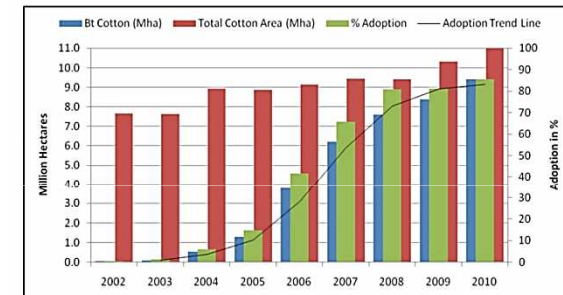




Figure 1. Adoption of Single and Multiple Gene Bt Cotton Hybrids from 2002 to 2010



Source: Compiled by ISAAA, 2010

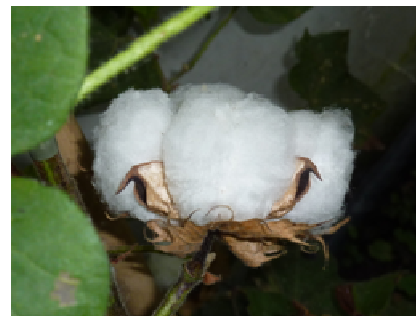
Influence of the Fast Spread of Bt Cotton on Organic Cotton Production

Examples from India and Burkina Faso

Matthias Klaiss, Monika Messmer, Dionys Forster, Rajeev Verma, Rajeev Baruah, Vivek Rawal, Lokendra Singh Mandloi, Yogendra Shrivastava

Content

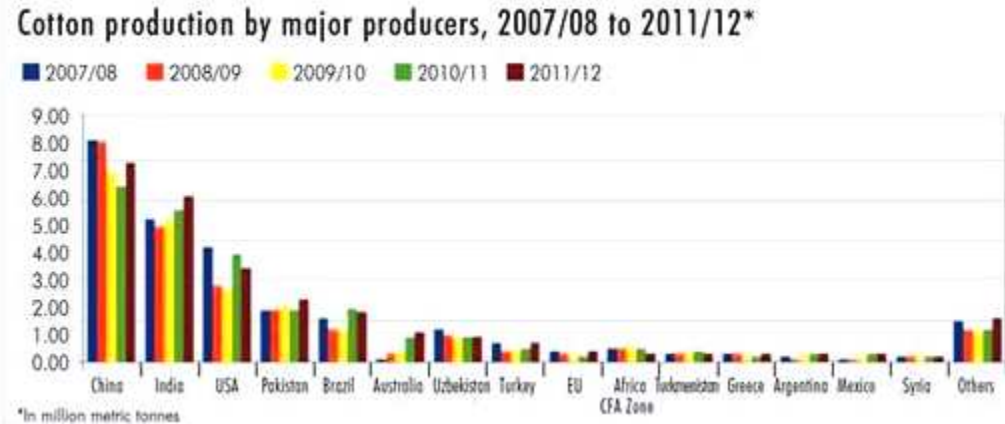
- Introduction
- Contamination
- The Indian Example
- Burkina Faso
- Summary
- Outlook



http://upload.wikimedia.org/wikipedia/commons/7/7e/Gossypium_barbadense_-_K%C3%BChler%E2%80%93Medizinal-Pflanzen-088.jpg

Cotton

- **Worldwide > 20 mio. cotton producers**
- **> 70 countries, 2.5 % of arable land, 35.77 mio ha**

