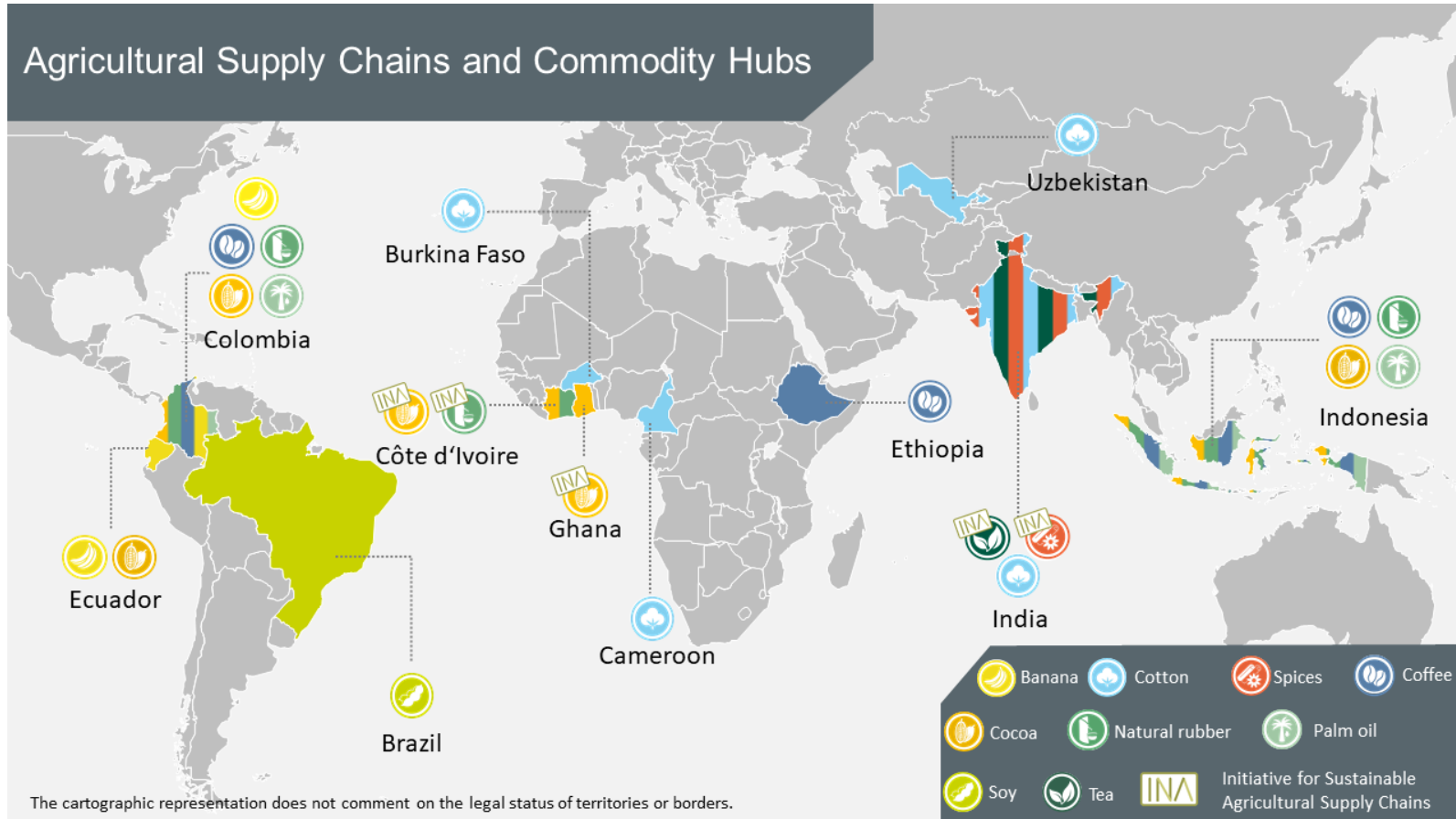
- promoting sustainable farming methods
- strengthening capacities for local value addition
- fostering global knowledge exchange

Commissioned by:

**German Federal Ministry for  
Economic Cooperation and  
Development (BMZ)**

- Duration: 04/2019 – 03/2027
- Volume: EUR 143.3 million

## Portfolio



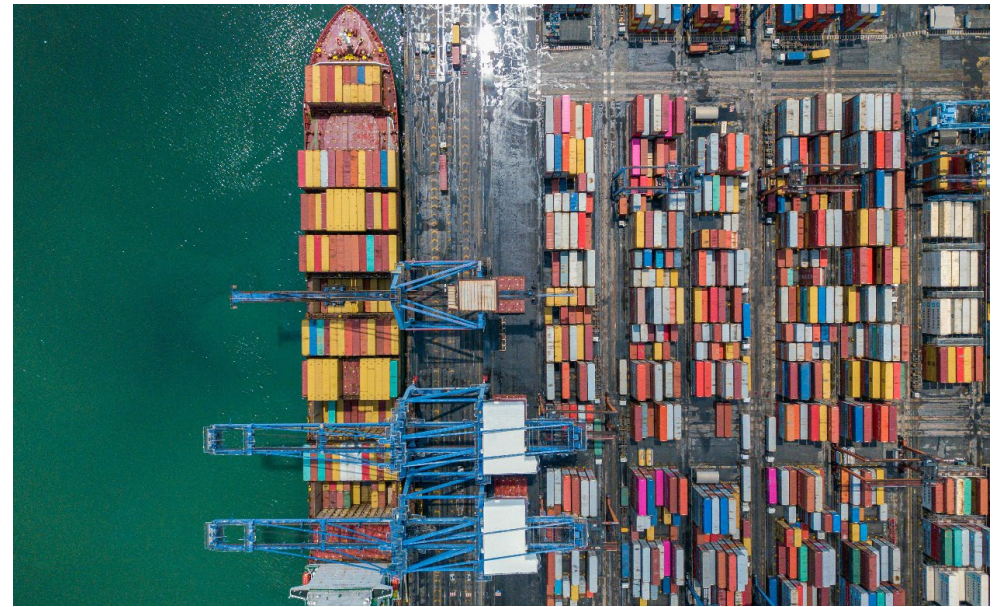


# Global challenges

- **Global imbalance:** A small number of globally operating companies dictate the conditions in supply chains – on the production side they face millions of small-scale producers.
- **Supply chains are highly complex and non-transparent:** neither consumers nor producers alone can influence this imbalance.
- **Long and fragmented supply chains:** Most companies do not have direct or long-term business relationships with smallholders.
- **Corporate due diligence:** Companies must be able to guarantee compliance with social, ecological and economic standards at the beginning of their supply chain.



