

# Impact Report HIGH TECH COTTON



SOUTH ASIA  
BIOTECHNOLOGY  
CENTRE



**RASI**  
SEEDS



RALLIS INDIA LIMITED  
A TATA Enterprise

High-Tech R&D Station, Sirsa

[www.sabc.asia](http://www.sabc.asia)

+91 291 2729998

# Executive Summary

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North India's cotton sector is at a critical crossroads. Declining productivity, increasing production costs, groundwater depletion, climate variability, pink bollworm infestation and labour shortages are threatening the livelihoods of nearly hundred of thousands of cotton-growing families. Responding to these challenges, the South Asia Biotechnology Centre (SABC) launched the High-Tech Regenerative Cotton Initiative, a science-driven demonstration programme integrating precision agriculture, renewable energy, regenerative farming and integrated crop management.

Implemented in partnership with Rasi Seeds Pvt Ltd and Rallis India Ltd and under the technical guidance of ICAR-Central Institute for Cotton Research (CICR), the initiative demonstrates that higher productivity can be achieved with significantly lower use of water, fertilizers and pesticides while simultaneously improving profitability, soil health and climate resilience. During Kharif 2024-25 and 2025-26, the initiative directly engaged approximately 1,800 cotton farmers across 25 villages covering nearly 830 hectares (1,830 acres) and produced over 11,620 quintals of sustainably produced cotton linked to organized supply chains.



**Producing More Cotton with Less Water, Less Fertilizer and Lower Carbon Footprint**

# Why High-Tech Regenerative Cotton?

Cotton cultivation in India is increasingly challenged by:

- Climate variability including El Niño
- Declining groundwater resources
- Rising fertilizer and pesticide costs
- Labour shortages
- Pink Bollworm outbreaks
- Sucking pests infestations
- Declining profitability

Rather than relying on individual technologies, SABC developed an Integrated High-Tech Regenerative Cotton Production System. This integrated approach creates a production system that is simultaneously productive, profitable and environmentally sustainable.

25

Villages covered in Haryana, Punjab & Rajasthan

1800

Smallholder farmers trained in high-tech regenerative production techniques

1830

Acres of cotton brought under regenerative cultivation

## The High-Tech Regenerative Cotton Model

| <i>Technology Package</i>        | <i>Regenerative Agriculture</i> | <i>Precision Crop Management</i>   | <i>Ecological Pest Management</i> |
|----------------------------------|---------------------------------|------------------------------------|-----------------------------------|
| Solar powered irrigation         | Farmyard manure                 | Weekly crop monitoring             | PBKnot mating disruption          |
| Precision drip fertigation       | Soil organic carbon improvement | Plant canopy management            | Sticky traps                      |
| Scientific irrigation scheduling | Reduced chemical dependency     | Decision-based nutrient management | Threshold-based IPM               |

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# Model Adaptive Regenerative Cotton Farm



| Technology Intervention        | Kharif 2024-25                                                       | Kharif 2025-26                                                       |
|--------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| Total area (in Acre)           | 2 Acres                                                              | 7 Acres                                                              |
| Location Details               | High Tech R&D Station, SABC Regional Office, Sirsa                   | High Tech R&D Station, SABC Regional Office, Sirsa                   |
| Land preparation               | Deep ploughing; cultivator and planking                              | Deep ploughing; cultivator and planking                              |
| Previous season crop           | Wheat                                                                | Mustard and Wheat                                                    |
| Methods of sowing              | Flat bed, Raised bed, Raised with rice straw mulch,                  | Flat Bed                                                             |
| Name of Bt- hybrid             | MC 5408 BG-II                                                        | MC 5408 & DC 5417 BG-II                                              |
| Date of sowing                 | May 14, 2024                                                         | 6 May and 6 June, 2025                                               |
| Seed rate                      | 1.2 Packet/Acre                                                      | 1.2 Packet/Acre                                                      |
| Spacing                        | 4 Ft x 1.5 Ft                                                        | 4 Ft x 1.5 Ft & 4 Ft x 1 Ft                                          |
| Source of irrigation           | Canal water & ground water stored in a water tank                    | Canal water & ground water stored in a water tank                    |
| Method of irrigation           | Drip irrigation                                                      | Drip Irrigation                                                      |
| Size of drip                   | 16 mm (16-2-2-40-A)                                                  | 16 mm (16-2-2-40-A)                                                  |
| Irrigation management          | Adopt proper soil moisture management                                | Adopt proper soil moisture management                                |
| Source of power                | Solar energy                                                         | Solar energy                                                         |
| Type of nutrients              | Application of water soluble fertilizers                             | Application of water soluble fertilizers                             |
| Method of nutrient application | Fertigation & foliage application                                    | Fertigation & foliage application                                    |
| Nutrient management            | Apply 4R system (Right source, Right rate, Right place & Right time) | Apply 4R system (Right source, Right rate, Right place & Right time) |