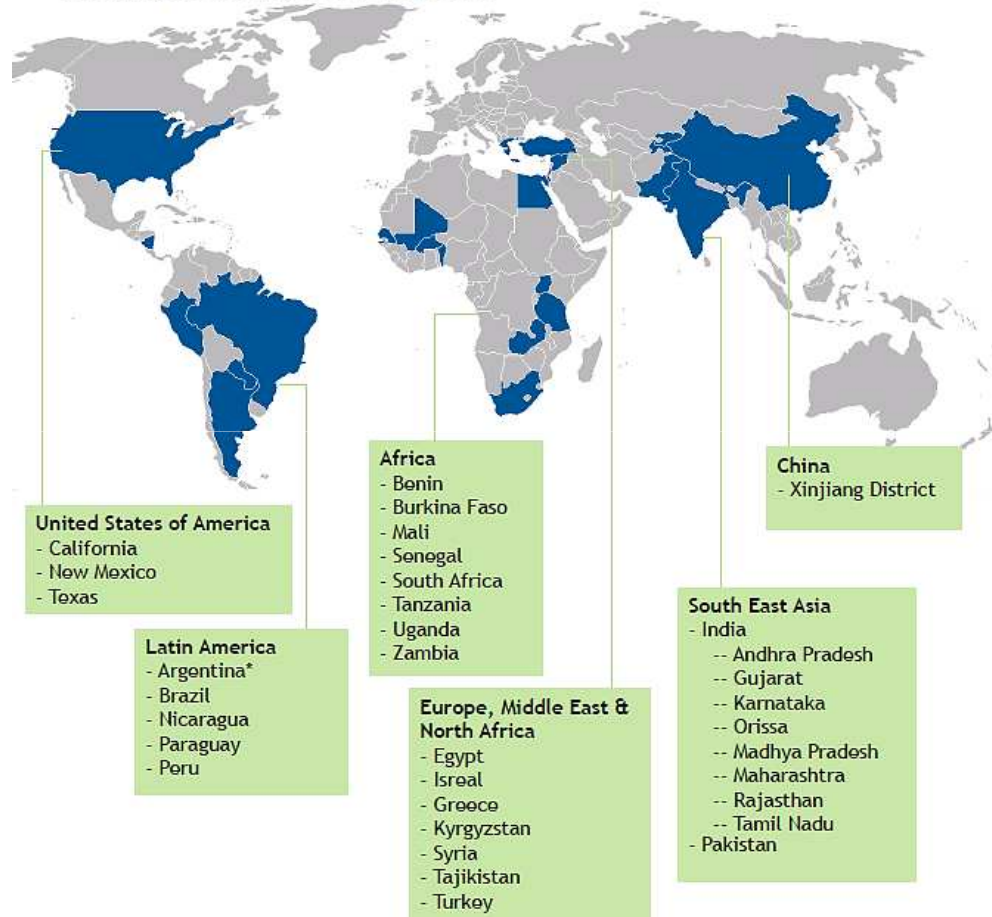


<http://project.mclglobal.net/?id=cottonguide2012>

- **Mostly small scale producers (< 2ha)**
- **appr. 86 % of cotton is genetically modified**
- **top Bt cotton producers**
USA 93 %, China 68 %, Australia 95%, India 90 % of Cotton production was Bt Cotton in 2011

Organic Cotton

In 2009-10 organic cotton growing took place in 23 countries. Countries have been categorised into six Regions as displayed in the map below.



Country	Metric Tonnes	(percentage breakdown)
1 India	195,412	(80.85%)
2 Syria	20,000	(8.27%)
3 Turkey	11,599	(4.80%)
4 China	4,300	(1.78%)
5 USA	2,808	(1.16%)
6 Tanzania	2,635	(1.09%)
7 Uganda	1,550	(0.64%)
8 Peru	831	(0.34%)
9 Egypt	666	(0.28%)
10 Mali	541	(0.22%)
11 Pakistan	345	(0.14%)
12 Burkina Faso	298	(0.12%)
13 Israel	150	(0.06%)
14 Benin	150	(0.06%)
15 Paraguay	109	(0.05%)
16 Greece	100	(0.04%)
17 Kyrgyzstan	83	(0.03%)
18 Tajikistan	55	(0.02%)
19 Senegal	27	(0.01%)
20 Nicaragua	17	(0.007%)
21 South Africa	15	(0.006%)
22 Brazil	5	(0.002%)
23 Zambia	2	(0.001%)
TOTAL	241,697*	

Textile Exchange, 2011d

Organic Cotton - success story

- **2005 only 0.1 % of global cotton production, 2010 it was already 1.1 %. Neither Recession nor unstable economies put damper on growth.**
- **Organic textiles industry grew +20% to estimated \$5.16 billion in 2010.**