A "smart mix" (on a global level) of legal regulations, voluntary standards, multi-stakeholder partnerships and development policy / measures is necessary to ensure that people at the beginning of the supply chain are appropriately represented



# Our approach

## From the **SHELF** to the **FIELD**:

starting from the consumer, working along the entire supply chain until the production level



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- **Cooperation with global players**, especially internationally relevant companies, standard organisations, etc.
- Cooperation with **international multi-stakeholder platforms and initiatives**
- **Global knowledge transfer and management** (e.g. dissemination of innovations & digital solutions)
- **Multiplication of sustainability concepts** (sustainable production regions, living income, deforestation-free supply chains etc.)



# Exemplary project activities and partners

## Global Sustainability Standards

- **Better Cotton Initiative (BCI)**
- **Organic standards**
- **Fairtrade standards**

Support of around **156,000 smallholder farmers for sustainable cotton production** in accordance with global sustainability standards.

## National and global brands

- **Welspun India:** BCI & digital extension services
- **Aldi:** in-conversion organic cotton
- **BrandsFashion:** in-conversion organic cotton & sports for development
- **bioRe:** organic cotton and preparation of botanical inputs

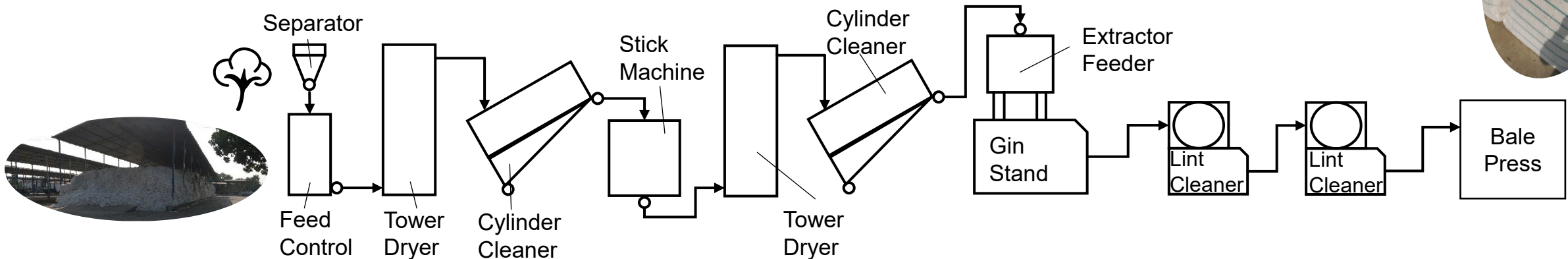
## Others

- **FiBL & OCA:** training modules organic cotton
- **World Bank WRG 2030:** trading certificates for water efficiency
- **ITA of RWTH Aachen and Augsburg University of Applied Sciences & Hochschule Niederrhein:** technical equipment & occupational safety in ginning mills



## Short state of the Art overview

- Two important Ginning methods:
  - Saw ginning vs. Roller Ginning
  - Divergence between capacity and quality
- Ginning as a keyword for a whole production line
  - Consecutive processes with own characteristics
  - Little inter-process coordination

