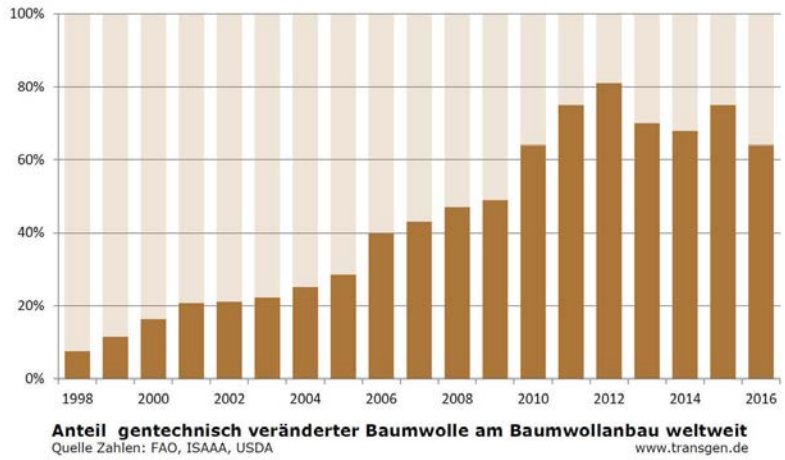
Traceability of GMO-free cotton – from the seed to the shirt

Christin Glöckner, Hohenstein Group

ABSTRACT

The global market shares of both conventionally grown cotton and organic cotton are increasing at a similar rate. In many cases, genetically modified organisms (GMOs) are also repeatedly found in cotton textiles that are labelled as organic. Reasons for this range from contaminated seeds, to cross pollination during cultivation, through to the intermingling of GMO cotton fibres during processes.
To guarantee manufacturers, fashion labels and consumers the utmost confidence in GMO-free cotton textiles, respective screenings of raw cotton, yarns and final products are necessary. Such screenings enable complete traceability along the entire textile supply chain. Until now the relevant certifications did not involve obligatory laboratory tests, only in some cases cotton seeds are sampled.
The Hohenstein Group offers manufacturers, fashion labels, certifiers and consumer protection agencies the appropriate GMO testing of both cotton and cotton end products. The molecular biological detection systems have been specifically optimised for cotton end products. Through this testing, a definitive yes/no statement can be made about the GMO-free raw cotton or cotton textiles.

FIGURE



REFERENCES

https://www.hohenstein.de/en/news/gmo_screening_for_cotton/gmo_screening_for_cotton.xhtml

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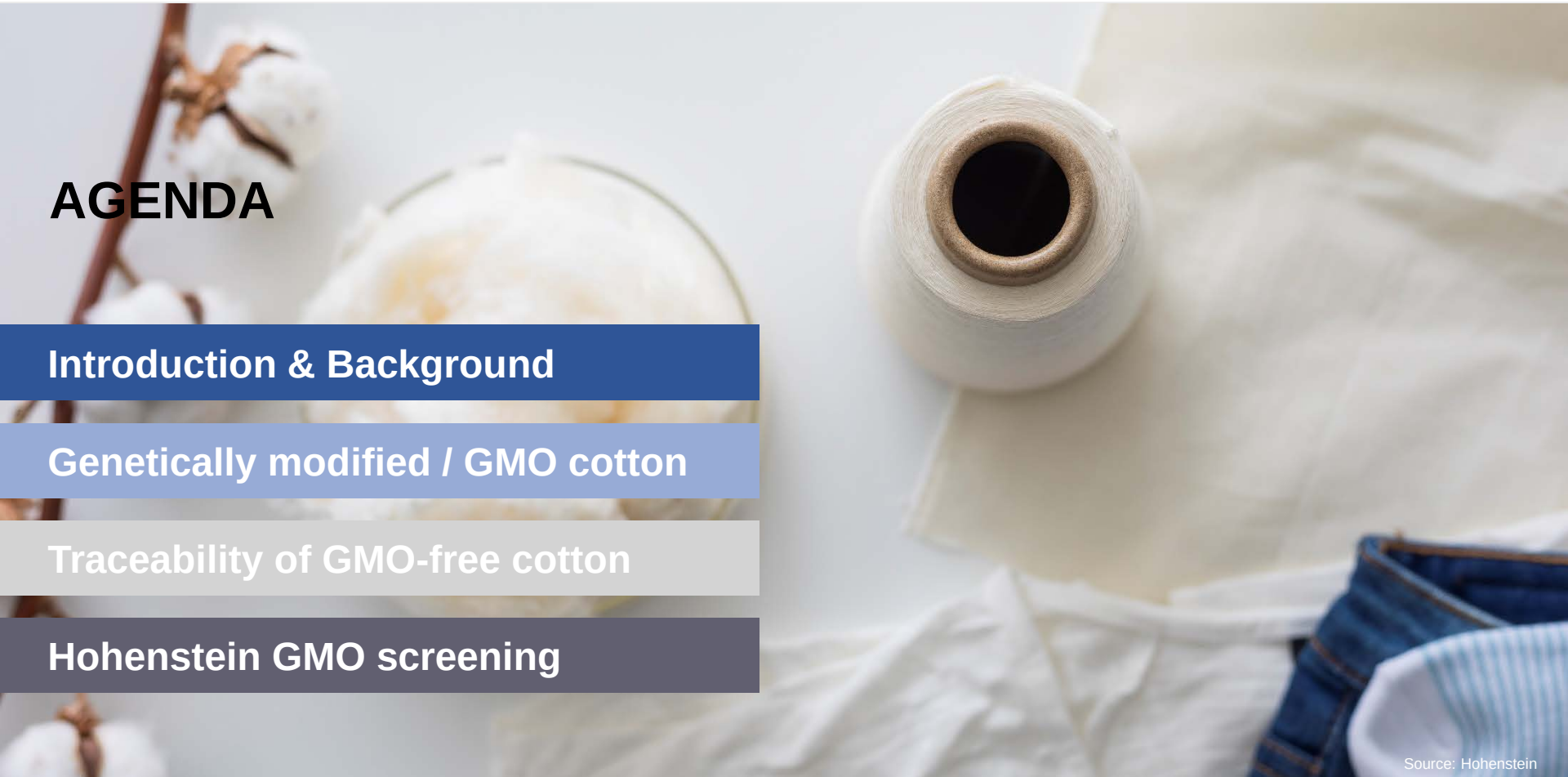
Traceability of GMO-free cotton – from the seed to the shirt