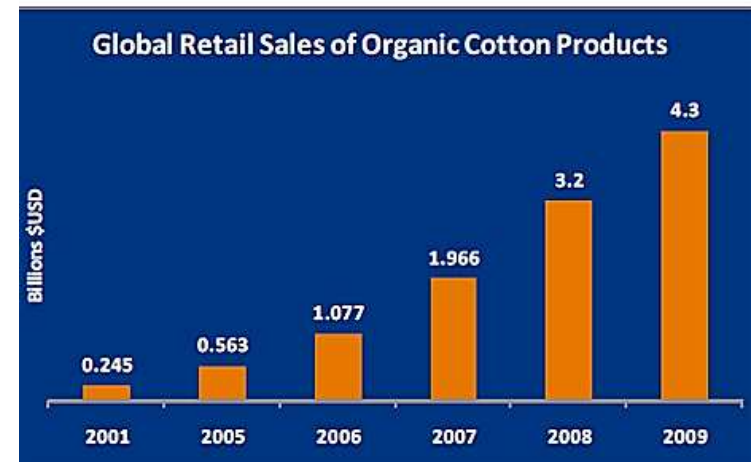
Textile Exchange 2011b

- **In 2009, global recession, -7 % in global apparel and textiles market, + 35% organic products sales**
- **“Several brands and retailers more than doubled their usage of organic cotton alone and plan to do so in 2012 as well”.**

www.naturalnews.com

Textile Exchange 2011a

Chart 1: Global Retail Sales of Organic Cotton Products



<http://www.environmentalleader.com/wp-content/uploads/2010/06/OrganicCottonSales.jpg>

Organic Cotton – big business

- **Global organic cotton market + 20 % in 2011**
- **estimated \$6.2 bio. market in 2011 and \$7.4 bio. market in 2012.”**

Textile Exchange 2011a,

- **The world market for organic cotton is projected to exceed \$19.8 billion by the year 2015.**

Global Industry Analysts, Inc., 2012

- **“Paradigm shift in the textile sector”**

John Mowbray, Ecotextile



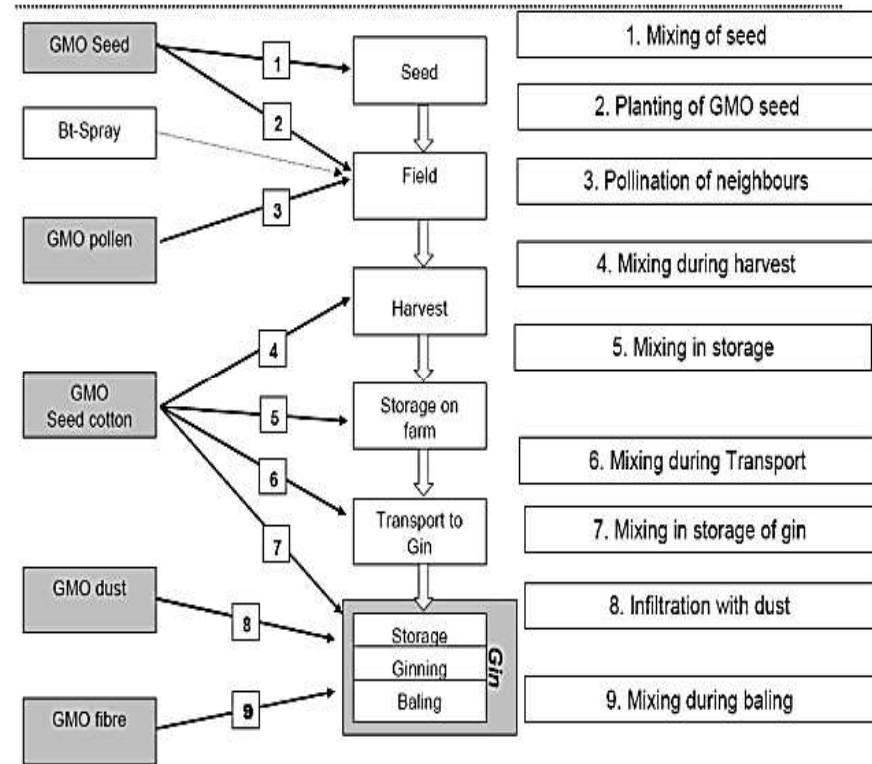
Organic Cotton – production decline

- **Organic cotton production -35 % 2011 to 2012**
- **Organic Cotton from 1.1% to 0.7% of Total Cotton Production 2011**
- **Reports about GM contaminated organic cotton, fraud**
- **Non-GM seed availability increasingly difficult**
- **Large scale Bt Cotton adaption poses risk to organic cotton production**
- **Increasing competition for land (GM <> organic),**
- **Coexistence very difficult if not impossible**

Contamination

- No GM organisms allowed in Organic
- Contamination
 - Genetic contamination 5-15%
 - Physical mixture 5-30%
- complex supply chains and small holdings, often poor, →risks of cross contamination are likely to increase
- Buffer zones often not feasible (ubiquitous GMO, small scale structures)