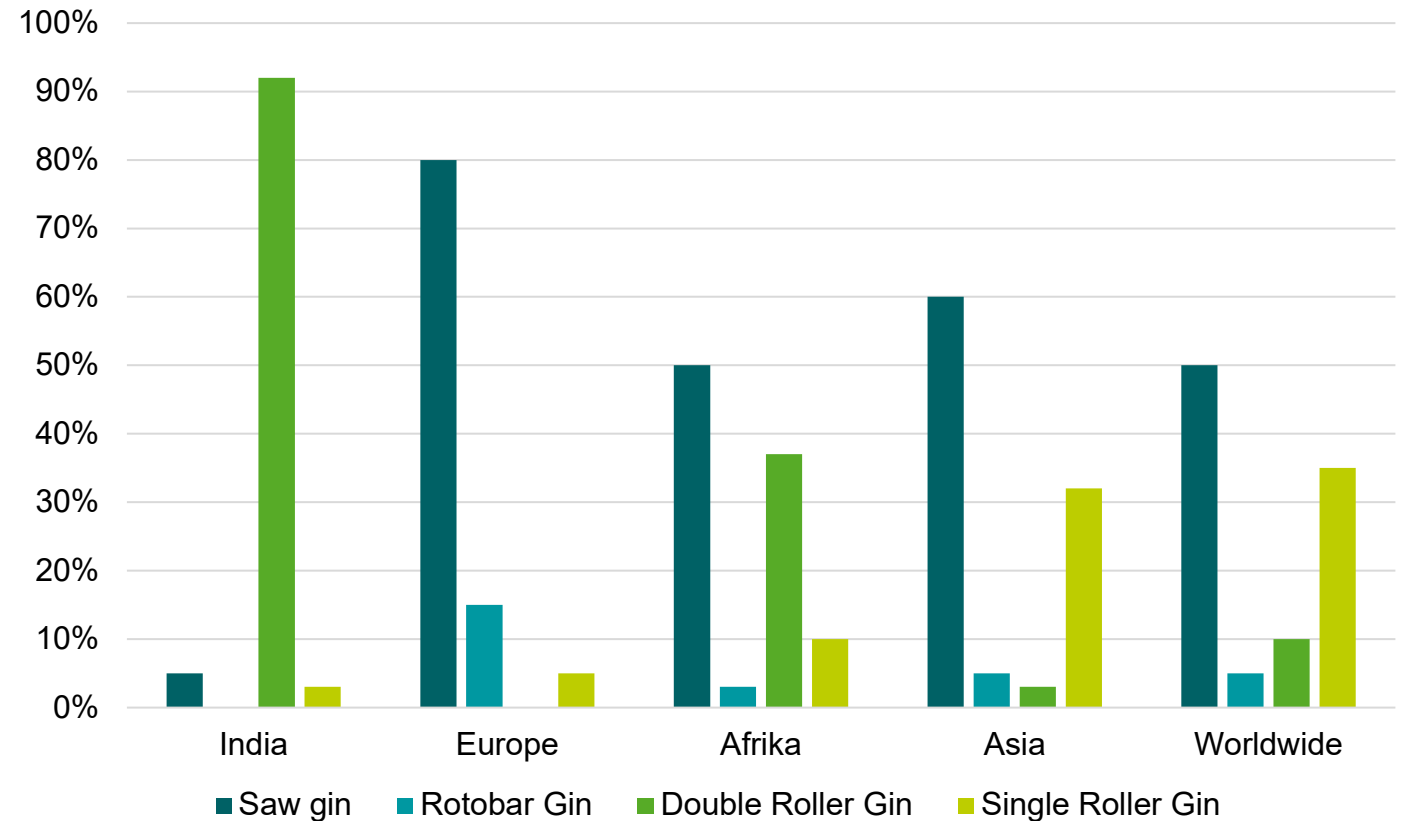




## Machine market share

- Market shares of ginning technologies vary greatly on a global scale
- Roller ginning especially popular in India
- Saw ginning used more frequently worldwide due to higher production capacity

### Market share of ginning technologies



[PAS10]

# Comparison of Saw and Roller Ginning

## Roller versus Saw Ginning

Factors	Roller Ginning	Saw Ginning
Kapacity [kg/h]	40 - 60 (1000 in high speed roller gin)	1800 - 3400
Price per machine [US \$]	3000 - 100.000	150.000 - 265.000
Space demand per machine [ $m^2$ ]	18	20
Operation per Bale [h]	5 - 0,6	0,4 - 0,3
Bonus payment fee per bale [US \$]	3 - 10	keine
Ginning Outturn (GOT)	High	Low



## Roller versus Saw Ginning



**DR Gin – Indian ©Bajaj Steel**



**Saw Gin – Chinese [SC21]**

- Saw Gin higher price but higher throughput
- Nominal throughput of 10.000 tons of fibres per year:  
68 DR Gins vs. 2 Saw Gins
- With bonus payment and higher GOT Roller Ginning is more profitable
- Variable costs and base price are regionally differing

## Main Issues in Ginning

- Problems in cotton growing
  - High trash content
  - Contamination through hand picking
  - Plastic contamination
- Problems in cotton ginning
  - Loss of fibre length
  - Fibre damages
  - Low cleaning
  - Safety hazards in the facilities
  - Production capacity
- Problems in storing
  - Mould
  - Increase of yellowness
  - Contamination through open storage
- Technological development and collaboration required

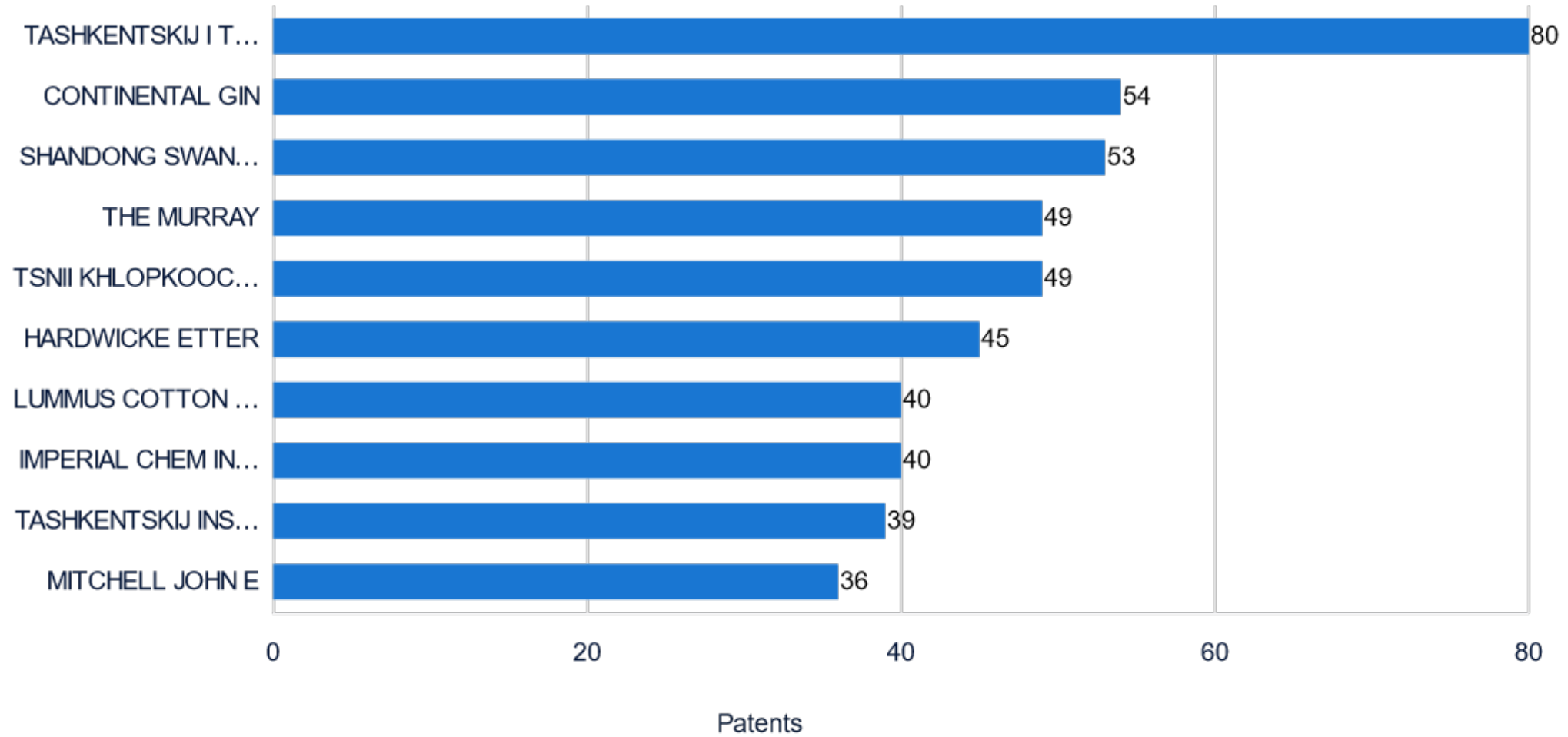
Fibre properties of hand and machine ginned cotton in comparison

