



Sowing the Seed of Change

An approach for Social Sustainability and an Integrated Way Forward

Amritbir Riar amritbir.riar@fibl.org

2nd symposium on Participatory Research to Foster Innovation in Agriculture

Zurich, 28 August 2019

Why we need to invest in organic cotton breeding in India?

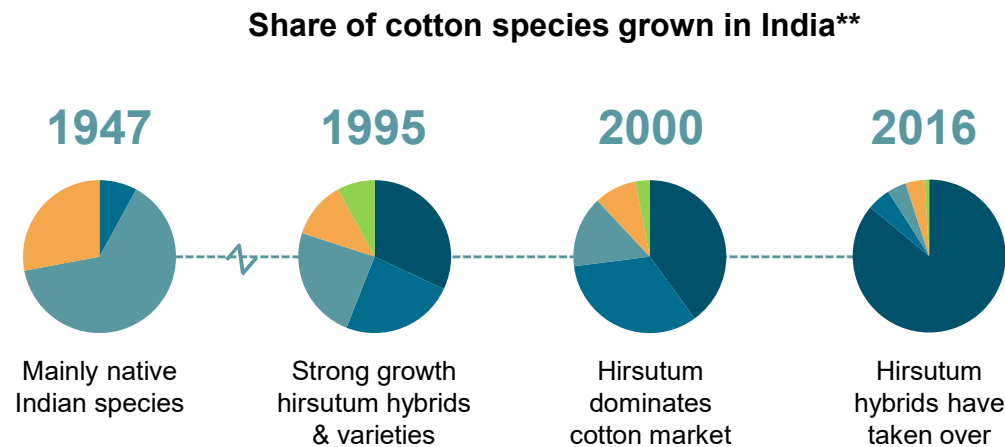
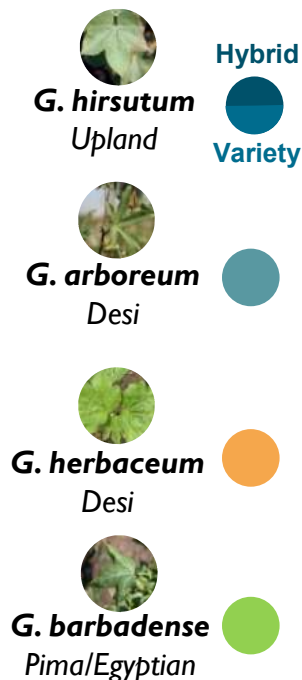


The GM has radically changed the cotton species grown in India, affecting the organic (non-GM) seed market

- India is leading global organic cotton producer (>50% of global production)
- Certified organic cotton only accounts for 1-2% of Indian production; GM cotton > 95%

Historic development of cotton species in India

Cotton species Legend



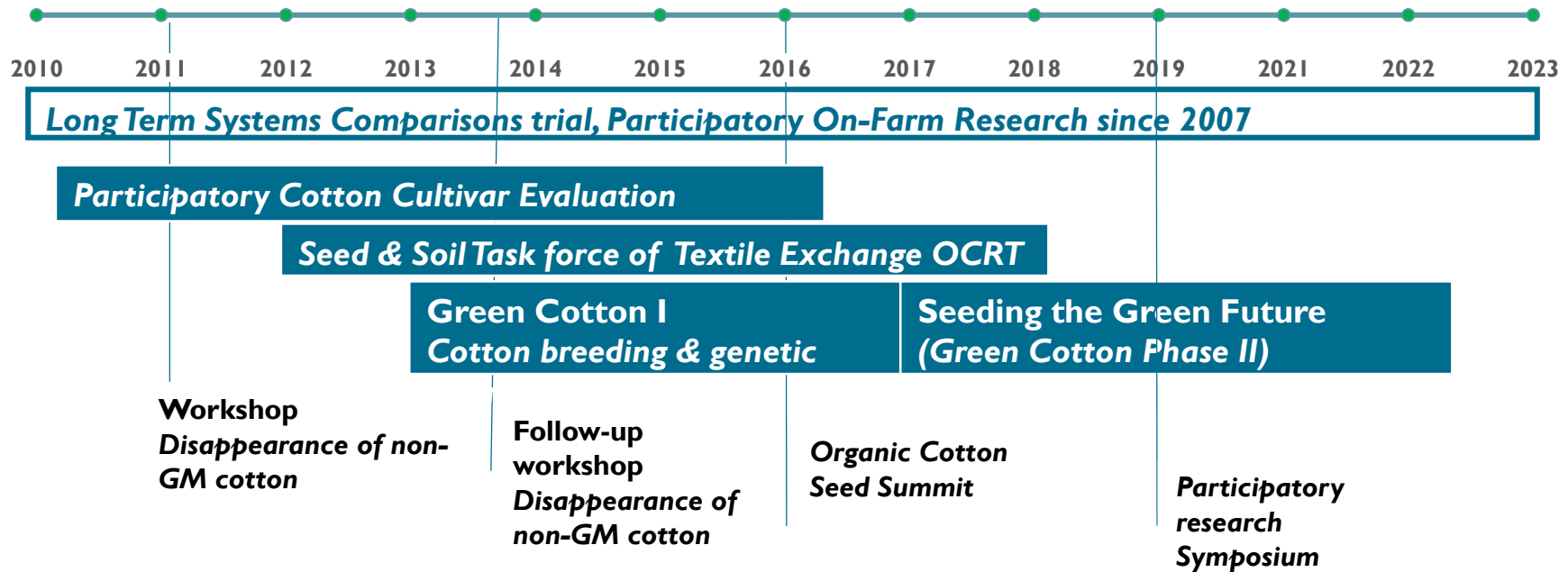
www.fibl.org

05 October 2020

3

***) Prof. Dr. R. W. Bharud, Agricultural University Rahuri, MA All Indian Cotton Improvement Project

FiBL's involvement in organic cotton seed breeding in India



To improve accessibility and availability of high-quality seeds and integrity throughout the chain