Potential GMO contamination pathways



Forster et al., 2011
 Blake, 2010, p.4
 Nemes, 2010

www.organicandfair.org/oftcc/Publications/Tools-and-Guides/Guidance_Document_final_version_2010_for_circulation_100621.pdf

India

- Largest Cotton producer after China , 21% of world production
- 6 mio small scale farmers <15acres, cotton holdings 3-4 acres
- 2010 cotton export accounts ~ 1/3 of foreign exchange earnings of India
- India was the only country to grow and market the 4 types of cotton species in the world.
 - *G. hirsutum* (AD)
 - *G. barbadense* (AD)
 - *G. arboreum* (A)
 - *G. herbaceum* (A)

James C. ,2011 in Kathage and Qaim , 2012
Nemes, 2010

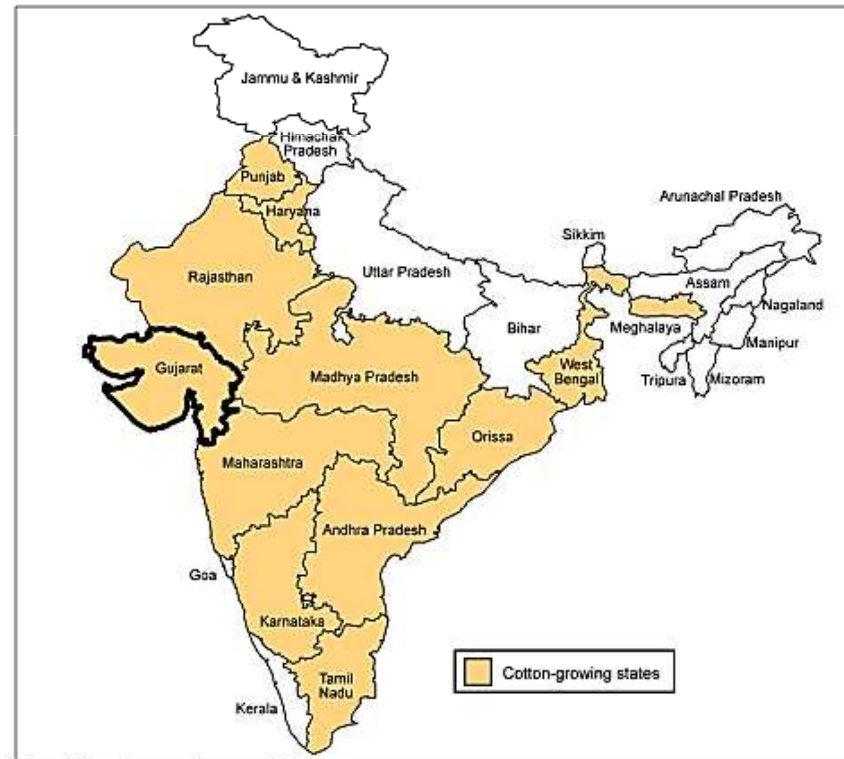


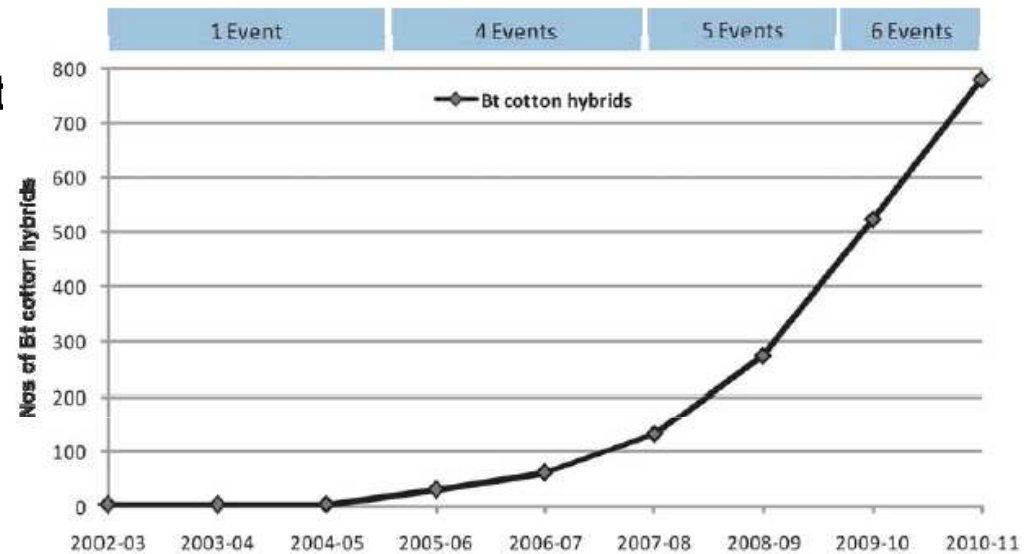
Figure 1. The cotton-growing areas of India.

