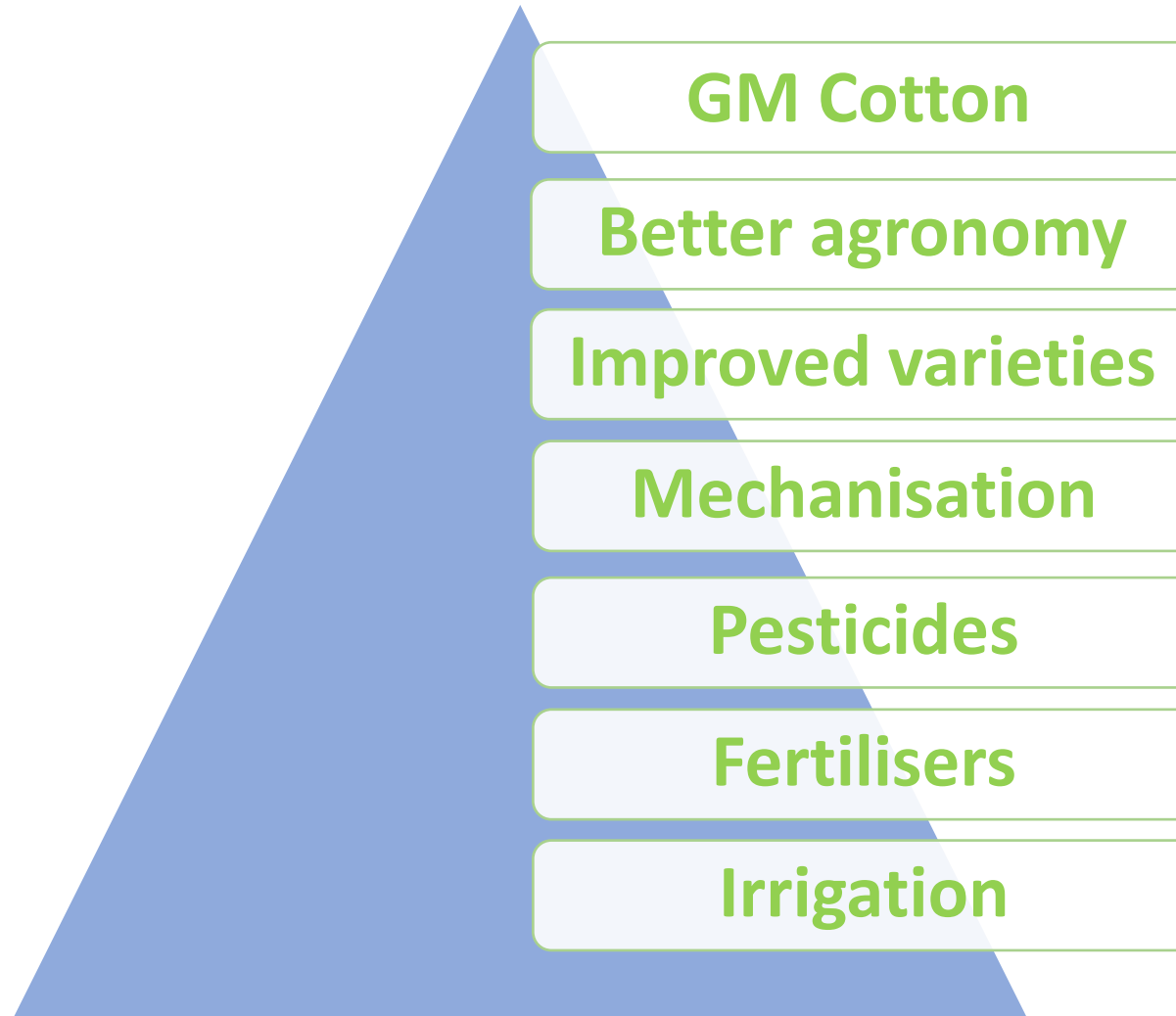


# IS BT COTTON THE ANSWER FOR INDIAN COTTON WOES?

Keshav Kranthi

# INCREASING YIELDS



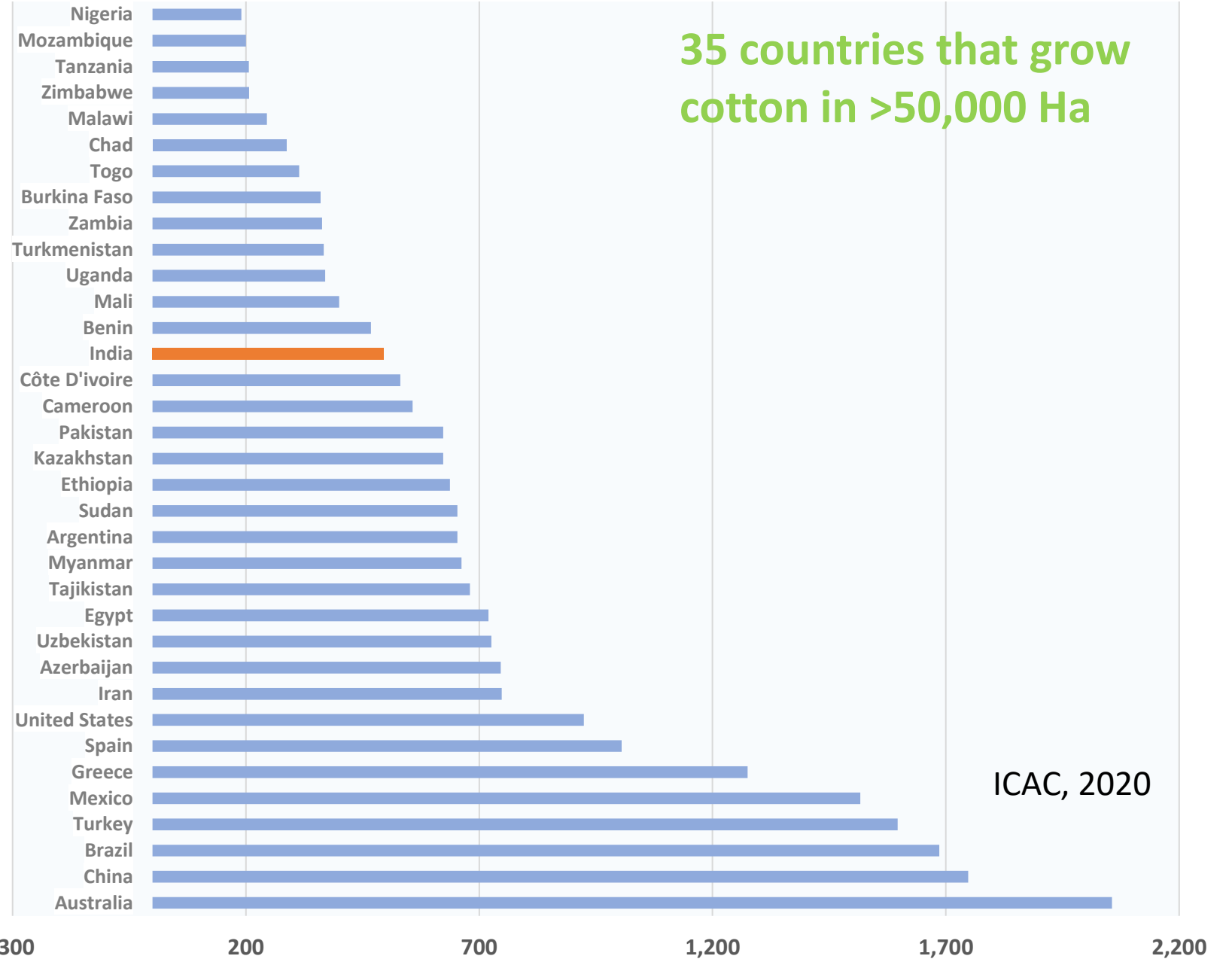
3

India ranks low in yields in the world