Objectives of 'Seeding the Green Future'



Secure non-GM organic seed supply for organic cotton farmers



Develop a broad portfolio of new cotton cultivars of American and traditional Desi cotton species with

- Improved agronomic performance
- High fiber quality (>28mm)
- Adapted to the various local organic growing conditions
- High resilience towards climate change
- High adoption rate by farmers



Improve integrity of organic cotton textile at the source by capacity building and close collaboration of actors among the supply chain



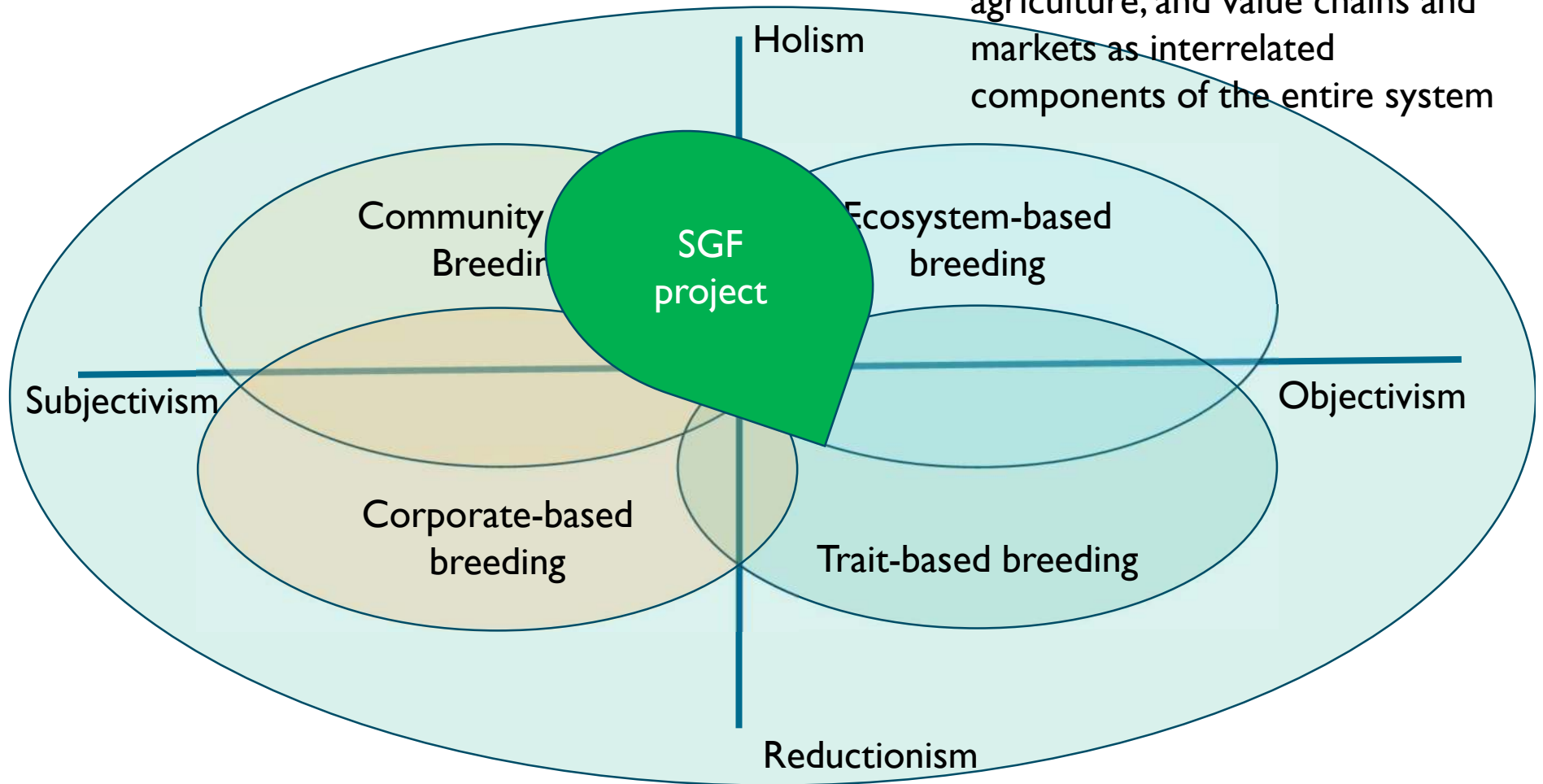
Contribute to improving farmer livelihoods and rural development

Why Participatory Cotton Breeding?