India – GM Cotton Introduction

- **The production and supply of seeds is done by the public and private sector**
- **traditionally cultivation of adapted Desi varieties (1950 around 97%)**
- **70ies, first hirsutum hybrids introduced**
-> **Desi varieties disappear, 2010 only 10 % , probably less**
- **1995 GM seeds for research purpose , also illegal testings**
- **2000 signing Carthagen Protocol on Biosafety**
- **2002 Commercial release of 3 Bt hybrids**
- **2003/4 Monsanto sublicensed Bollgard gene to other companies**

India – GM Cotton Introduction

- **2005 3rd Amendment to Patent Act**
 - patents for GM seeds
→ Dominant private sector
- **2006**
 - shift from case-by-case to event based approvals.
 - Gov't sets maximum retail price for GM cotton set by



•**2002: 3 approved varieties**

•**2010: already 780 Bt Cotton hybrids from 34 seed companies**

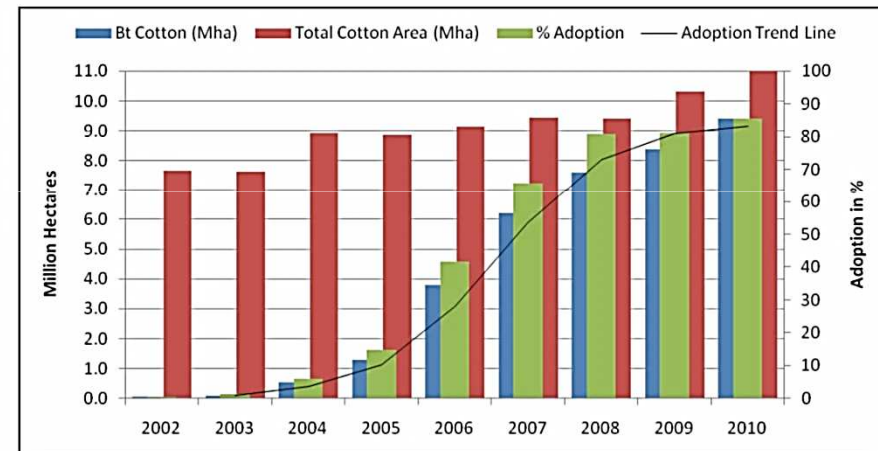
Textile Exchange, 2011c
Yesudas and Sakkhari in SAGE/DDS, 2012
NEMES, 2010

Choudhary and Gaur, 2010

India – Fast spread of GM Cotton

- **By 2011, 7 million farmers had adopted Bt on 26 mio acres (~10.52 mio ha), around 90% of total Indian cotton area**

Figure 1. Adoption of Single and Multiple Gene Bt Cotton Hybrids from 2002 to 2010



Source: Compiled by ISAAA, 2010

Choudhary, B & Gaur, K., 2010a.

India - Fast spread of GM Cotton

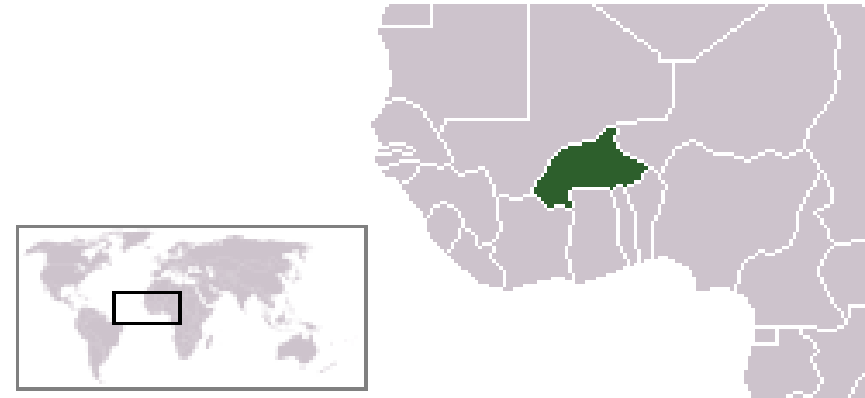
- **GM promotion by Government,**
- **2002-2012 : 90% Bt Cotton**
- **Privatization of seed sector, concentration**
- **R&D goes to Bt hybrid production, no interest in non-GM**
- **gradual replacement of open pollinating varieties to hybrids**
- **smaller local seed companies who could provide organic seed marginalized and disappeared**
- **non-GM seed production disappearing →prices rise**
- **Illegal spread of Bt Cotton, proliferation of seed market**
- **Many varietal genotypes are heavily contaminated**
- **Environment of seed insecurity**
- **TRACENET is a burden esp. for small scale organic producers**