Out of 75 countries that grow cotton

India ranks 36 in yields

90 x 10cm

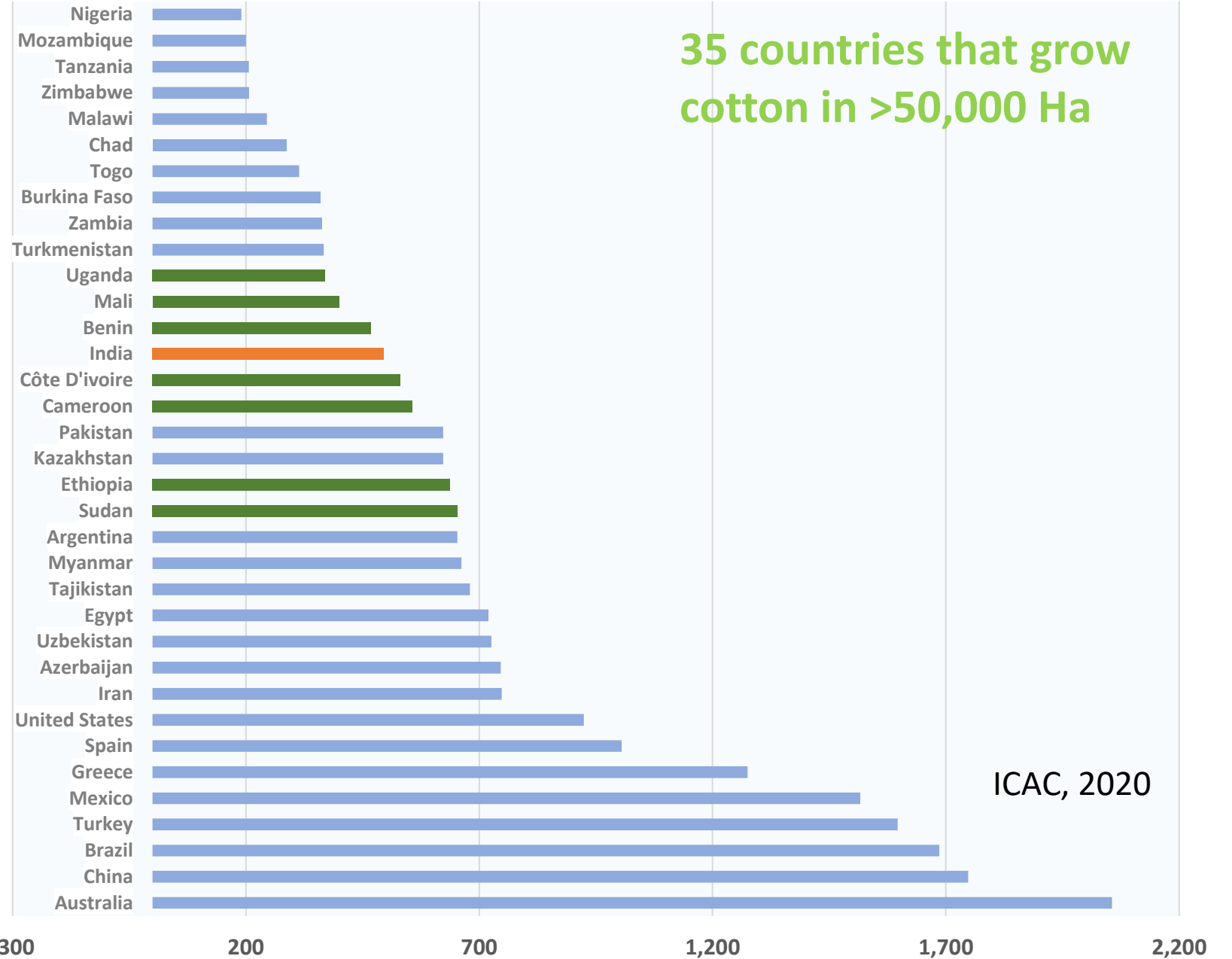


35 countries that grow cotton in >50,000 Ha

ICAC, 2020

# India v/s Africa

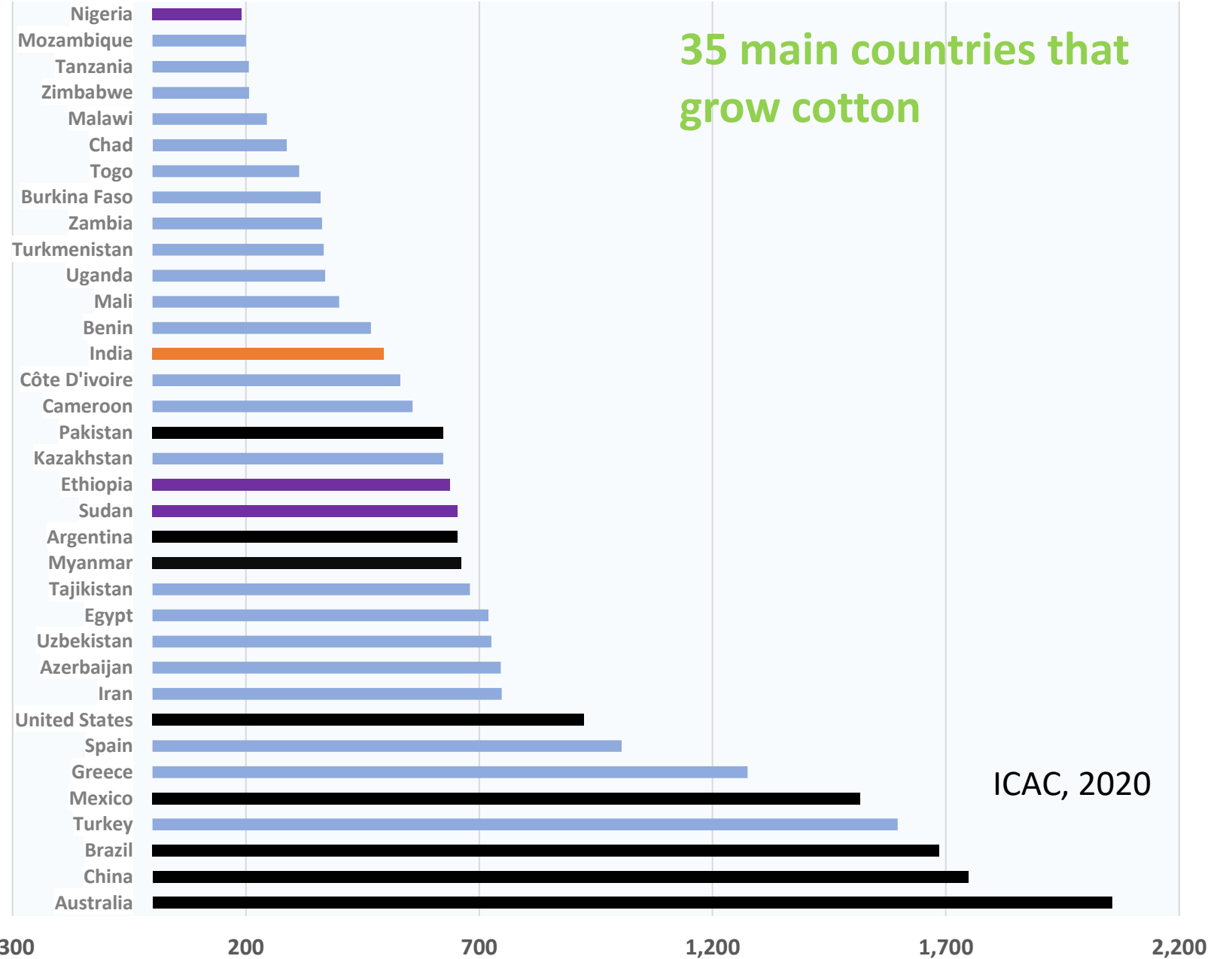