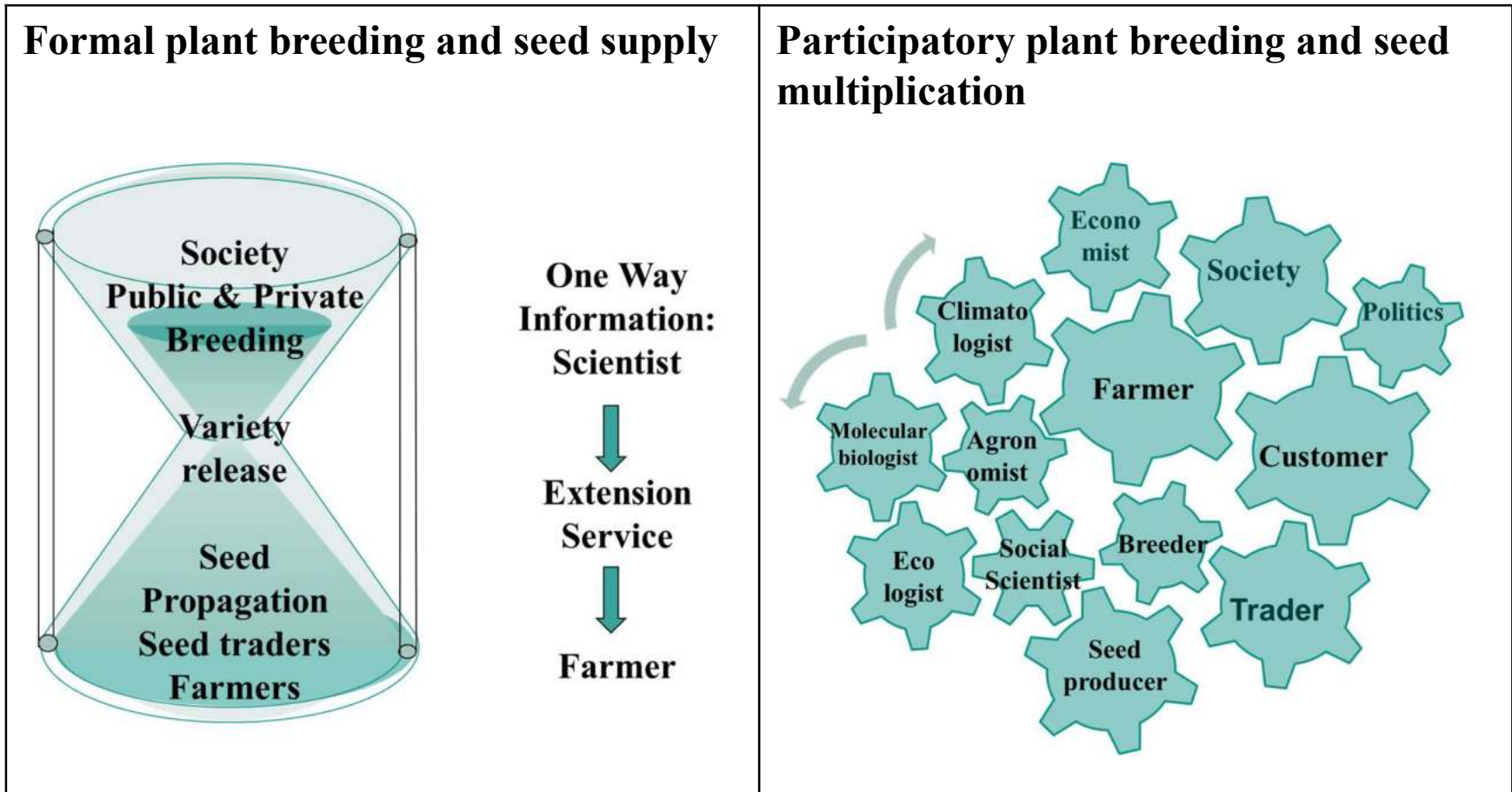
Systems-based breeding concept

Systems-based breeding including civil society, policy, nature, agriculture, and value chains and markets as interrelated components of the entire system

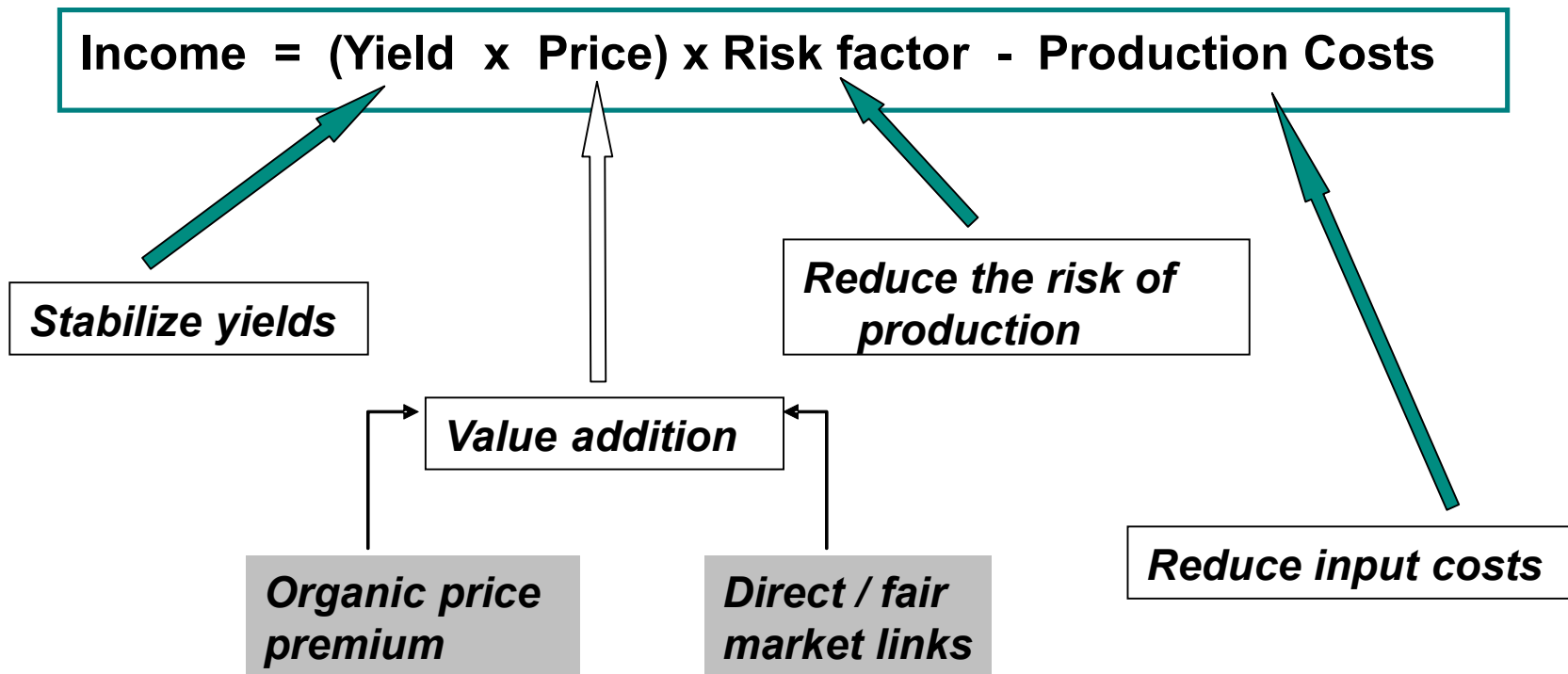


Lammerts van Bueren, E.T., P.C. Struik, N. van Eekeren and E. Nuijten. 2018. Towards resilience through systems-based plant breeding. A review. *Agronomy for Sustainable Development* 38: 42.