**SOUTH ASIA BIOTECHNOLOGY CENTRE**  
एशिया-एशिया जैवप्रौद्योगिकी केंद्र

**PROJECT BANDHAN**  
A Kind of Crop Revolution

**प्रोजेक्ट बंधन**  
आपकी खेती, हमारी कृपा है हमें

**PBI**

## North India High Tech Cotton Demonstration Kharif 2024-25

| Demo Plot Sowing Details |                     | Plot 1          | Plot 2            | Plot 3                         | Plot 4                                 |
|--------------------------|---------------------|-----------------|-------------------|--------------------------------|----------------------------------------|
| Name of Hybrid :         | MC-5408 BGII Diggaz |                 |                   |                                |                                        |
| Spacing :                | 4 x 1.5 feet        |                 |                   |                                |                                        |
| Date of Sowing :         | 14 May, 2024        |                 |                   |                                |                                        |
| Plot Size :              | 2 Acre              |                 |                   |                                |                                        |
| Total Plant Population : | 13107               | Flat bed sowing | Raised bed sowing | Raised bed with straw mulching | Raised bed with plastic sheet mulching |

**Technology demonstration**

**Cropping System:** Raised bed sowing, Raised bed with straw mulching and Raised bed with plastic sheet mulching in comparison to flat bed sowing.

**Irrigation:** Drip Irrigation

**Fertilizer:** Fertigation with Fully Water Soluble Fertilizer

**Integrated:** Pests, diseases, weeds, and herbicide & hand weeding

Water Tank-1 → Solar Panel → Water Tank-2



# Impact on Resource Use

| Indicator           | Achievement  |
|---------------------|--------------|
| Farmers reached     | 1,800        |
| Villages            | 25           |
| Area covered        | 1830 acre    |
| Cotton produced     | 11,620 q     |
| Water savings       | 65-70%       |
| Nitrogen reduction  | 54%          |
| Pesticide reduction | 27%          |
| SOC increase        | 0.29 → 0.47% |



High Tech Regenerative



Conventional Farming



High Tech Regenerative



Conventional Farming



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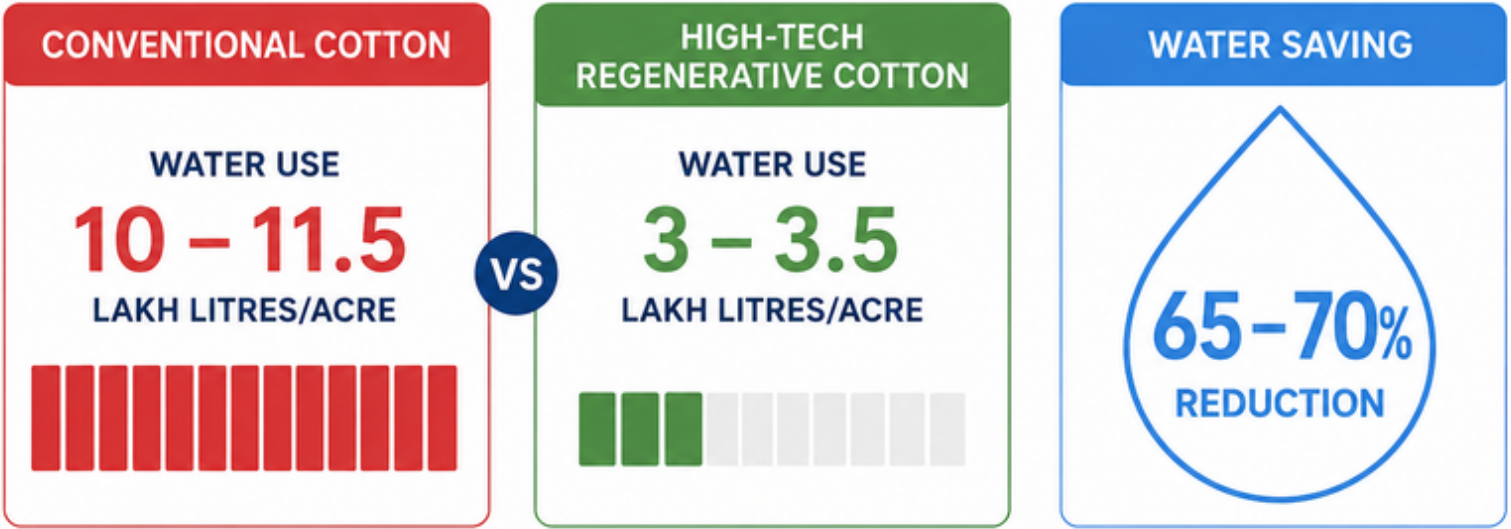
# Impact on Resource Use

## Water Conservation

One of the most remarkable achievements has been dramatic improvement in water-use efficiency

### WATER CONSERVATION

Comparing Water Use Efficiency (per acre)