90 x 10cm



# Bt-cotton countries

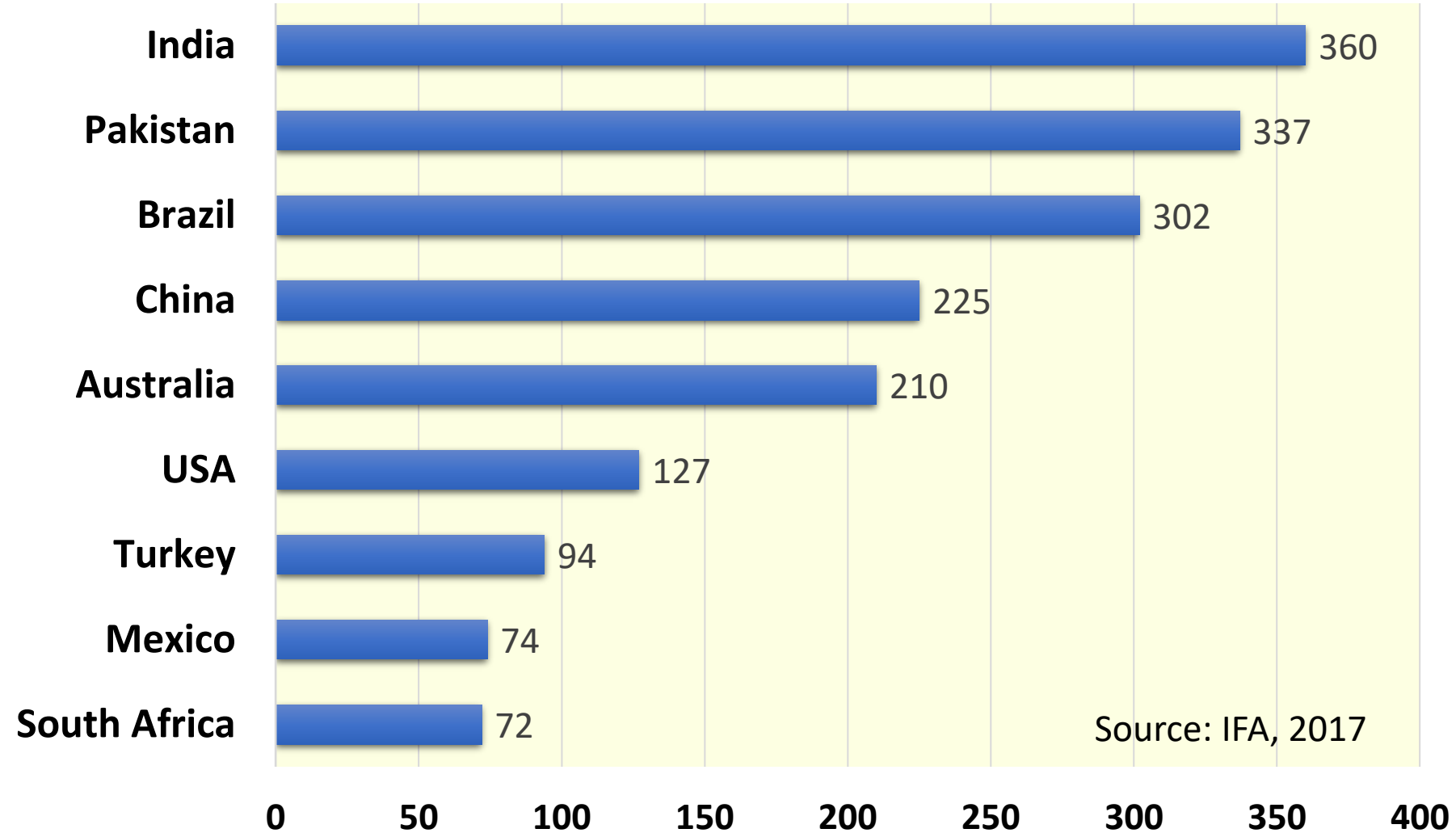
# Hybrids: India

90 x 10cm



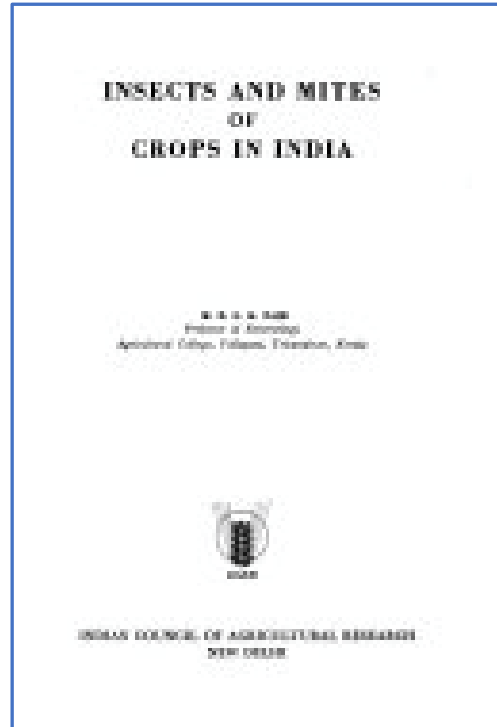
# Fertilizer (g) use per Kg lint produced