Christin Glöckner· Hohenstein Group

Source: Shutterstock

AGENDA

- Introduction & Background
- Genetically modified / GMO cotton
- Traceability of GMO-free cotton
- Hohenstein GMO screening



Source: Hohenstein

Introduction & Background

Source: Shutterstock

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Expertise from one single source

Source: Hohenstein

Independent institute for testing, certification and inspections

Non-commercial research, commissioned industrial research

Academy for further training and continuing education

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Headquarters Hohenstein

Source: Hohenstein

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Global service

Over 860 employees worldwide – about 560 employees in the German headquarter

America

- Brazil
- Colombia
- Dom. Republic
- Ecuador
- El Salvador
- Guatemala
- Honduras
- Mexico
- Peru
- USA

EMEA

- Belarus
- Bulgaria
- Ethiopia
- Hungary
- Lithuania
- Mauritius
- Morocco
- Romania
- Russia
- Tanzania
- Turkey
- UK

Asia

- Bangladesh (2x)
- Cambodia
- China (2x)
- Hong Kong
- India (4x)
- Indonesia
- Laos
- Myanmar
- Pakistan
- Sri Lanka
- Syria
- Thailand
- Uzbekistan
- Vietnam

Source: Shutterstock

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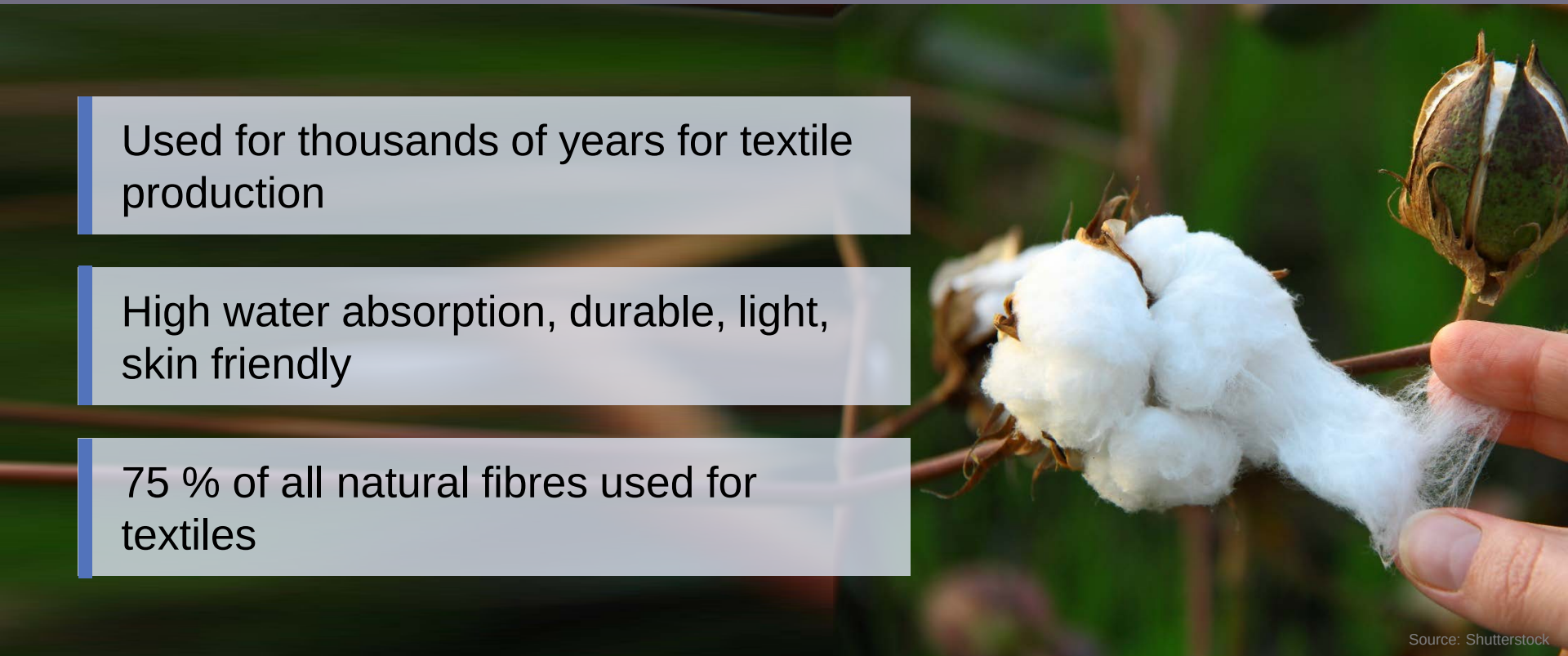
Cotton · Facts

- Used for thousands of years for textile production
- High water absorption, durable, light, skin friendly
- 75 % of all natural fibres used for textiles



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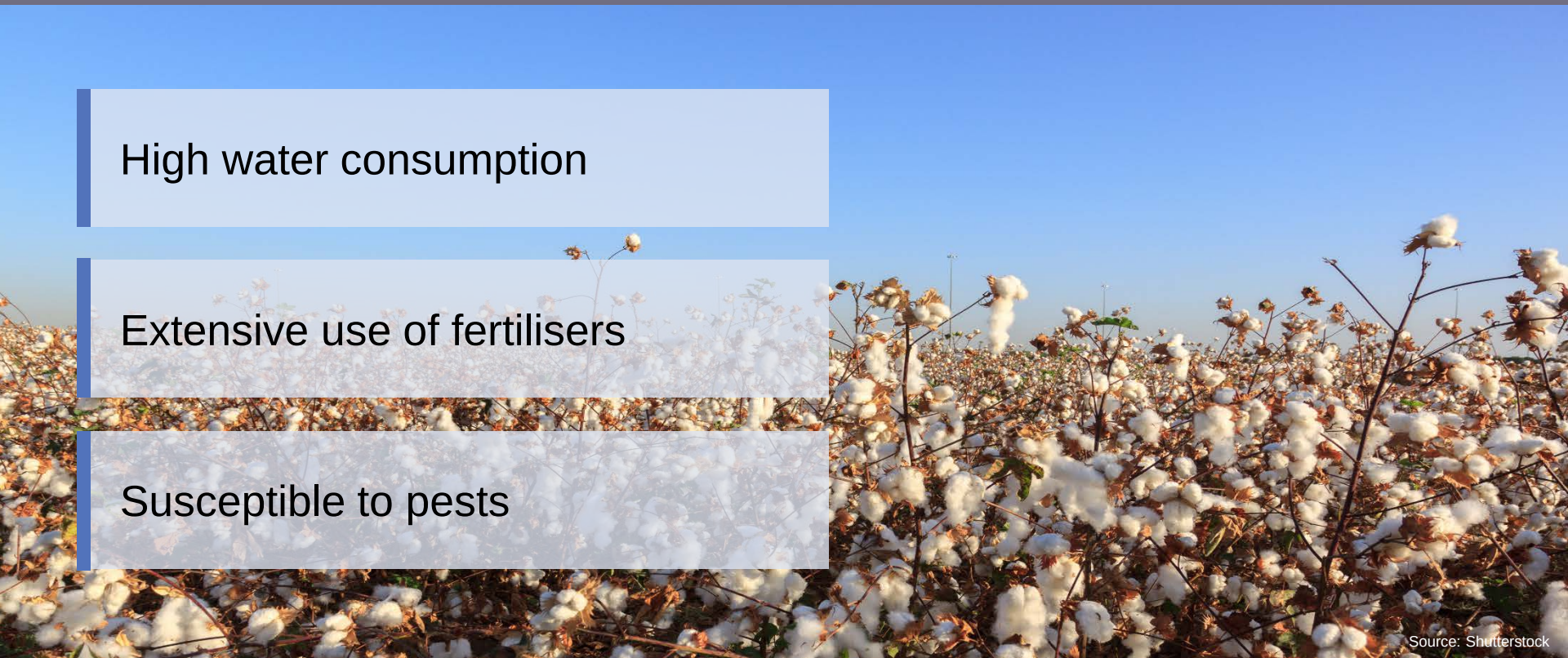
Cotton · Challenges