Textile Exchange, 2011c
Mbaye and Barry, 2011
Forster et al., 2011
Blake 2010
Ramaswami et al., 2009
Murugkar et al., 2007 3

Burkina Faso - Cotton

- **35% of GDP from the cotton sector, 18% of the people live from cotton growing (1/6 of all farm households)**
- **In West Africa Burkina Faso, Nigeria, Mali and Ghana have functioning legislation allowing field trials with GM**
- **since 2006 opted for Bt Cotton**
- **SOFITEX being formerly gov'tal is gatekeeper and dominates the sector, only Bt seed provider**
- **Largest Bt-Cotton producer in Africa**
- **signed Carthagena protocoll, illegal liberation of Bt before**
- **strong role of NGOs to implement political framework for GMOs**

www.cotton-made-in-africa.com
Delpeuch, 2011,
Textile Exchange 2011c
Mbaye and Barry, 2011, p.69



<http://agritrade.cta.int/Agriculture/Commodities/Cotton/USDA-review-of-cotton-production-in-West-Africa>
<http://upload.wikimedia.org/wikipedia/commons/e/ea/LocationBurkinaFaso.png>

Burkina Faso Bt Cotton adoption

- **2000: joint collaboration between Burkina Faso's national cotton companies and Monsanto**
- **2006 Gene transfer in the local varieties (back cross)**
- **2007: field experiment with 20 farmers (20 ha under controlled conditions with farmers participation)**
- **2008 : 8'500 ha (2%)**
- **2009: 125`000 ha Bt Cotton (Monsanto's Bollgard II) in local varieties (29%)**
- **2010: 260'000 ha (65%)**
- **2011: 247'000 ha Bt Cotton (58% of total cotton area)**

VITALE 2010,
www.thereporterethiopia.com,14.9.2012
Mbaye and Barry, 2011, p.70
www.ISAAA.org

Burkina Faso Bt Cotton

- **60% profit to the seed farmers, 28% to Monsanto and 12% to research.**
- **Monsanto owns events, Burkina Faso varieties**
- **Opposition in different communities, price struggles, even riots**
- **275% price increase for untreated non-GM Cotton**
- **Increasing output prices**
- **GM free zones for seed production required**
→ **no policy to create alternative zones**
- **100 m (?) distance to GM field challenging in smallholder context**
- **Farmers switching back to non GM ?**
Published and disclaimed

VITALE 2010,
www.thereporterethiopia.com,14.9.2012
MBAYE and BARRY, 2011, p.70
Traidcraft, 2011

Burkina Faso Implications for organic cotton

- **Organic cotton was found to be polluted with Bt Cotton →no premium**
- **Criminalizing traditional seed exchange between farmers**
- **Before GM introduction conventional seed could be used**
- **Negative campaigns against organic projects from seed companies**
- **Outcrossing in wild or local species possible**
- **Additional cost for organics for testing, non-GM certification, setup and maintain traceability systems**
- **Number of organic farmers decreased rapidly**
- **Example organic cotton project:**
After steep increase, drop from 7'000 farmers to 2'400 , production 2'200 t in 2008 to 700 t of lint in 2010
- **Organic seed production insufficient, inferior quality has to be used**

Summary

- **India: 90% GM Cotton in 10 years, BF fast spread as well**
- **Concentration in seed market, dominance of private sector**
- **Seed chain is GM seed chain**
- **Promotion of GM crops by governments, role of NGOs**
- **Coexistence with GM impossible**
- **Outcrossing**
- **Contamination of varieties with GM genes**
- **Many varieties already polluted**
- **Non-GM seed availability is crucial for farmers**
- **Non-GM seed scarcity → thread to production, to breeding**
- **Organic has burden taking care for traceability and non-GM purity, no „costs-by-cause principle“**