Fertiliser-use-efficiency is the lowest in India



# Until 1978

## American bollworm *Heliothis armigera* was **NOT** a major pest of cotton



MRGK Nair, 1975, 1978

# SYNTHETIC PYRETHROID

**insecticides from 1980 may have caused resurgence of  
American bollworms and whiteflies**

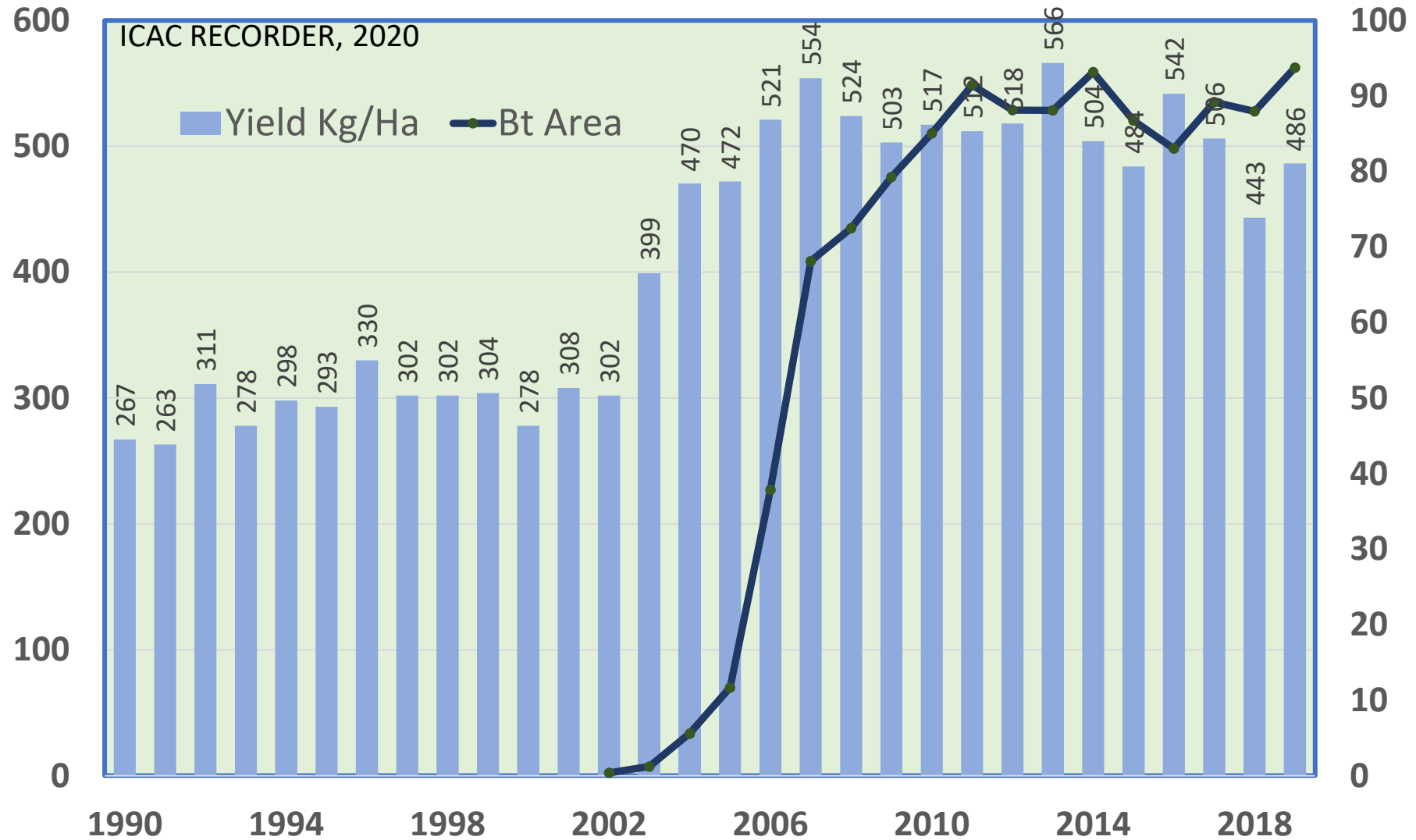
Reed & Pawar, 1982; Ahmed et al., 2005



# Cotton 1990-2019

Yields increased in 2003, 2004 & 2005 with more than 90.0% area under non-Bt

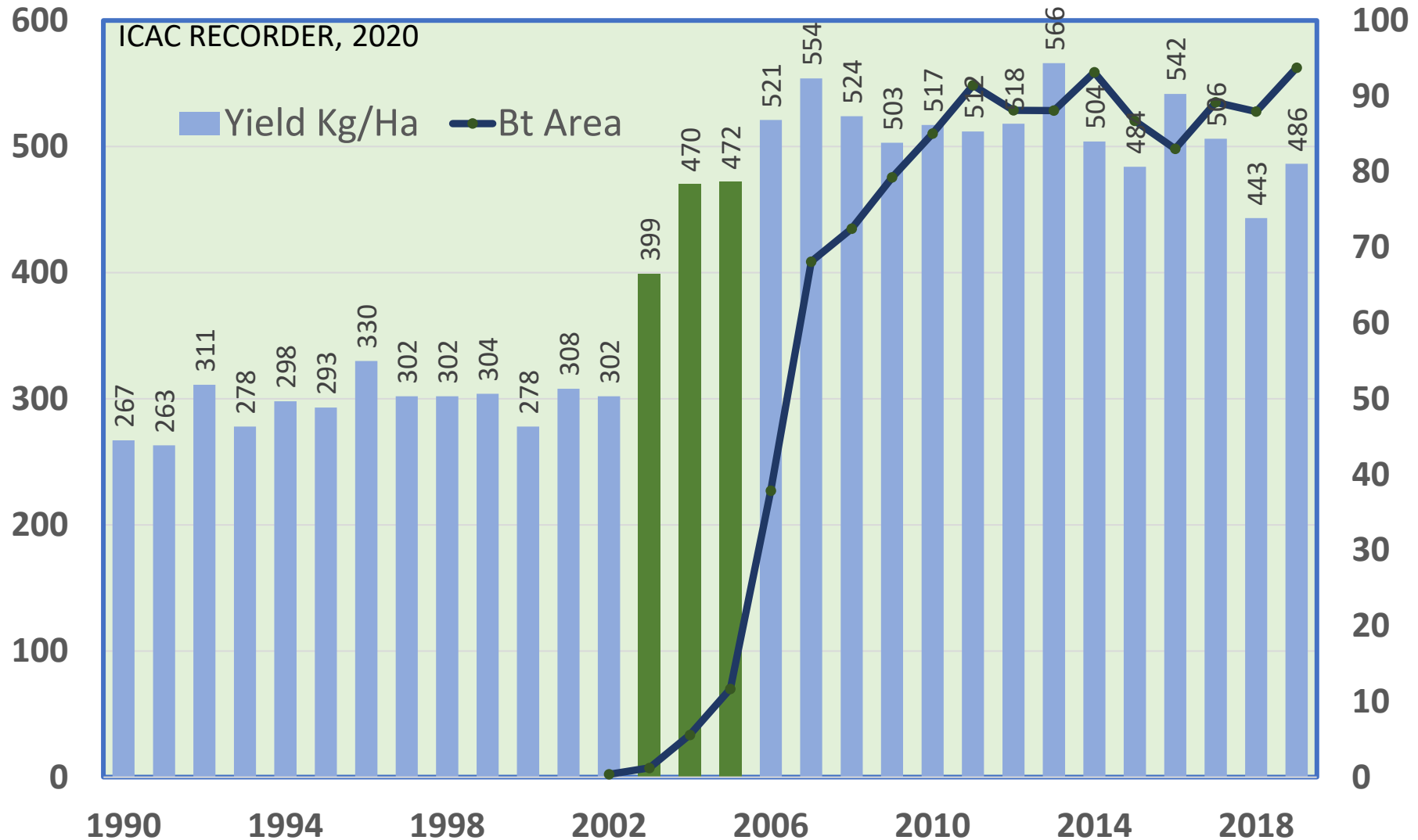
<https://cotcorp.org.in>



# Cotton 1990-2019

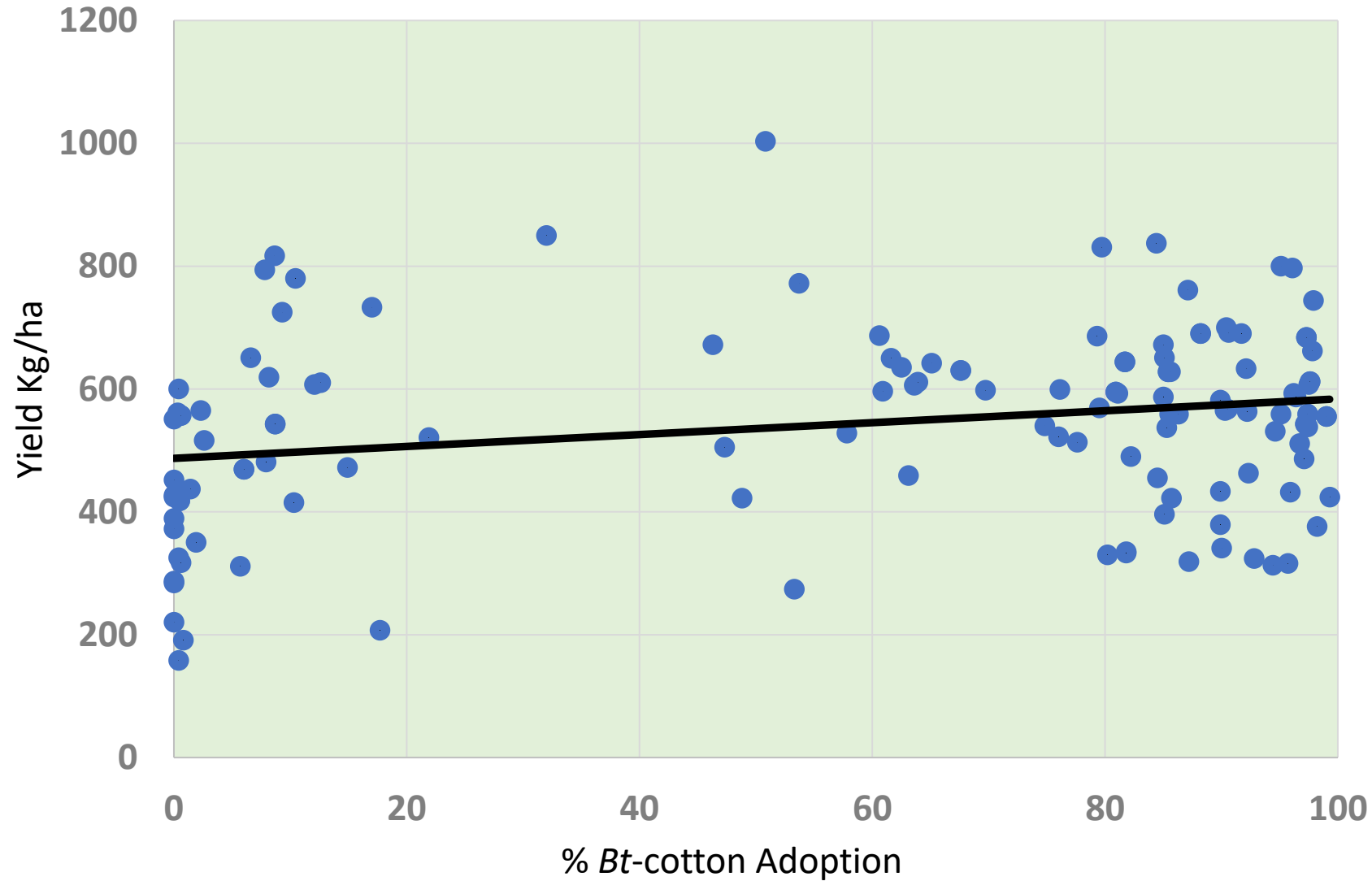
Yields increased in 2003, 2004 & 2005 with more than 90.0% area under non-Bt

<https://cotcorp.org.in>



# Poor correlation (**0.26**) between *Bt*-cotton adoption & Yield

<https://cotcorp.org.in> & <http://agricoop.nic.in>



Data source: Ministry of Agriculture, India

# Helicoverpa armigera infestation on non-Bt cotton 2004-2018

	NORTH ZONE			CENTRAL ZONE				SOUTH ZONE	