- High water consumption
- Extensive use of fertilisers
- Susceptible to pests



Source: Shutterstock

Genetically modified / GMO cotton

Source: Shutterstock

GMO Cotton

GMO Cotton

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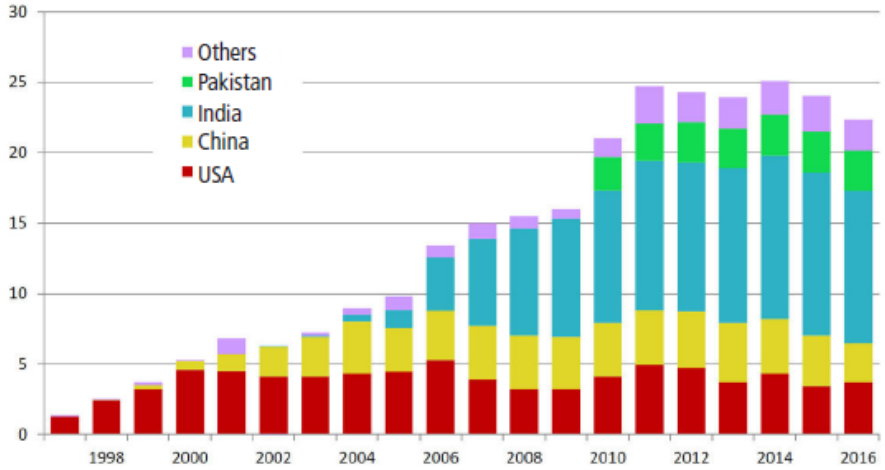
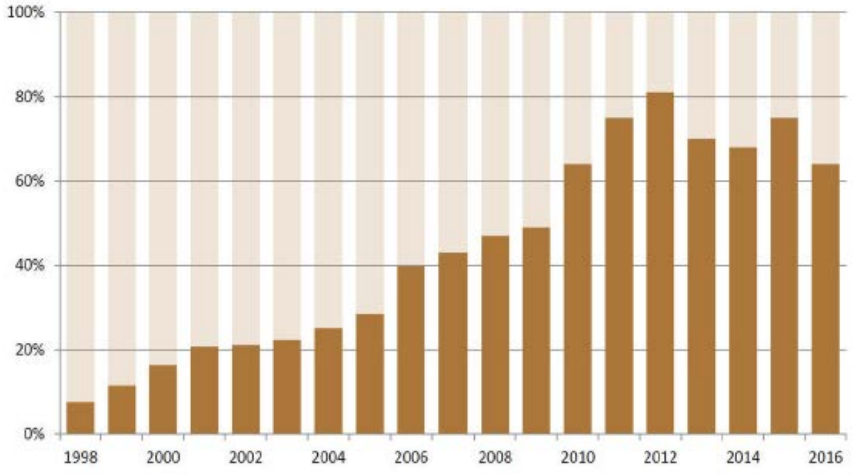
	GM-cotton in ha · 2016	GMO-proportion in % · 2016
Worldwide (since 1996)	22.300.000 (-)	64
India (since 2002)	10.800.000	96
USA (since 1997)	3.700.000 (+)	93
Pakistan (since 2010)	2.900.000	97
China (since 1997)	2.780.000 (-)	95



Cultivation areas for genetically modified cotton in million hectares
Source figures: FAO, ISAA, USDA



Proportion of genetically modified cotton on cotton farms worldwide
Source figures: FAO, ISAA, USDA

GMO cotton

GMO cotton seeds are expensive,
the plants are sterile.

The plants are resistant against the main pests, but are quickly prone to other pests.

Insects become
resistant against the Bt toxin.