Participatory Breeding: as a viable Alternative to Seed Monopoly



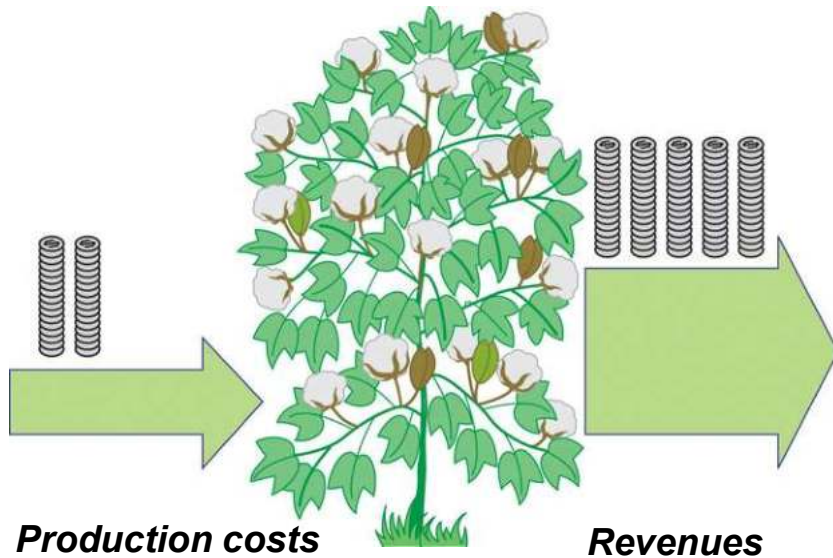
Participatory breeding: Three level interventions



Strategies in organic cotton farming

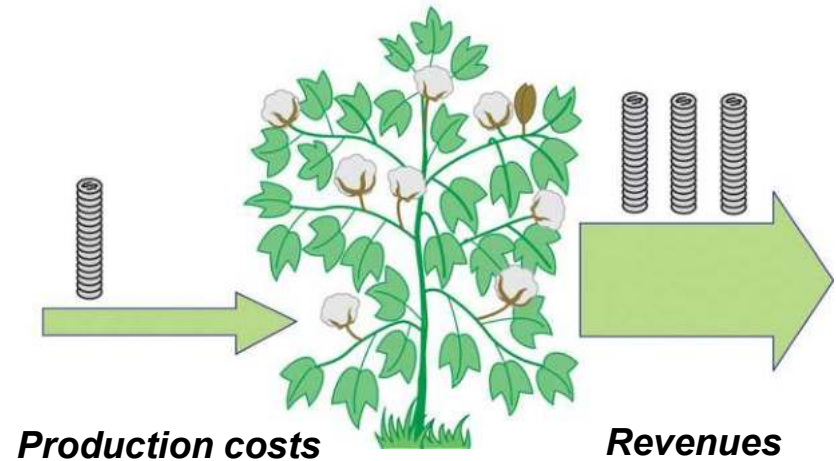
Strategy I: Intensive organic

- High yields, but relatively high production costs
- High loss in case crop fails



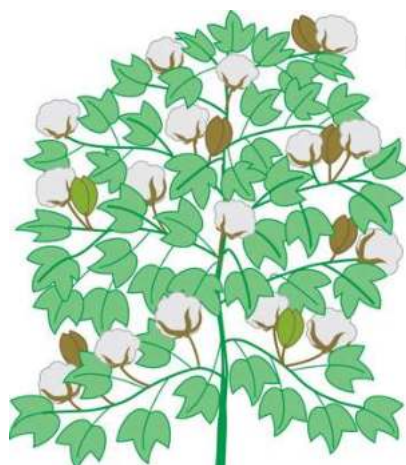
Strategy II: Low input, low risk

- Smaller yields, but also lower production costs, thus still good income
- Lower loss in case crop fails



Selecting the right cotton species and cultivar types

American Upland cotton (*G. hirsutum*)



larger leaves

FI hybrids

Advantages:

- High yields
- Longer staple (higher price)

Disadvantages:

- Needs more water
- Needs more manure
- More prone to pests

Suitable for:

- Deep soils
- Heavy soils
- Good irrigation

Indian 'desi' (traditional) cotton (*G. arboreum*, *G. herbaceum*)

Varities

Advantages:

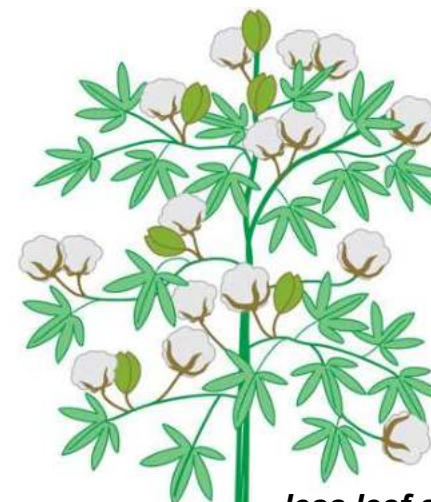
- Better drought resistance
- More pest tolerant

Disadvantages:

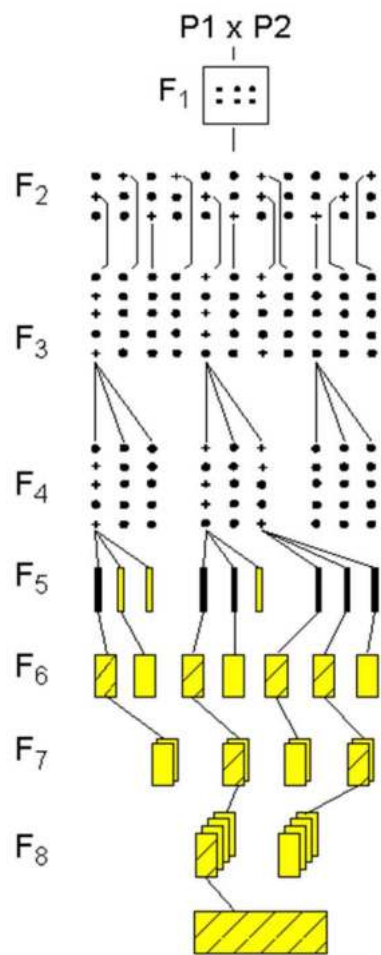
- Smaller yields
- Mostly shorter staple (lower price)

Suitable for:

- Shallow soils
- Sandy soils
- Little/no irrigation



less leaf area



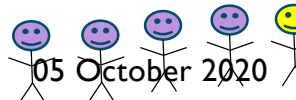
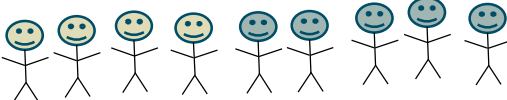
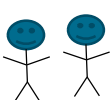
Breeding material from different breeders or seed companies

Start participatory breeding at two cotton growers organisation: Selection of early and advanced generation