	Faridkot	Hisar	Sriganganagar	Khandwa	Surat	Akola	Nanded	Guntur	Coimbatore
<b>1999</b>	BETL	BETL	AETL	BETL	BAETL	AETL	BETL	AETL	BETL
<b>2004</b>	BETL	AETL	BETL	AETL	BETL	BETL	NA	AETL	AETL
<b>2005</b>	BETL	BETL	BETL	AETL	BETL	AETL	AETL	BETL	NA
<b>2006</b>	BETL	BETL	BETL	BETL	AETL	AETL	AETL	BETL	NA
<b>2007</b>	NA	NA	NA	AETL	NA	NA	NA	NA	NA
<b>2008</b>	0	NA	0	AETL	BETL	NA	BETL	BETL	BETL
<b>2009</b>	0	NA	0	AETL	AETL	AETL	BETL	BETL	BETL
<b>2010</b>	BETL	NA	0	AETL	AETL	AETL	BETL	BETL	BETL
<b>2011</b>	0	BETL	0	AETL	BETL	AETL	BETL	BETL	BETL
<b>2012</b>	BETL	NA	0	BETL	AETL	NA	NA	0	BETL
<b>2013</b>	NA	NA	0	AETL	NA	MA	BETL	BETL	NA
<b>2014</b>	NA	AETL	0	NA	NA	NA	BETL	BETL	0
<b>2015</b>	NA	NA	0	NA	AETL	ETL	BETL	BETL	NA
<b>2016</b>	BETL	NA	BETL	NA	NA	BETL	NA	BETL	NA
<b>2017</b>	BETL	NA	0	BETL	0	BETL	BETL	BETL	0
<b>2018</b>	NA	NA	NA	BETL	BETL	BETL	BETL	BETL	BETL
<b>2019</b>	BETL	BETL	BETL	BETL	BETL	BETL	BETL	BETL	BETL