Source: Shutterstock

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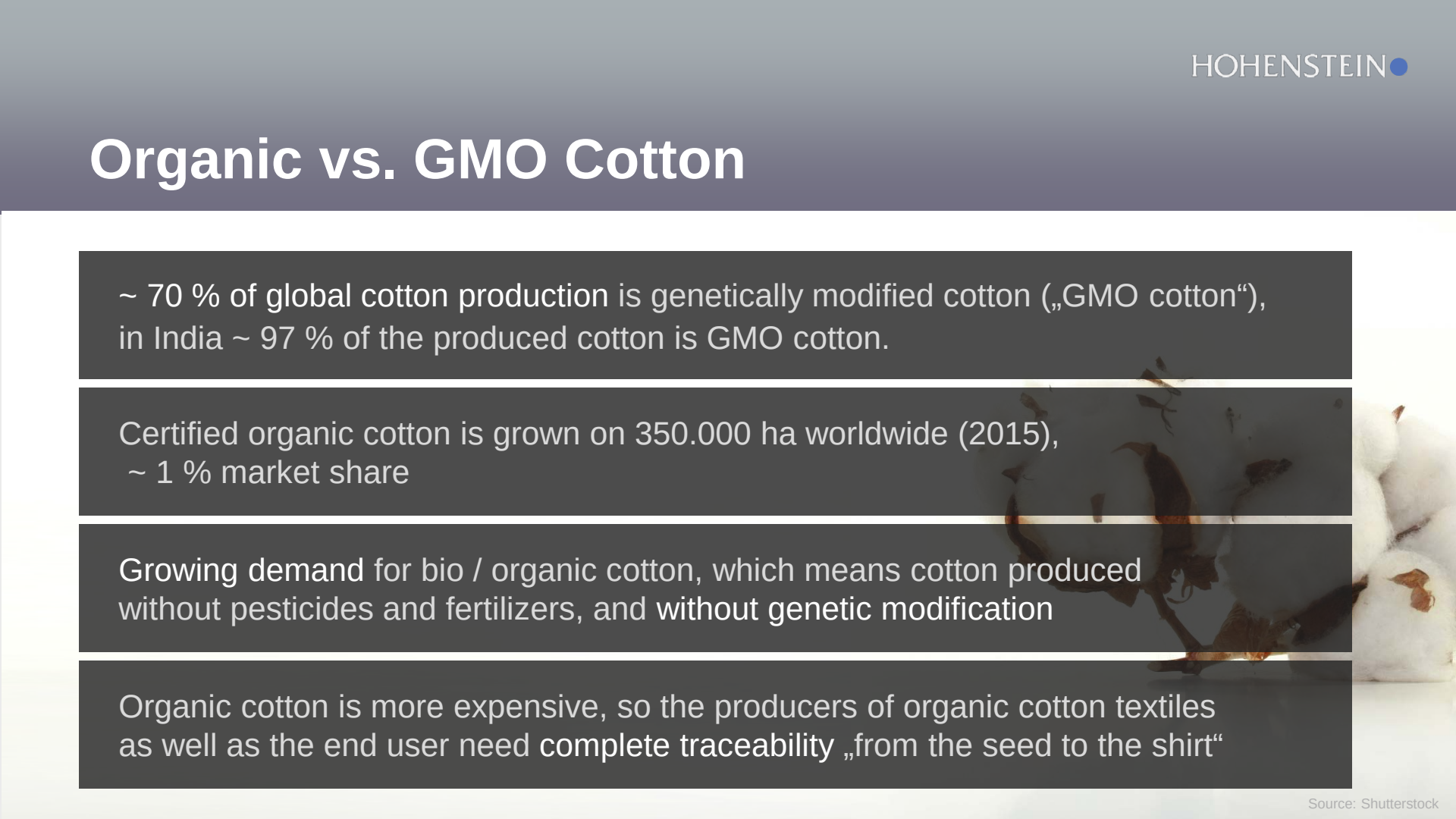
Organic vs. GMO Cotton

~ 70 % of global cotton production is genetically modified cotton („GMO cotton“), in India ~ 97 % of the produced cotton is GMO cotton.

Certified organic cotton is grown on 350.000 ha worldwide (2015), ~ 1 % market share

Growing demand for bio / organic cotton, which means cotton produced without pesticides and fertilizers, and without genetic modification

Organic cotton is more expensive, so the producers of organic cotton textiles as well as the end user need complete traceability „from the seed to the shirt“



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Traceability of GMO-free cotton
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Traceability of GMO-free cotton

- Current certification for organic cotton (e.g. GOTS) is based on paperwork, not on testing. In some cases, cotton seeds are tested on genetic modification.
- The more processing of cotton, the more difficult to extract DNA and conduct the GMO test.