Outlook: The Dharwad Declaration

- **National Workshop June 21st 2011**
«Disappearing non-GM cotton - ways forward to maintain diversity, increase availability and ensure quality of non-GM cotton seed»
- **Jointly organized by bioRe India Ltd., FiBL Switzerland, University of Agricultural Sciences Dharwad and others**
- **To combine forces for immediate action and support of:**
 - Collaboration and Exchange
 - Desired Policy Changes
 - Evaluation and multiplication of existing cotton varieties under organic and low-input conditions
 - Establishing and optimizing the non-GM seed chain
 - Continuous improvement of non-GM Varieties



http://www.fibl.org/fileadmin/documents/en/news/2011/pr_india110706_DharwadDeclaration.pdf

Outlook: The Dharwad Declaration cont'd

To achieve these goals we join forces and partner in non-GM cotton seed issues to secure non-GM seed availability and genetic diversity over long-term.

Dharwad, 21 June 2011

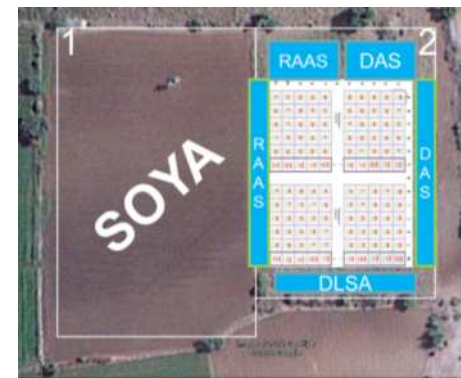
Signed by: Dr. L. Savariraj, Sawed Trust; Dr. M. Abdaheer, Sawed Trust; A. Ambatipudi, Chetna Organic; D. P. Arya, Pratibha Syntex; Dr. A. Barik, DOCD Mumbai; R. Baruah, bioRe; V. Carriappa, Savayava Krishikar Sangha, HD Kote; M. Chinnaswami, Appachi Cotton; G. R. Dharmendar, Chetna Organic; Dr. D. Forster, FiBL; O. Gadade, Cotton Connect; P. V. Gaonkar, UAS Dharwad; A. Katyal, Sunstar Overseas Ltd; H. G. Kencharaddi, UAS Dharwad; M. Kunz, Remei AG; S. Makari, SOFA; Dr. M. Messmer, FiBL; P. Nagarajan, Textile Exchange; H. Patel, Agrocel; Dr. B. C. Patil, UAS Dharwad; Dr. S. S. Patil UAS Dharwad; K. Prasad, Sahaja Samrudha; G. Rajashekar, Centre of Sustainable Agriculture; M. Ramakrishnan, Arvind Limited; H. M. Ranganatha, UAS Dharwad; D. N. Reddy, Chetna Society; S. P. Reddy, UAS Dharwad; A. Roy, Ram Krishna Ashram Krishi Vigyan Kendra; K. Sainathan, Agrocel; M. S. Sunstar Overseas Ltd; R.T. Singh, Centre of Sustainable Agriculture; Dr. M. V. Venugopalan, CICR.

Outlook: FiBL- bioRe research partnership



The GREEN COTTON project

- Introduction of participatory breeding approaches, facilitating and training of farmers to get into breeding again
- Inquire suitability of different types of cotton cultivars for organic and low input farming conditions in Central India, on farm trials representing farmers' growing conditions
- Participatory cultivar testing
- Drought resistance
- *G. hirsutum* + *G. arboreum*
- Alternative seed chain development



Messmer et al. (2011);
Roner (2012);
Roner et al. (2012)

Outlook: The Green Cotton Project



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	40	5	27	28	5	112	50	28	32	26	33	48	80
2	20	28	30	30	25	100	3	12	33	14	38	71	71
3	39	32	45	22	41	88	48	44	30	39	49	78	80
4	48	45	34	44	1	102	1	4	15	37	47	78	80
5	43	14	6	36	32	104	17	21	38	42	35	74	74
6	Replication 1						Replication 2						
7	49	17	32	3	15	100	41	28	33	3	3	69	80
8	33	37	38	38	24	114	32	7	33	46	5	68	80
9	33	40	28	21	21	106	48	27	19	18	22	71	71
10	23	1	4	42	18	100	43	8	20	23	18	70	70
11	8	23	39	7	39	112	8	18	18	40	24	71	71