Above economic threshold

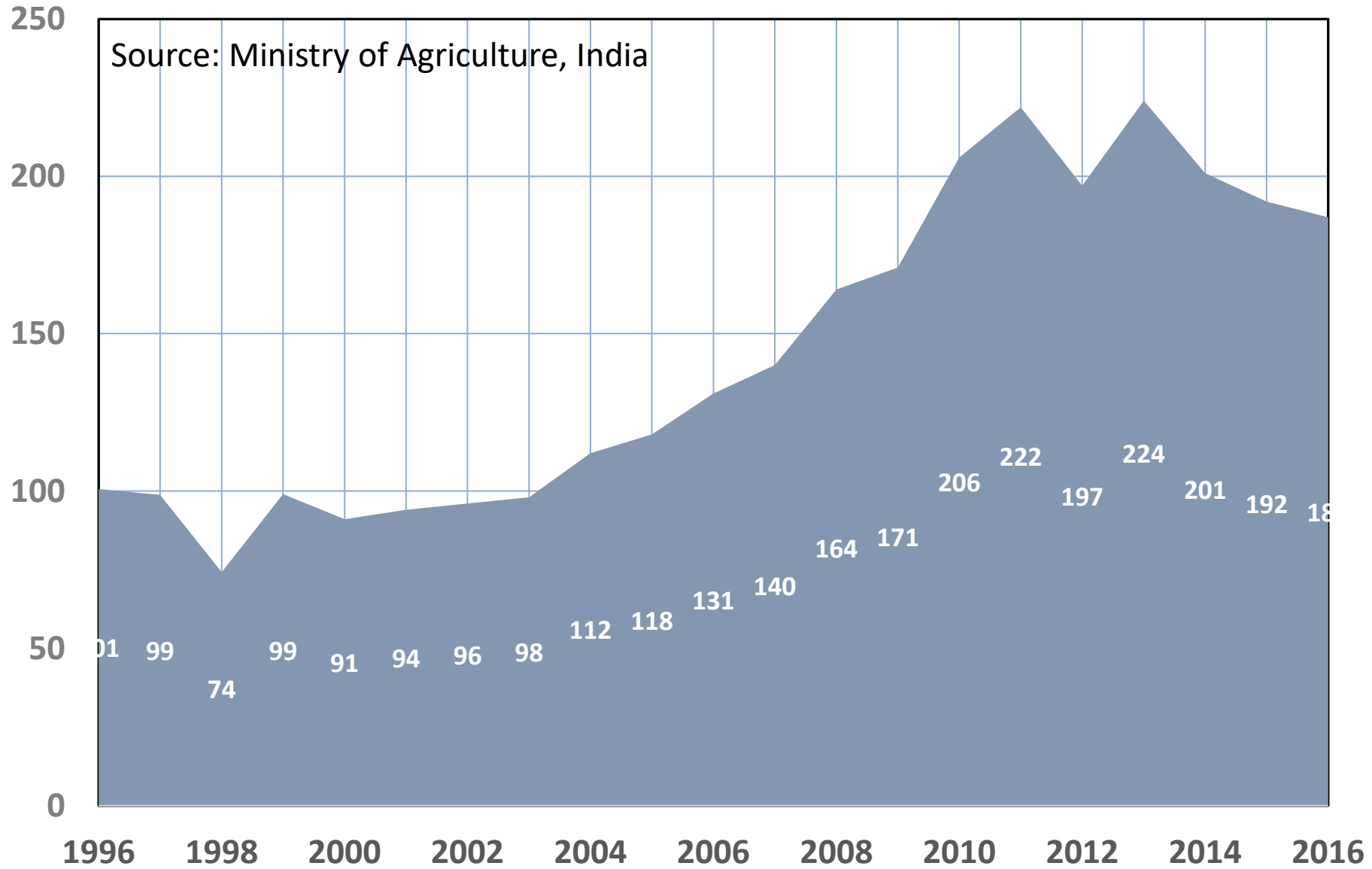
AETL

Below economic threshold

BETL

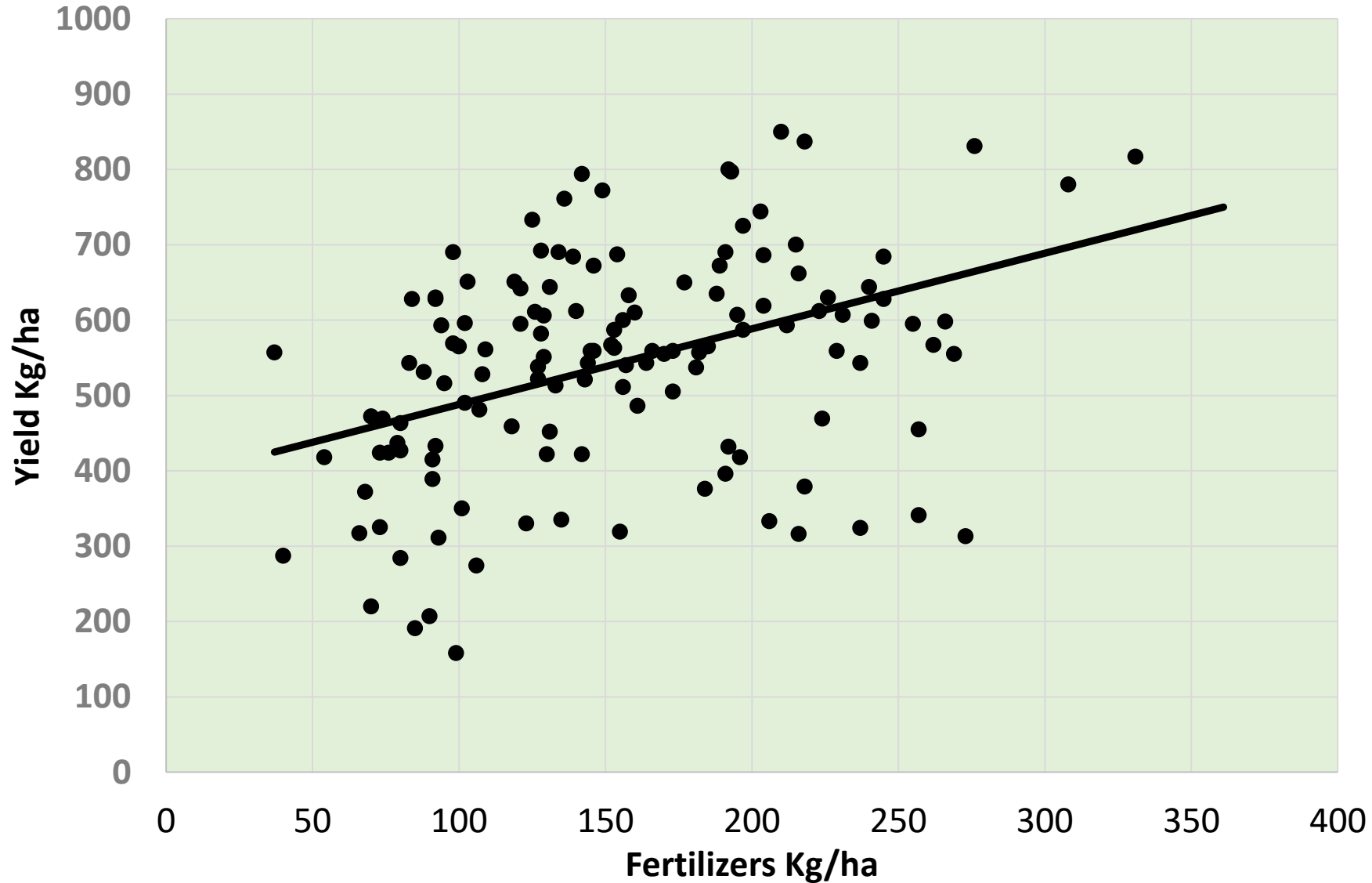
[http://www.aiccip.cicr.org.in/main\\_aiccip\\_reports.html](http://www.aiccip.cicr.org.in/main_aiccip_reports.html)

# Fertilizer use (Kg/ha) more than doubled during 2002-2011



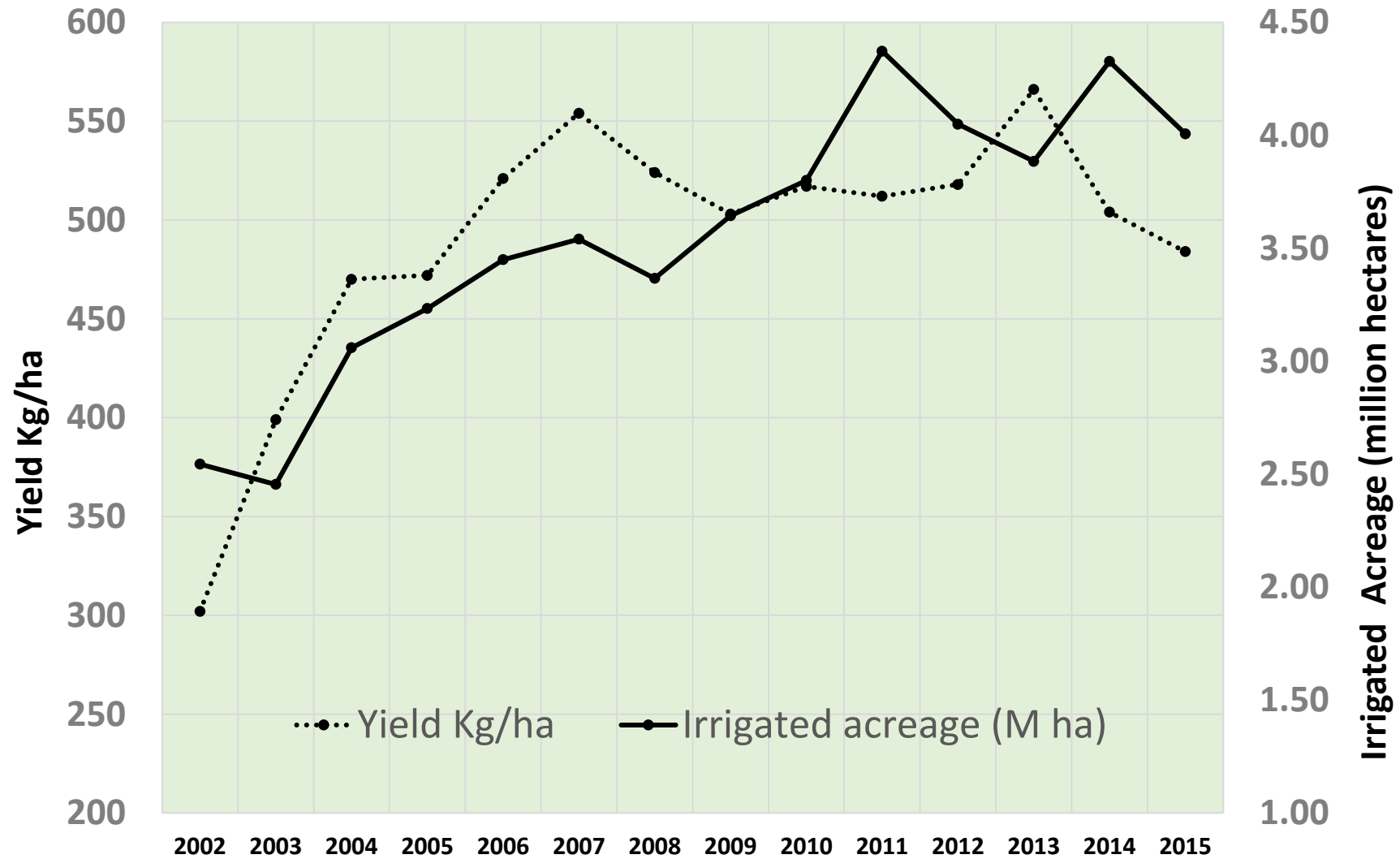
# Positive correlation (0.42) between Fertilizers & Yield