On-station & On-farm baby trials of best lines

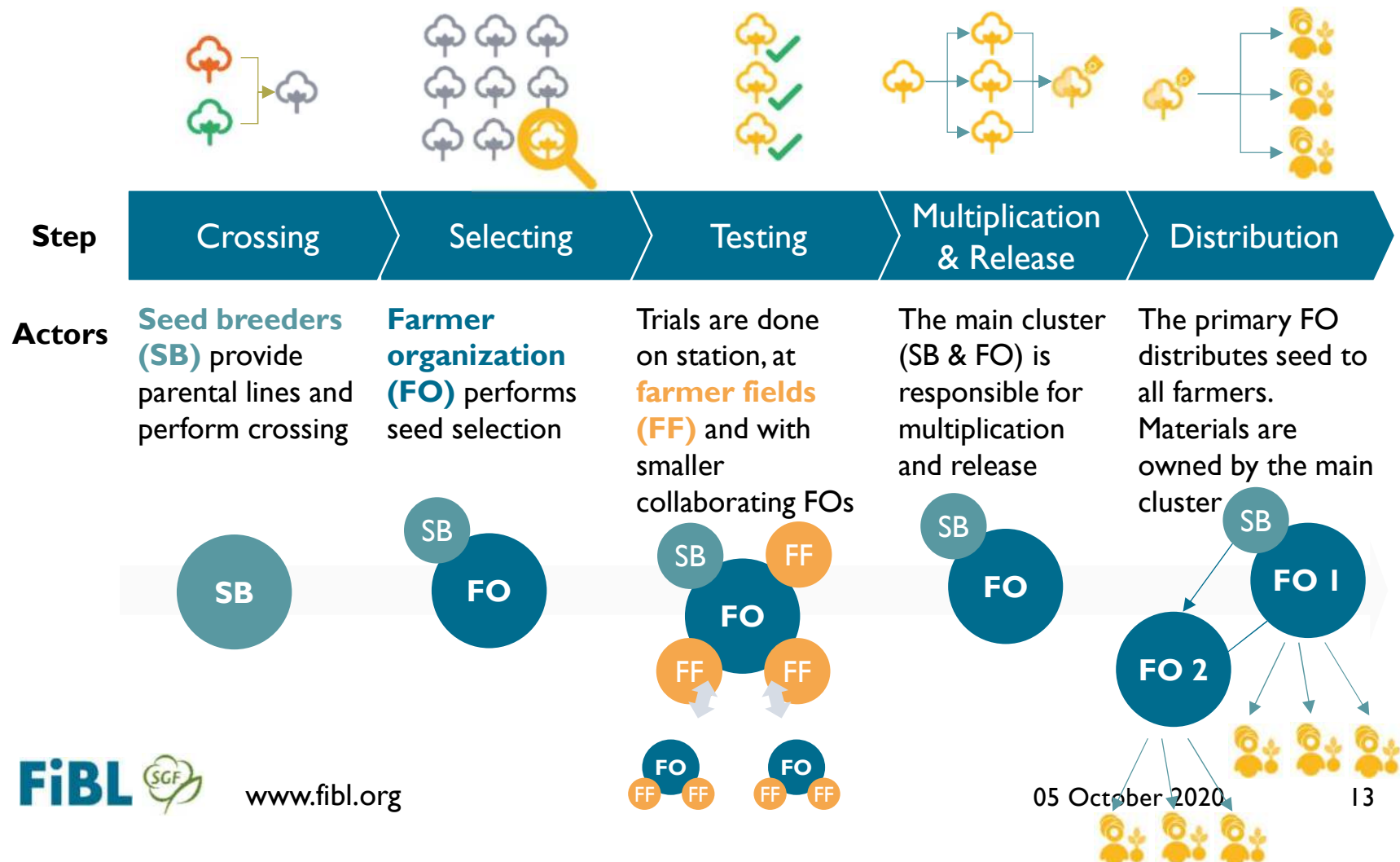
MLT in different pedoclimatic regions

Two seed producer provide organic non-GM cotton seed for ALL organic farmers

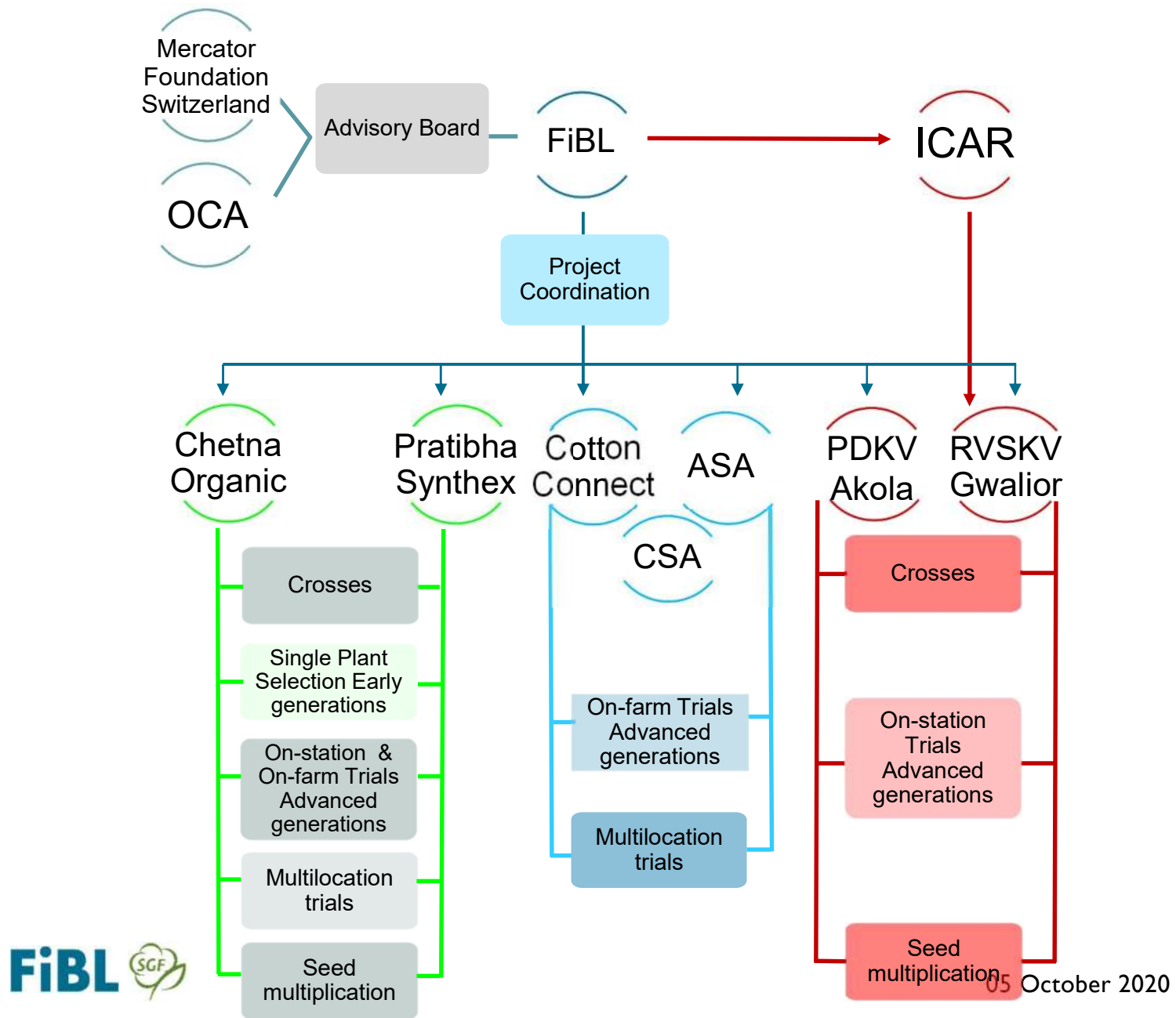


...demanding seed breeders, farmer organizations farmers and value chain to work closely together

Simplified overview of actors involved (cluster approach)