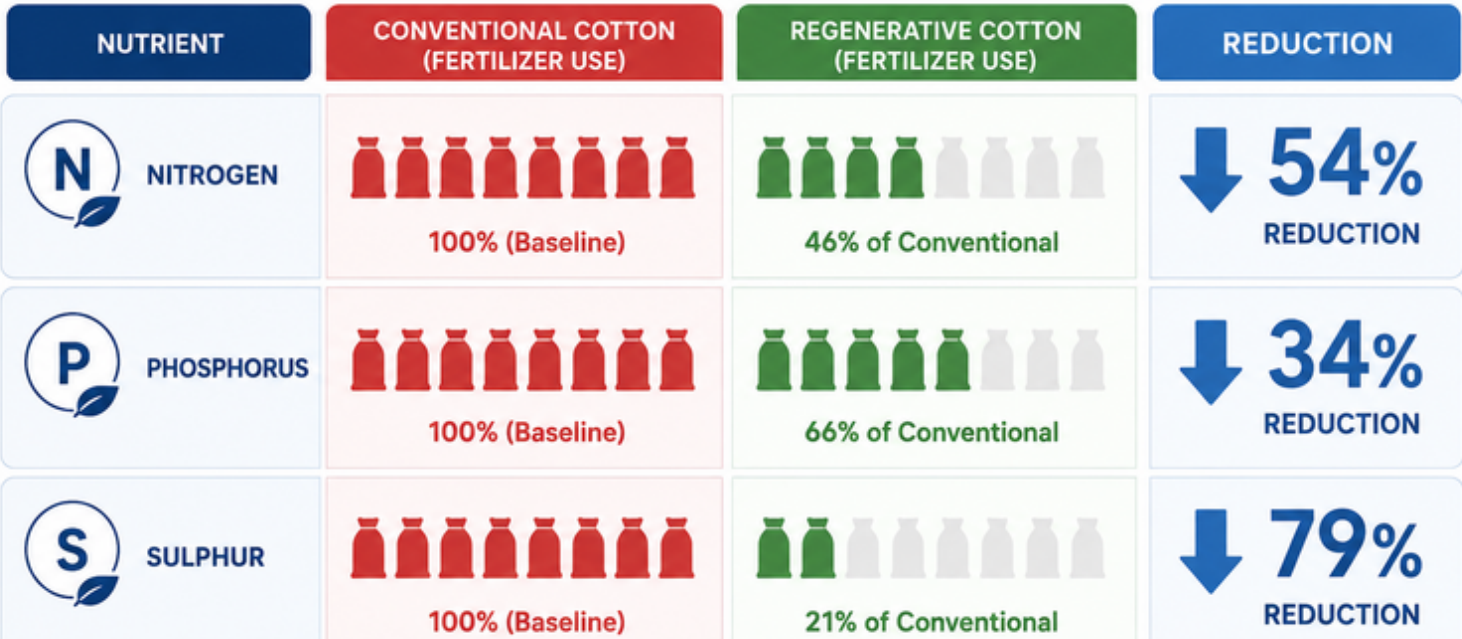
# Impact on Resource Use

## Fertilizer Reduction

Precision fertigation substantially reduced fertilizer consumption.

### FERTILIZER REDUCTION

Regenerative Cotton Compared with Conventional Cotton



# Impact on Resource Use

## Reduced Chemical Footprint

Integrated Pest Management reduced insecticide use by 27% through

- PBKnot technology
- Weekly pest surveillance
- Threshold-based spraying
- Eco-friendly chemistries

This resulted in

- lower production costs
- lower environmental contamination
- improved biodiversity

27%

Reduced Chemical  
Footprints



# Impact on Resource Use

## Restoring Soil Health

Healthy soils are the foundation of resilient agriculture.

The regenerative approach increased Soil Organic Carbon from 0.29% to 0.47% through

- Farmyard manure
- Reduced chemical inputs
- Improved biological activity

Higher SOC improves

- moisture retention
- nutrient availability
- drought resilience

0.47%  
SOC  
0.29%

# Impact on Resource Use

## Building Low-Carbon Cotton

The initiative contributes toward low-carbon cotton production through

- Solar-powered irrigation
- Reduced fertilizer use & Lower pesticide use
- Reduced pumping energy
- Improved nutrient efficiency

Together these interventions establish a practical pathway toward carbon-smart cotton farming.

## Impact on Resource Use

### Market Linkages

Approximately 11,620 quintals of sustainably produced seed cotton entered organized supply chains through partnerships with

- Cotton Corporation of India
- Haryana Ginners Association
- Rajasthan Cotton Ginners Association
- Textile industry stakeholders

demonstrating that sustainability and commercial viability can coexist.



# The Road Ahead

SABC proposes to expand this initiative through:

- Multi-state climate-smart cotton demonstrations & HDPS validation
- Digital advisory platforms & Carbon accounting frameworks
- Farmer Producer Organisation partnerships
- Responsible sourcing systems & Textile industry collaboration
- National technology validation under the Mission on Cotton Productivity



## Acknowledgements

The High-Tech Regenerative Cotton Initiative has been made possible through the collective efforts of progressive farmers, PI Foundation, Rasi Seeds, Rallis., ICAR-Central Institute for Cotton Research, Krishi Vigyan Kendras, state agricultural universities, FPOs, industry partners and the dedicated field team of the South Asia Biotechnology Centre