<https://cotcorp.org.in> & [https://eands.dacnet.nic.in/Cost\\_of\\_Cultivation.htm](https://eands.dacnet.nic.in/Cost_of_Cultivation.htm)



# 19.2 Lakh ha of irrigated cotton added 2003 to 2011

<https://eands.dacnet.nic.in/PDF/Pocket%20Book%202019.pdf>





# Pink Bollworm

OUTBREAK  
IN INDIA  
**2017**  
Losses  
Rs. 8320 crores



06 metro | Hindustan Times

## Maha loss for farmers as pest attack claims 84% cotton crop

SURVEY REVEALS Aurangabad worst-hit with farmers losing crop planted on 4.6L ha

**PINK BOLLWORM ATTACK**

98% of the cotton crop in Maharashtra has been lost due to the pink bollworm attack. The state has reported a total loss of 84% of the cotton crop, worth Rs. 8,320 crore. The survey also revealed that the state has lost 41 lakh bales of cotton, worth Rs. 34,39 lakh. The survey also revealed that the state has lost 89,400 MT of cotton, worth Rs. 2,71 crore. The survey also revealed that the state has lost 2.71 crore MT of cotton, worth Rs. 2,71 crore.

**DISTRICTS WITH HIGHEST DAMAGES TO THE CROPS**

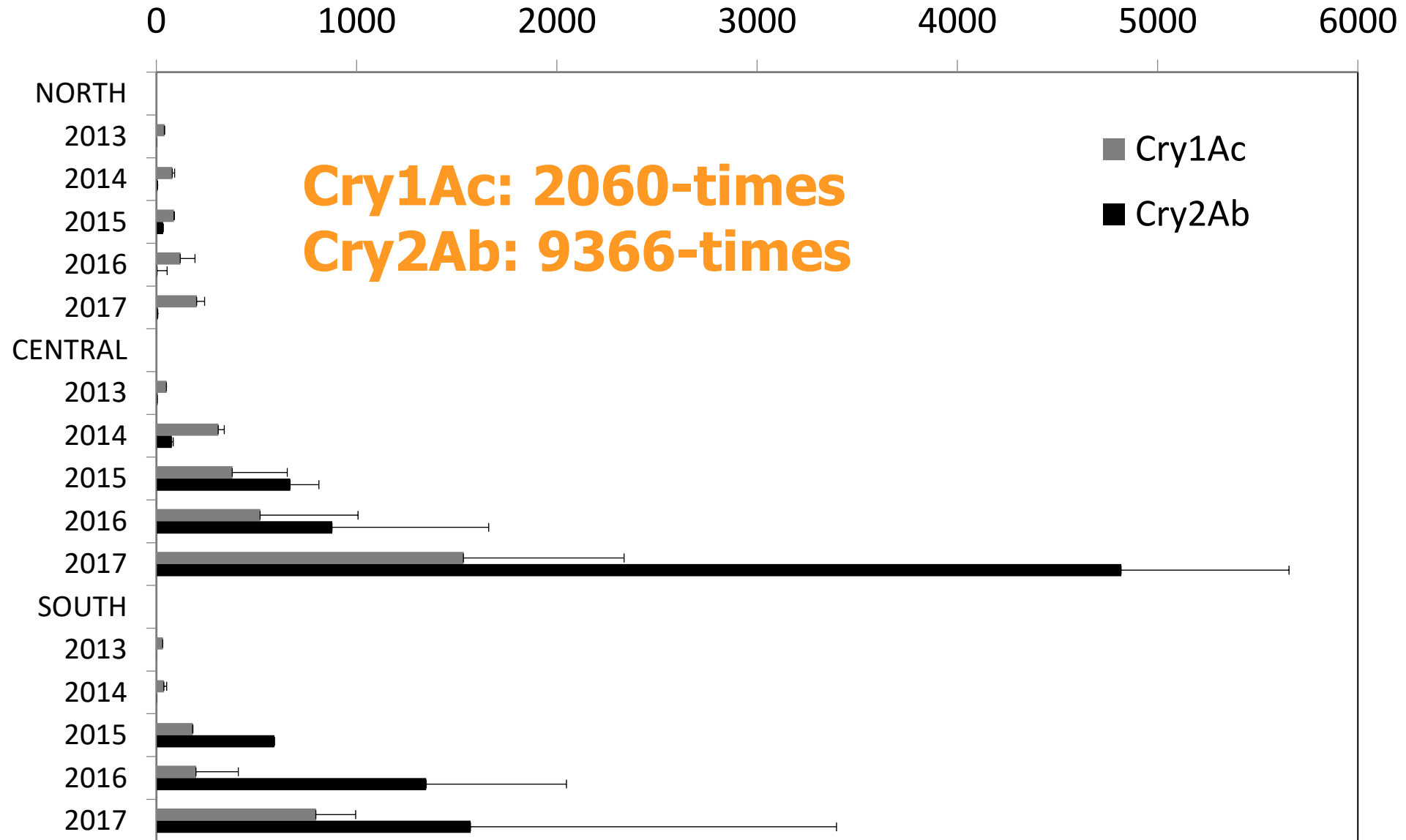
District	Loss (in %)
Aurangabad	8.81
Beed	2.89
Nanded	2.81
Tandur	2.71
Wara	2.56
Yadadri Prasangar	2.15

The actual loss will be ascertained after purchases are completed. We expect most of the farmers to qualify for NDRF compensation.