	Hand ginned	Roller ginned
Average length [mm]	27,3	24,3
Trash count [cnt/g]	10	38
Neps [cnt/g]	137	330

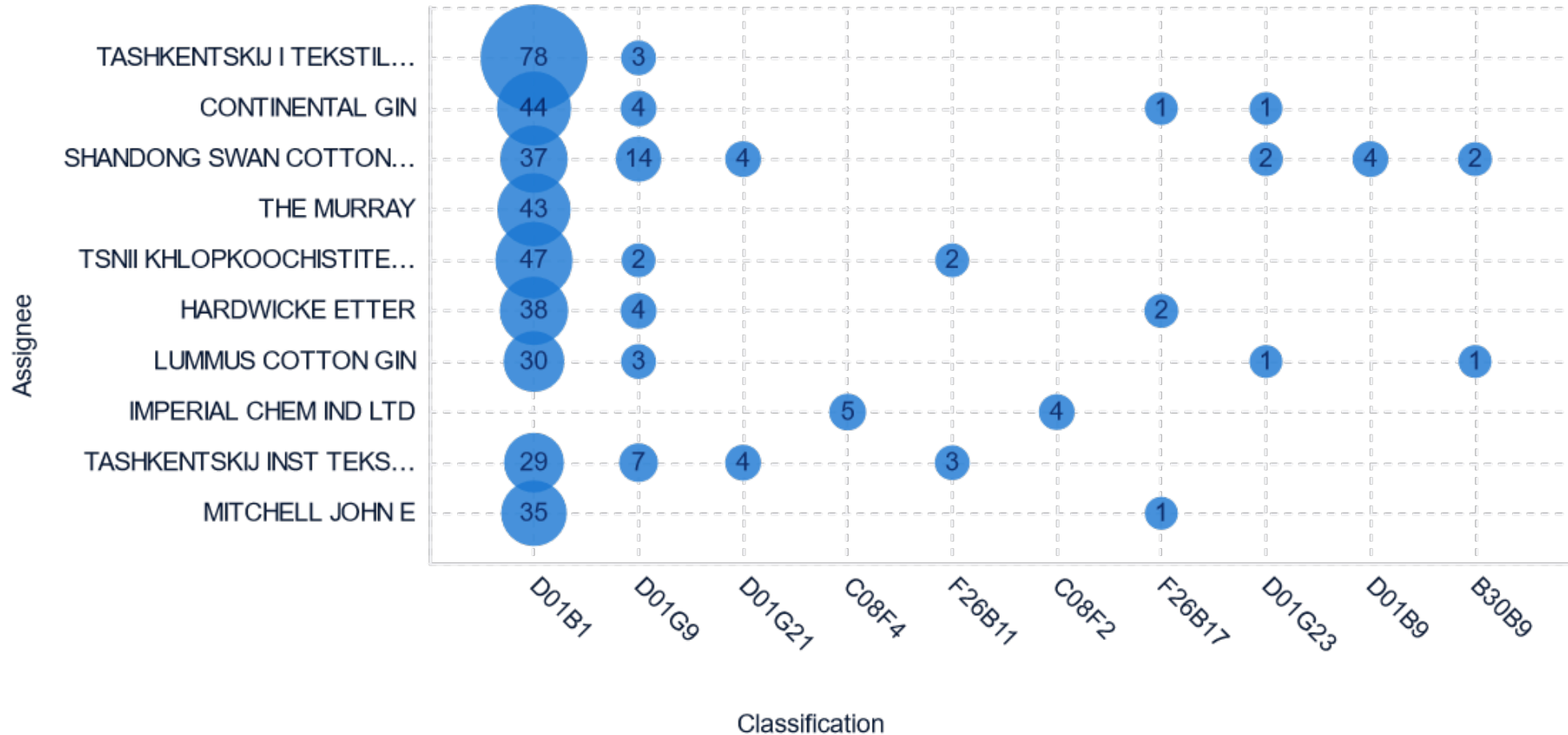




## Innovation share



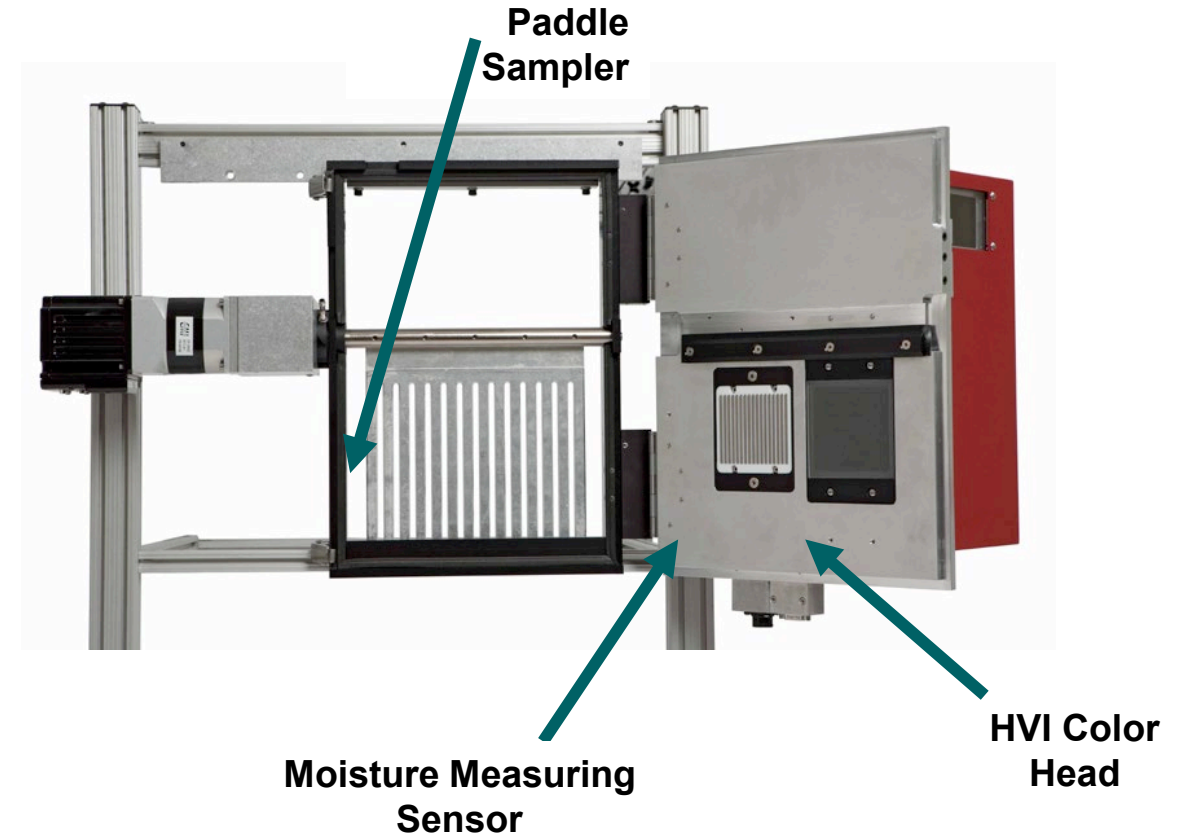
## Technology focus of Top Assignees





## Sampling station

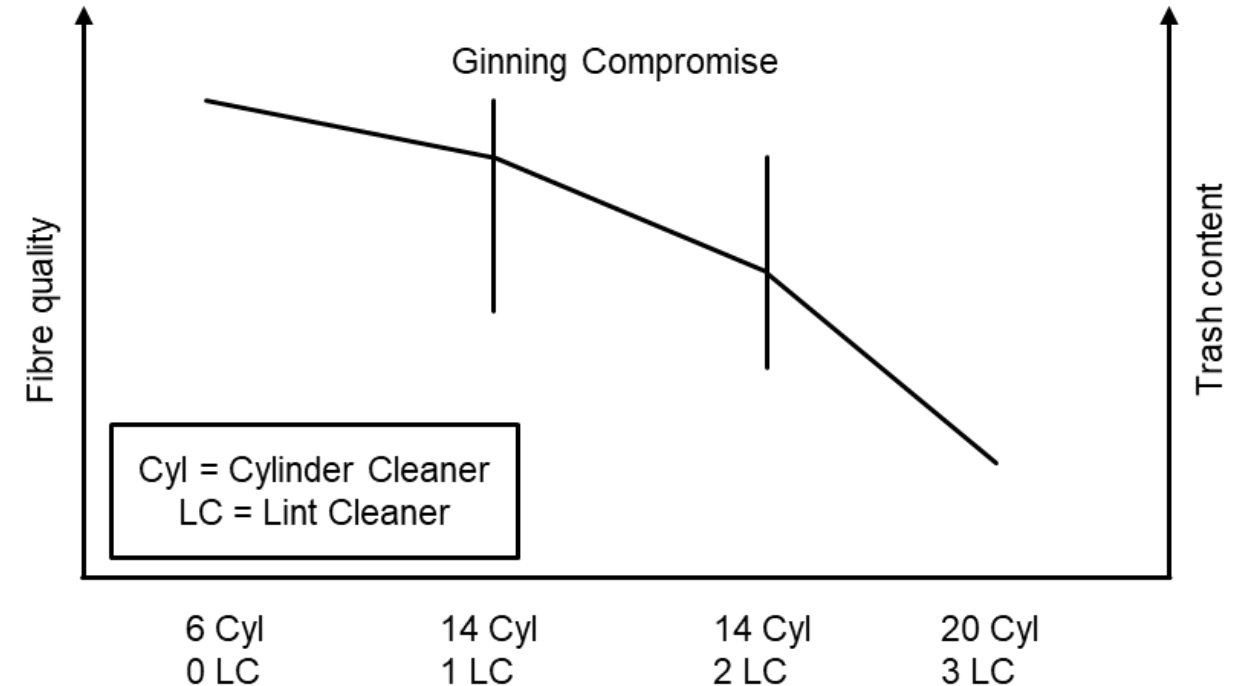
- INTELLIGEN 2 gin process monitoring system
- Real time measurements of fiber color, trash, and moisture
- Provide information to make decisions on dryer temperature for optimum fiber moisture
- Provides accurate information on leaf grades in order to optimize the cleaning process and reduce fiber damage



©Uster

## Trash Management

- Trash during cotton harvest is unavoidable
  - Sufficient training minimizes contamination
  - Measures for cleaning cotton needed
  - But cleaning the cotton damages the fibre
- Only cleaning cotton when needed
  - Empirical research for the right cleaning procedure
  - Process control via camera systems with artificial intelligence