Adapted from: www.b2binternational.com

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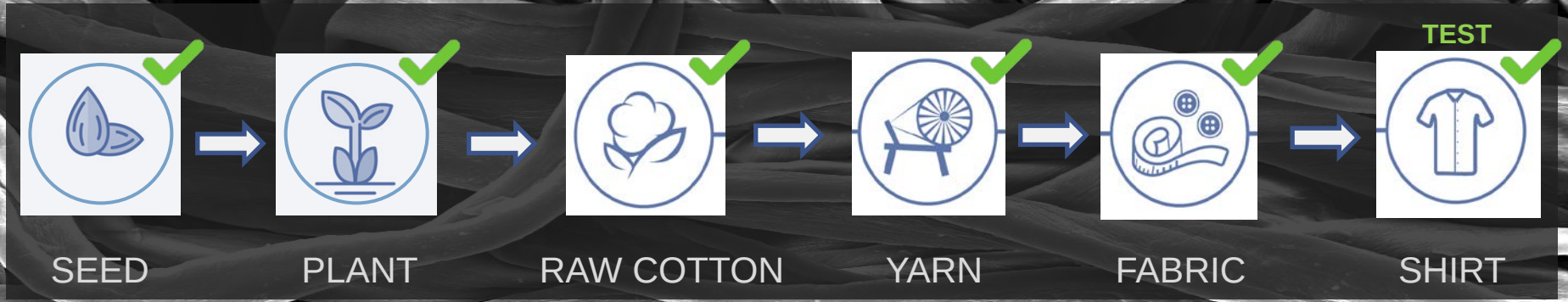
Traceability of GMO-free cotton

Sample preparation and DNA extraction optimized for testing the final product.
Intermediate products can always be tested as well.

Clear test result: GMO cotton detected – yes/no

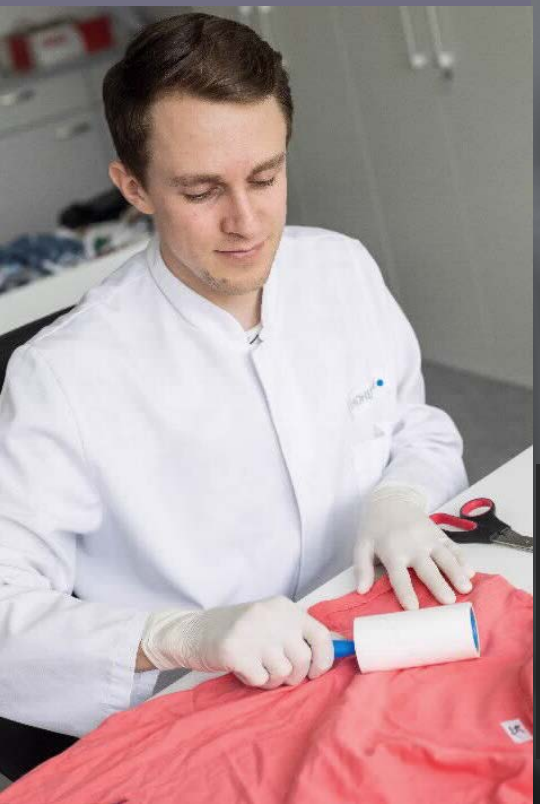


Adapted from: www.b2binternational.com

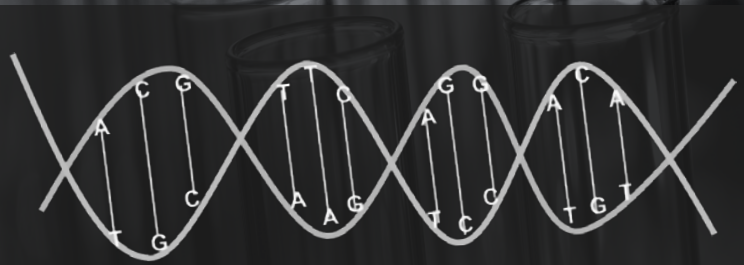
Hohenstein GMO screening

Source: Hohenstein

Hohenstein GMO screening



1. Cleaning
2. Mechanical comminution
3. Enzymatic digestion
4. DNA purification
5. **P**olymerase **C**hain **R**eaction



Source: Hohenstein; Shutterstock

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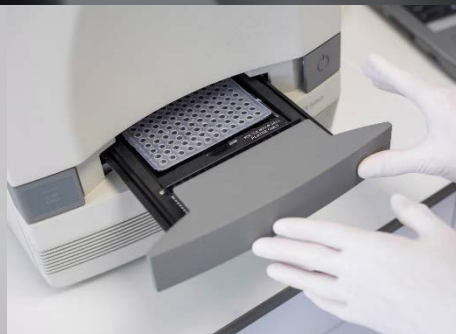
Polymerase Chain Reaction (PCR)