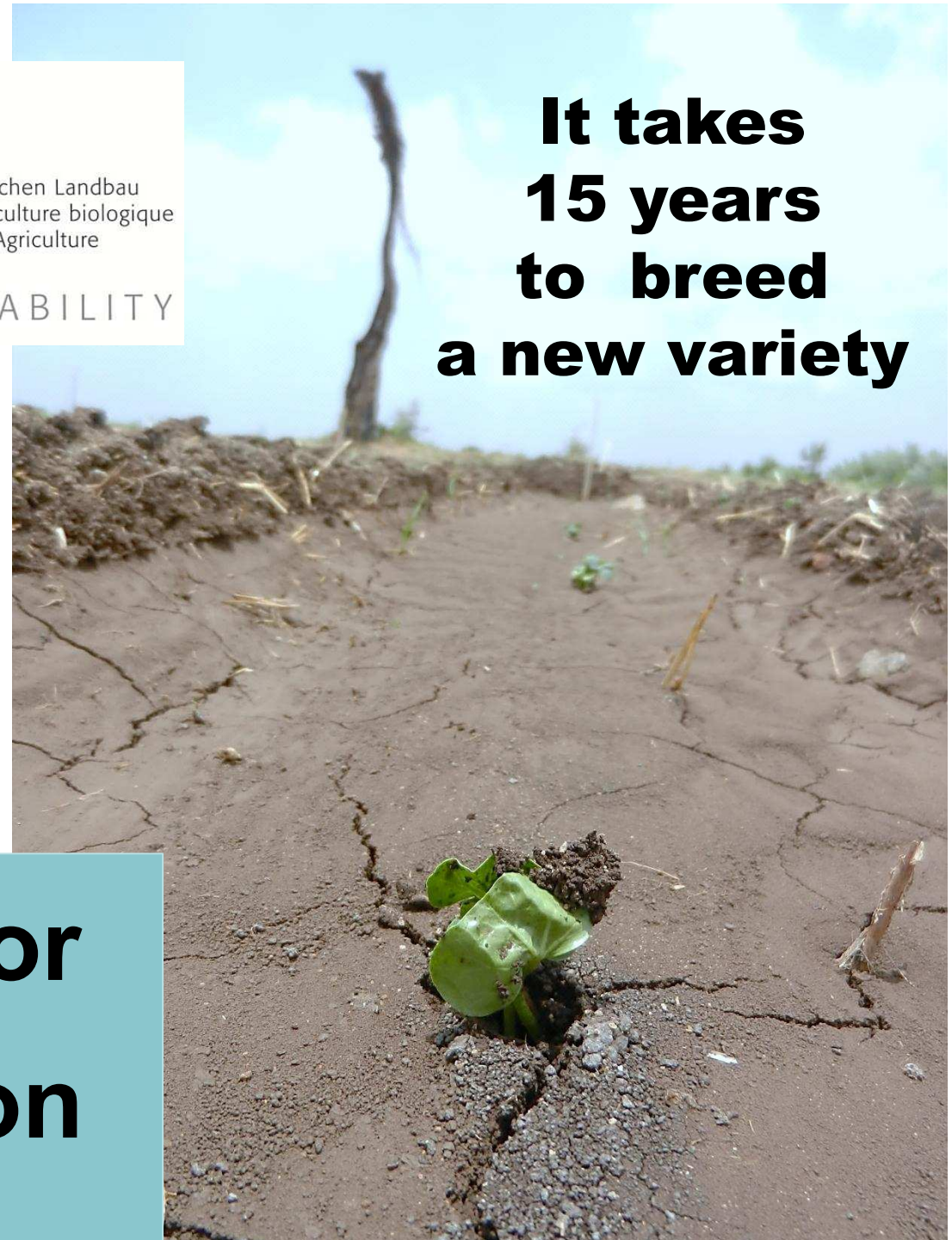


 **FiBL** Forschungsinstitut für biologischen Landbau
Institut de recherche de l'agriculture biologique
Research Institute of Organic Agriculture
EXCELLENCE FOR SUSTAINABILITY



**Thank you for
your attention**

**It takes
15 years
to breed
a new variety**



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