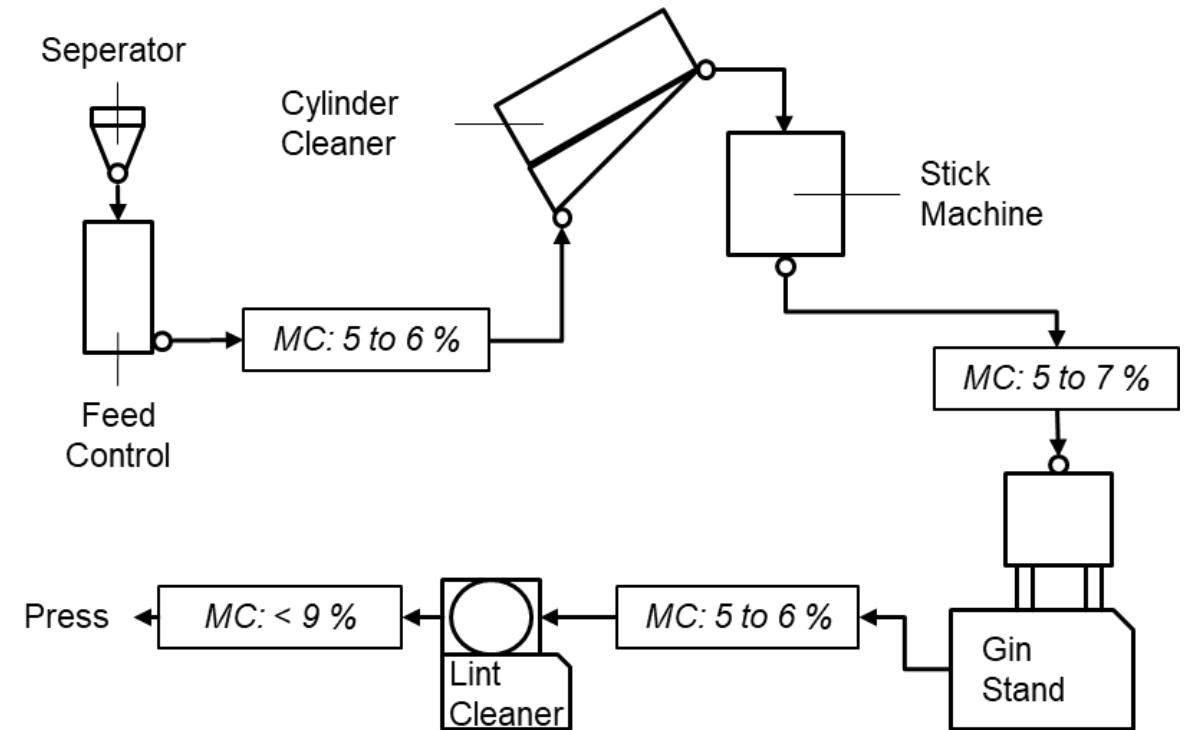


[MA94]



## Moisture Management

- Finding the right moisture content (MC) for ginning
  - Different machines need different moisture contents
  - Several different conditions in the facilities
  - Differences in the varieties
- Solutions for measurement on line
  - Infra red
  - Microwave
  - Capacitive



[MA94]

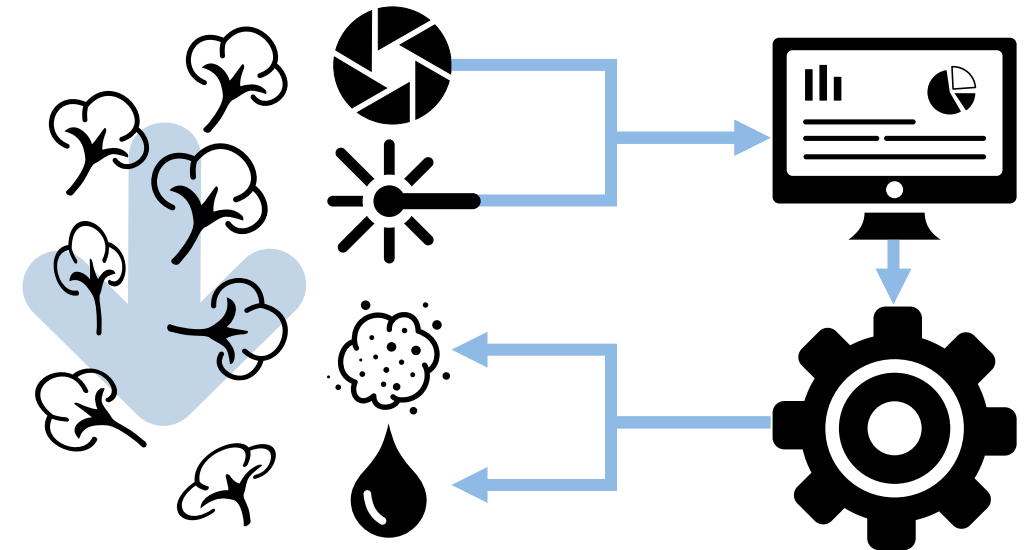
## Vision

- **Modern ginning mills** will help to **create a leadership** in cotton growing and goods manufacturing
- Improving **quality** is the key issue for this leadership
- Quality is based on excellent performance and dedication to quality work **in all steps of the value chain**
- To show the effects of this new concept a **model ginning and spinning lab** can be used:
  - Concentrating on product quality in all steps of the value chain
  - Focussed on ginning and spinning
  - Integration of new concepts in a model scale
    - Modern technologies
    - Inline measurement techniques
    - Data monitoring
  - Used as a training facility as well
  - **Focussing on ELS cotton is a good step to showcase dedication to quality**