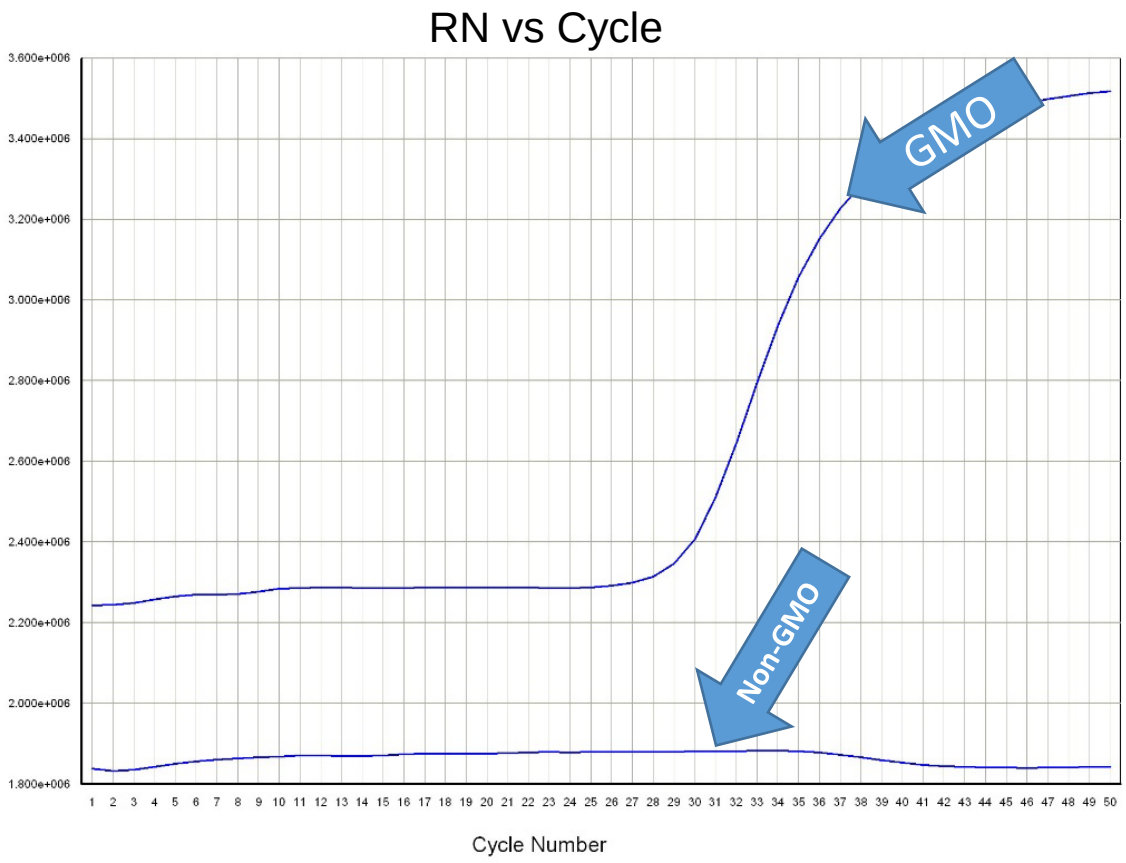
- Amplification of specific DNA target sequences
- Target sequences need to be known
- Detection limit ~0.1% GMO cotton content

Source: Hohenstein; Shutterstock



Hohenstein GMO screening



- **Internal control**
  → Does PCR work?
- **Negative control**
  → No contamination
- **Cotton**
  → DNA from plant source
- **Sample**
  → GMO or non-GMO?