SGF Project Governance

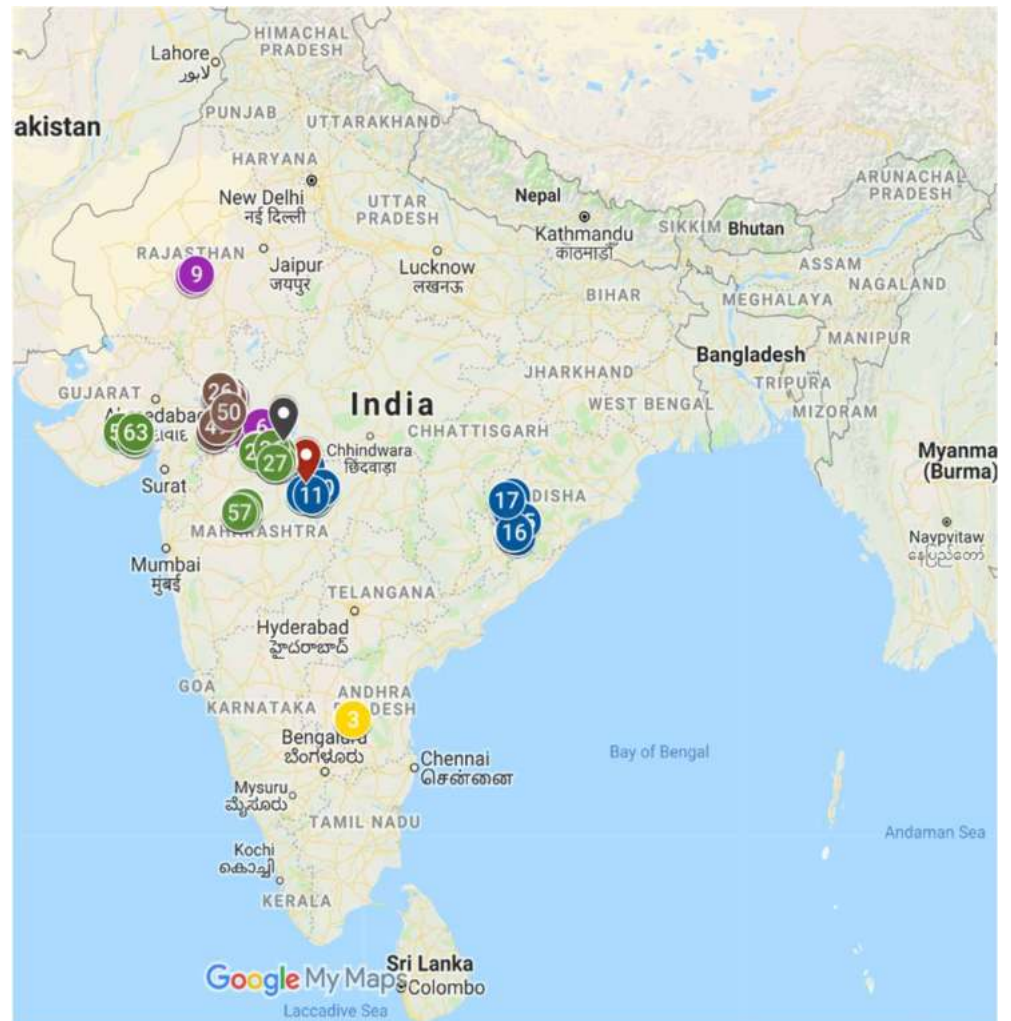


**What has been
achieved and what
is still going-on?**

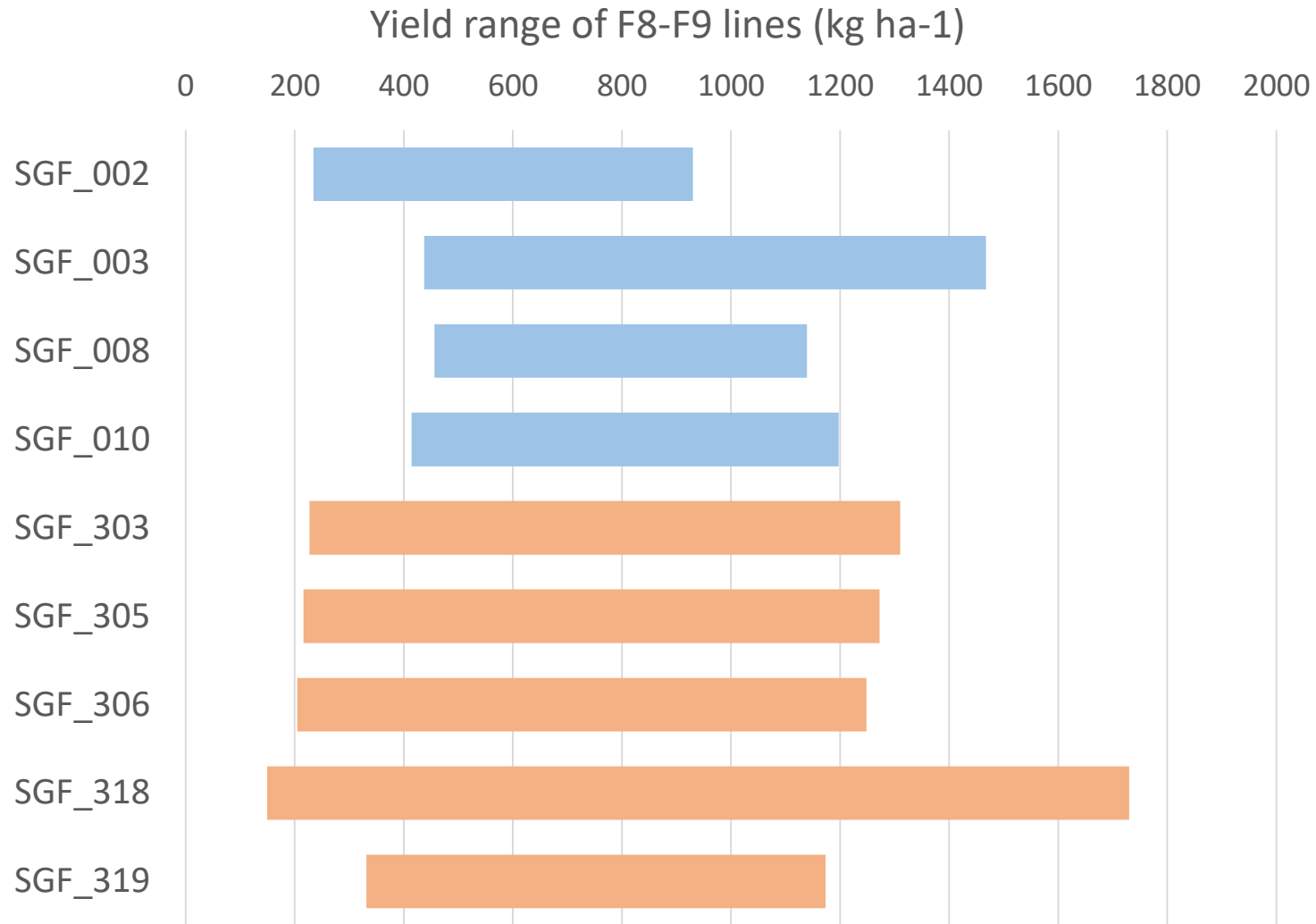


SGF Trial Sites (2018-19) 150 trials

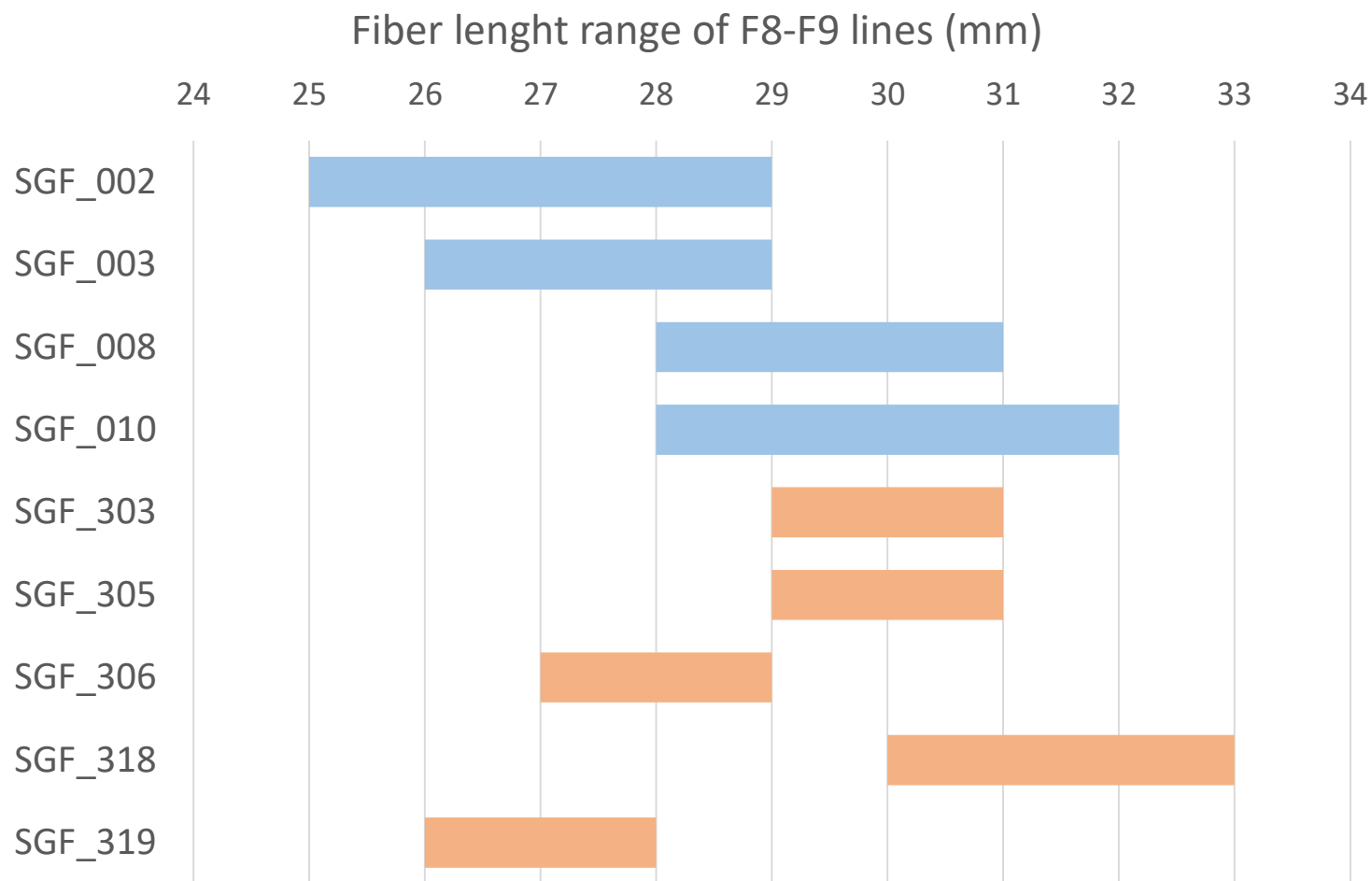
- 1 Madhya Pradesh
- 2 Maharashtra
- 3 Rajasthan
- 4 Odisha
- 5 Gujarat
- 6 Andhra Pradesh



Upcoming open-pollinated varieties



Upcoming open-pollinated varieties



Slide 18

RA1 make box plots and one for commercial hybrids

Amritbir Riar, 23-08-2019

RA2 mark 28 mm line

Amritbir Riar, 23-08-2019

Where we are heading to and why?



Bollworm: how much we can control by genetics?

- 68 different hybrid and varietal lines of *Gossypium hirsutum* and varietal lines of *G. arboreum*
- Bollworm can damage up to 65% of bolls under irrigated and highly fertile conditions.
- Damage from bollworms range from 13 -91%
- *G. hirsutum* varietal lines were more susceptible than *G. hirsutum* hybrids and traditional *G. arboreum* varietal lines.



Priorities for coming years

Breeding and optimized agronomy for:

- Improved agronomic performance
- Adapted to the various local organic growing conditions
- High resilience towards climate change

Combining participatory breeding with novel breeding tools




- Application of Novel breeding tools (Marker assisted selection)
- Trials to improve crop management and plant protection (NUE + WUE)

Factors for successful upscaling

- Infrastructure (Green/Glass houses, Seed storage facilities etc.)
- Capacity development for breeding and Secure Seed Multiplication (Guidelines & Organizations)

'Seeding the Green Future' has ambitious goals of scaling its output and impact, given that partners and funding increase

Roadmap to scale – the ambitions

	Phase I: 2017-2018	Phase II: 2018-2022	Phase III: 2022-2026
 Clusters & FOs	2 clusters 5 FOs	5 clusters 20 FOs	10 clusters 40 FOs
 Regions	Central India	Central and Southern India	Central, Southern and Northern India
 New cotton lines		10	30



Success factors to scale:

- Successful fundraising from donors, foundations, industry

FiBL



Supporters

FiBL

www.fibl.org

**STIFTUNG
MERCATOR
SCHWEIZ**