## Technical Measures

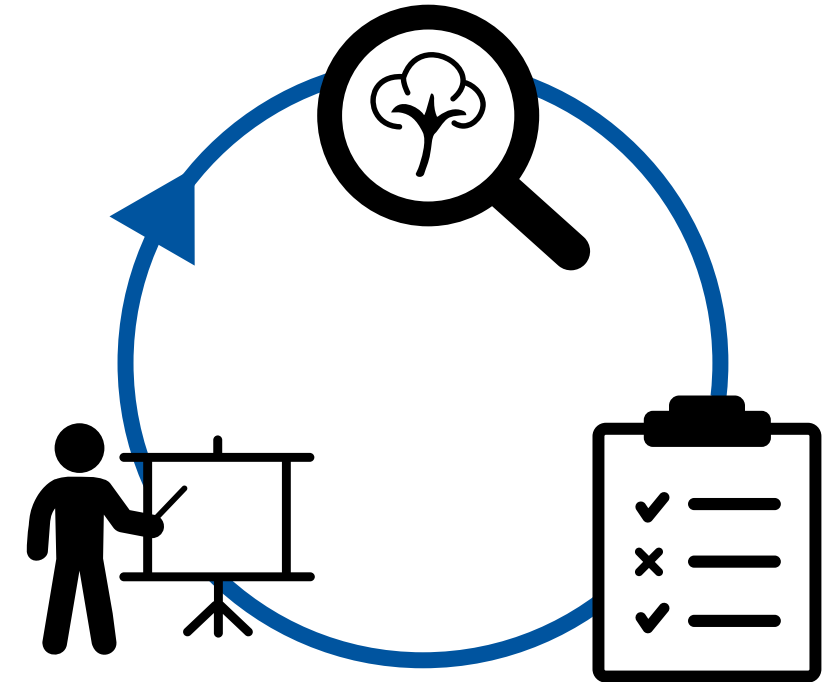
- Identify possibilities to interlink the machines
  - Sensors to monitor raw cotton and lint quality
  - Different process routes for different qualities of raw cotton
  - Find best practices
- Innovative processes to gin cotton
  - Further research in high speed roller ginning
- Increase work safety in the ginning facilities





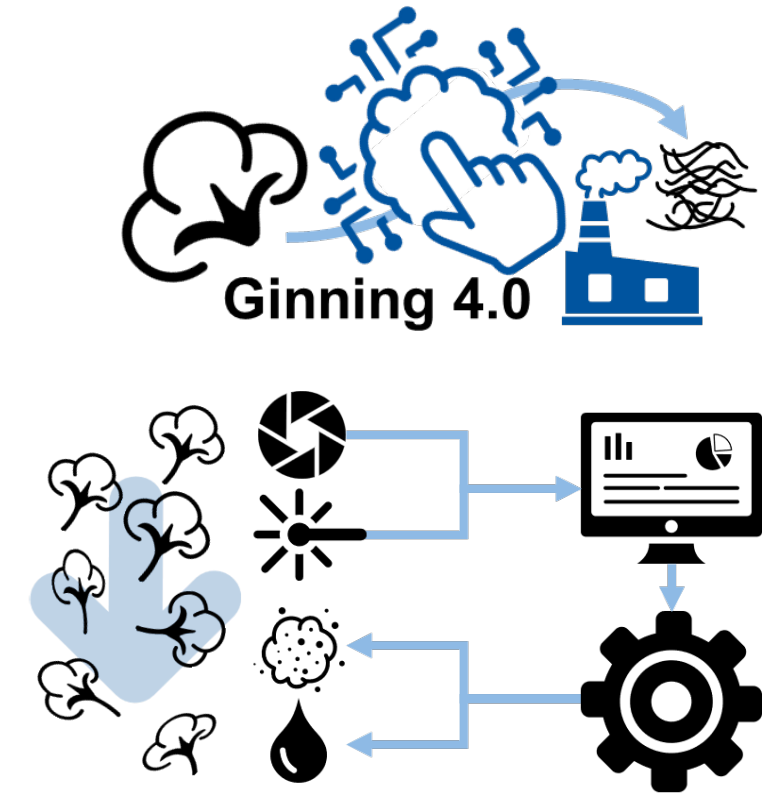
## Sociological Measures

- Examine the current conditions in the ginneries
  - In terms of process parameters and maintenance
  - Find simple measures to improve cotton quality
- Training Courses in the ginnery locations
  - Teaching the connection of product and process quality
- Introducing a fair pay system
  - Rewarding good quality
  - Adjustment of trading systems



## In-Line Ginning Management

- Possibilities to measure and control cotton parameters in the facilities
- Parameters to control:
  - Moisture content
  - Fibre quality (HVI-Values)
  - Fibre damage
- Machine parameter optimization:
  - Feed control
  - Machine settings
- Understanding correlations between process-parameters and cotton qualities
- Collection of Big-Data for cotton

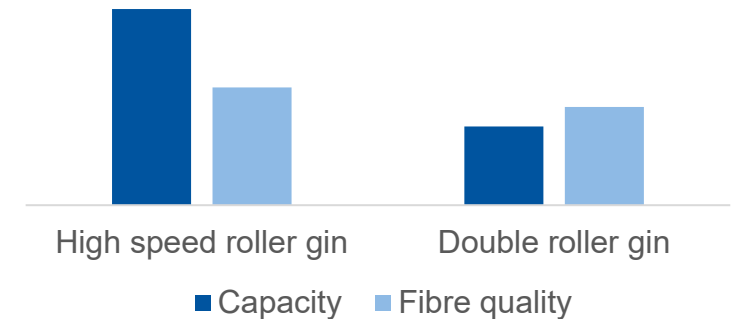


## High speed roller ginning

- Compromise between saw and roller ginning
  - Partly same or better qualities then roller ginning
  - Based on roller ginning technology knowledge
  - With cooling systems and higher pressures
- Promising process for further research and development
- Research in this field primarily driven by the two companies  
*Consolidated Cotton Gin Co, Inc*, Lubbock, USA and *Lummus AG Technology*, Savannah, USA
- Possible cooperation in development with ITA