Source: Hohenstein; Shutterstock

Hohenstein GMO screening

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Limitations

No quantification of GMO content

but clear yes/no result, quantification is not needed at the moment

DNA detection limit

if no DNA can be extracted, test cannot be conducted

GMO-free ≠ organic/bio cotton

detection of pesticide and fertilizer use is not included

Source: Shutterstock

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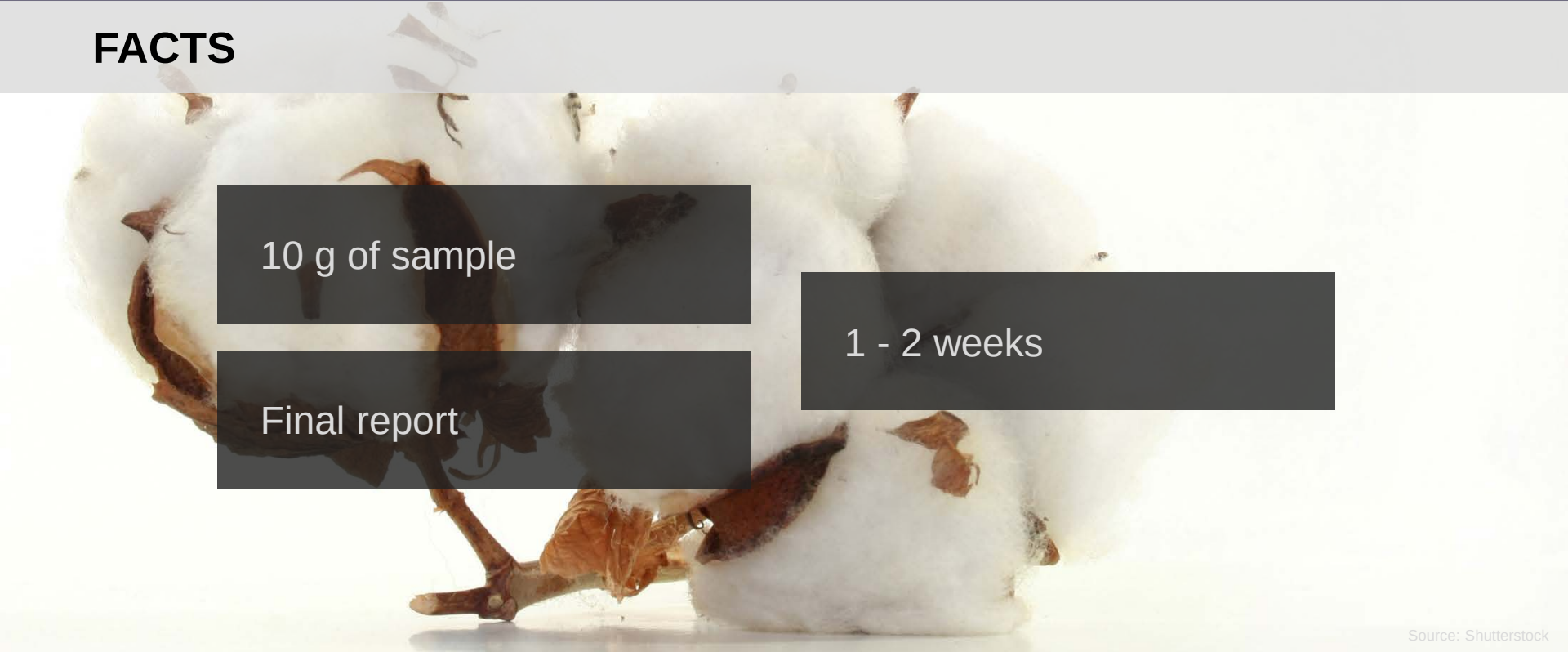
Hohenstein GMO screening

FACTS



10 g of sample

1 - 2 weeks

Final report

Source: Shutterstock

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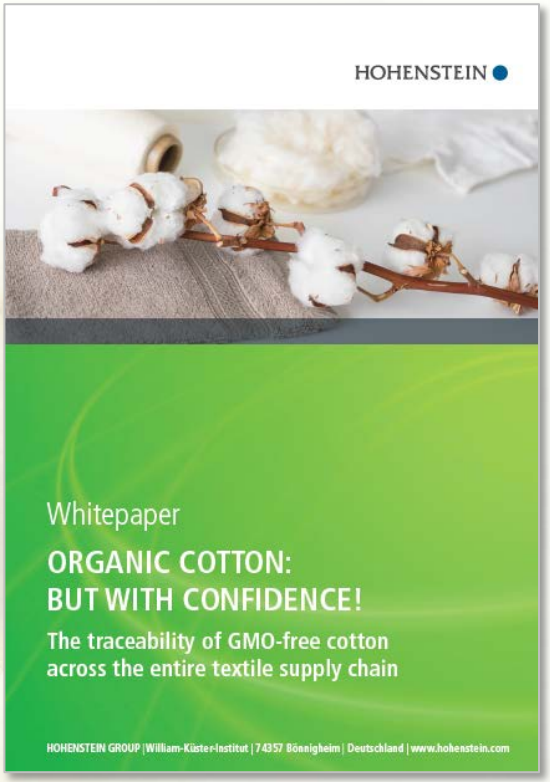
More information

Homepage
www.hohenstein.com

Contact us

Whitepaper



Source: Hohenstein; Shutterstock

Thank you for your kind attention!

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