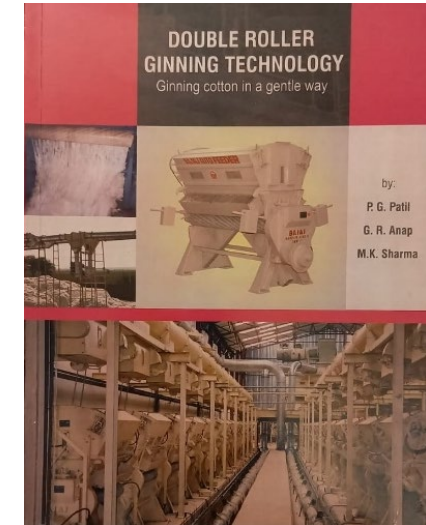
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## Information Distribution

- Using new media to bring information to the stakeholders
  - Re-launch the informative book series
  - Testing ways like videos and social media
  - Improve and expand training courses
- Finding ways to reward good cotton quality
  - Improving the global view on Indian cotton
- Teaching the interrelationships between raw material and product



# Thank you for your attention!



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## Information Distribution

[MA94] Mayfield, W. D.; Anthony, W. S. (Hg.) (1994): Cotton ginner's handbook. Rev. ed. Washington, D.C.: United States Department of Agriculture, Agricultural Research Service (Agriculture handbook (Washington), 503)

[PAS10] Patil, P. G.; Anap, G. R.; Sharma M. K. (2010): Double Roller Ginning Technology. Ginning Cotton in a gentle way. 1. Aufl. Nagpur: Bajaj Steel Industries Ltd.

[SC21] Shandong Swan Cotton Machinery; Type MY 85/86-19.4 Saw Gin  
<http://www.sdmj.com.cn/en/products.aspx?CatId=131&wb=2>

# Relevant Topics in Ginning

## Further measures of future developments

### Suggestions for Fast Improvement

- Fire Safety
- Accidental Safety
- Washer Material
- Strapping the cotton bales
- Blending of the cotton
- Improvement of Air Quality in the Ginning Mill
- Inhouse Quality Testing
- Traceability of Cotton in the Ginning Mill
- Knowledge Distribution
- Moisture-dependent Pre-sorting
- Process Step-dependent Moisture Regulation of the Cotton

### Suggestions for middle and long-term Improvements in the Future

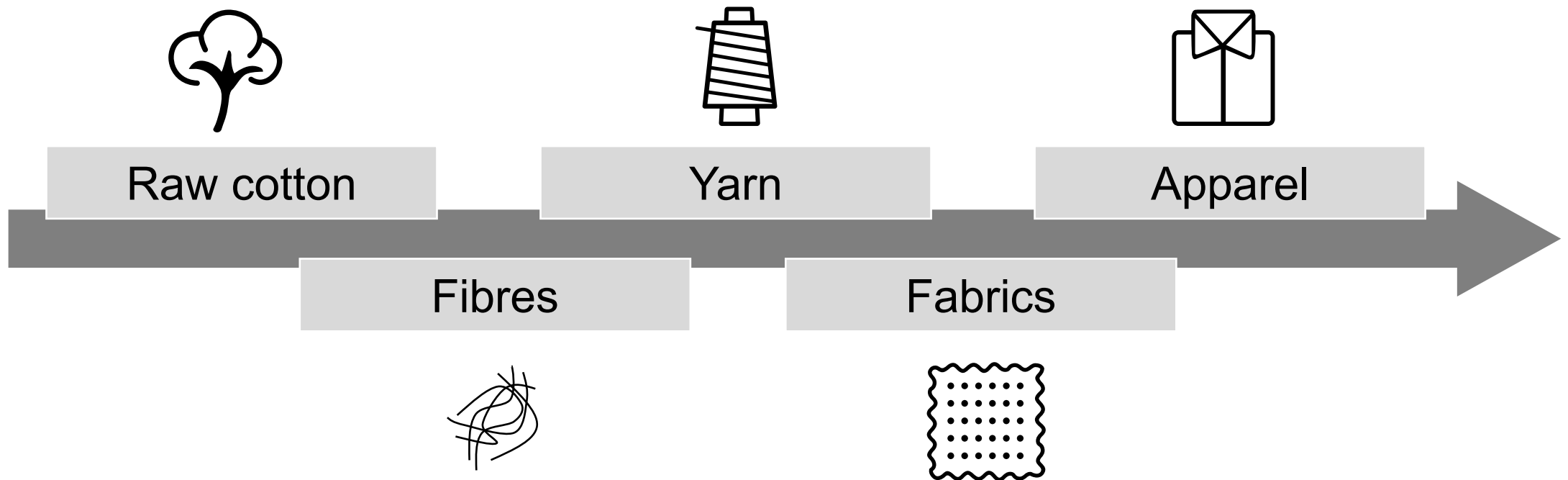
- New Ginning Mill Generation
- Design 4 Recycling
- Implementation of Industry 4.0 in Ginning Mills





## Motivation

- Highest quality influence across the whole production chain
- Basis for every processing possibilities



## Relevant Topics in Ginning



## Storage of raw cotton in the US and in India





## Storage of raw cotton in Australia



# Relevant Topics in Ginning



## Insights of an American and Indian ginning facility



# Relevant Topics in Ginning



## Feeding system of an American and Indian ginning facility

## Current situation

- Global Cotton Ginning Machinery Market is growing rapidly
- Growing demand for cotton and related products main driver for market
- Expected growth rate of 6.2% and market share of 0.5 billion US \$ by 2025



## Visions

- Ginning 4.0
  - Data mining in the facilities
  - Interlinking of the processing machines
- Exploiting the technical potential of the ginning processes
- Understanding of quality in the ginning facilities and the textile chain
  - Quality of the products
    - Raw Cotton, Lint, Yarn, Fabrics, Apparel
  - Quality of the processes
  - Correlation between process, product and maintenance