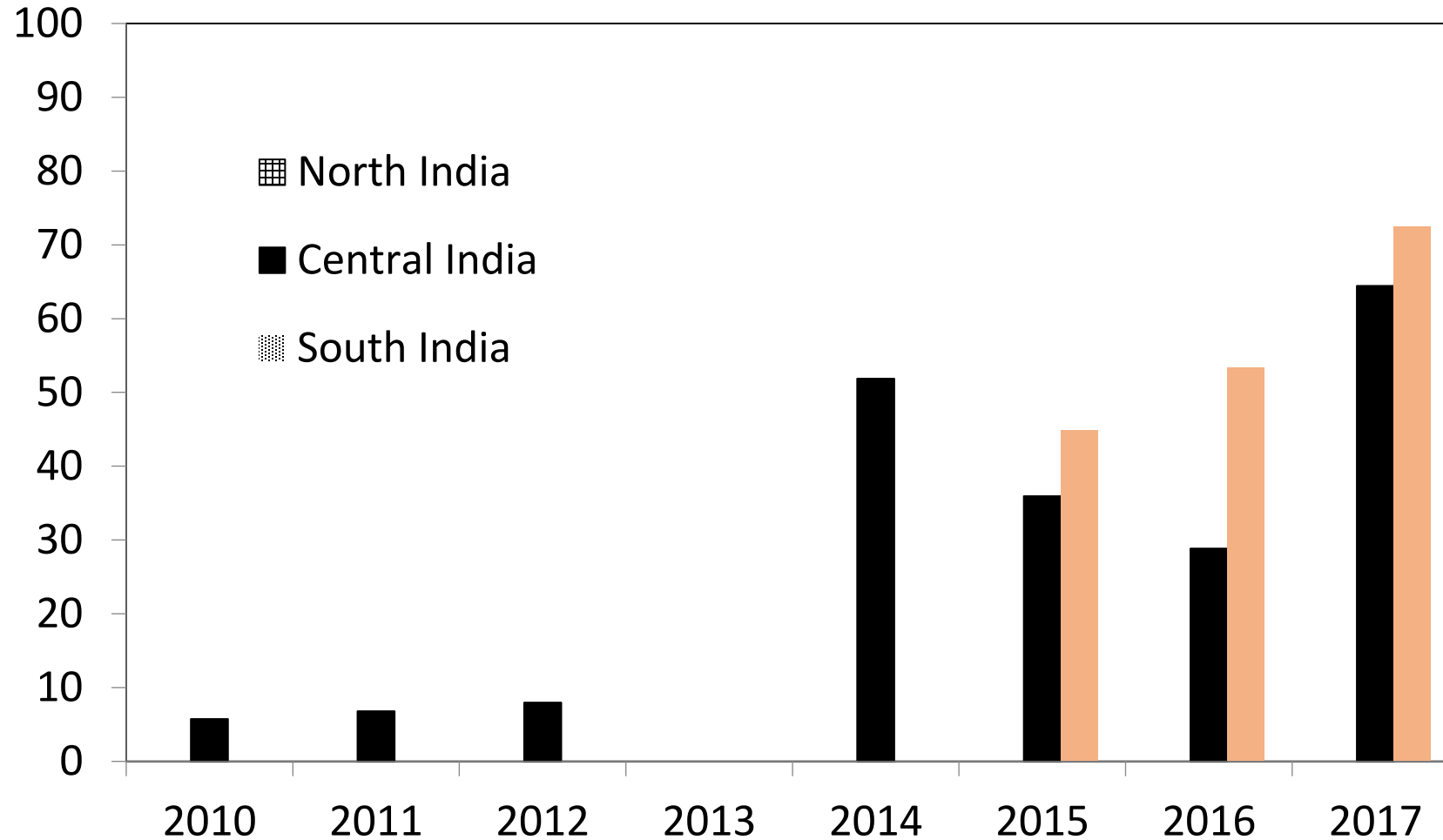
By N. MANI, principal secretary, NDRF



# Pink Bollworm Resistance to Biotech Cotton

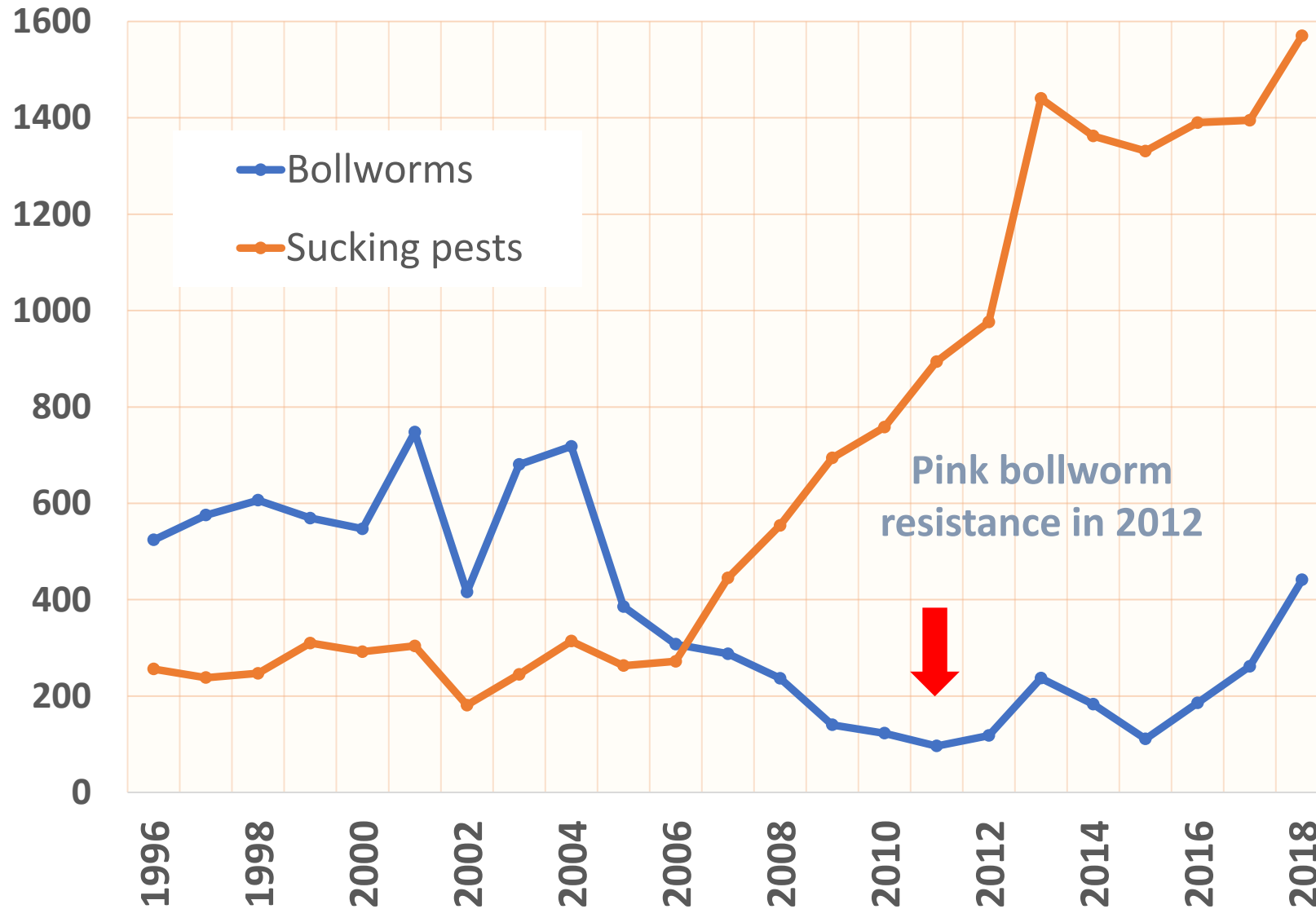


# Pink Bollworm **30-70%** Infestation in Bt-II Cotton in India (2015-2017)



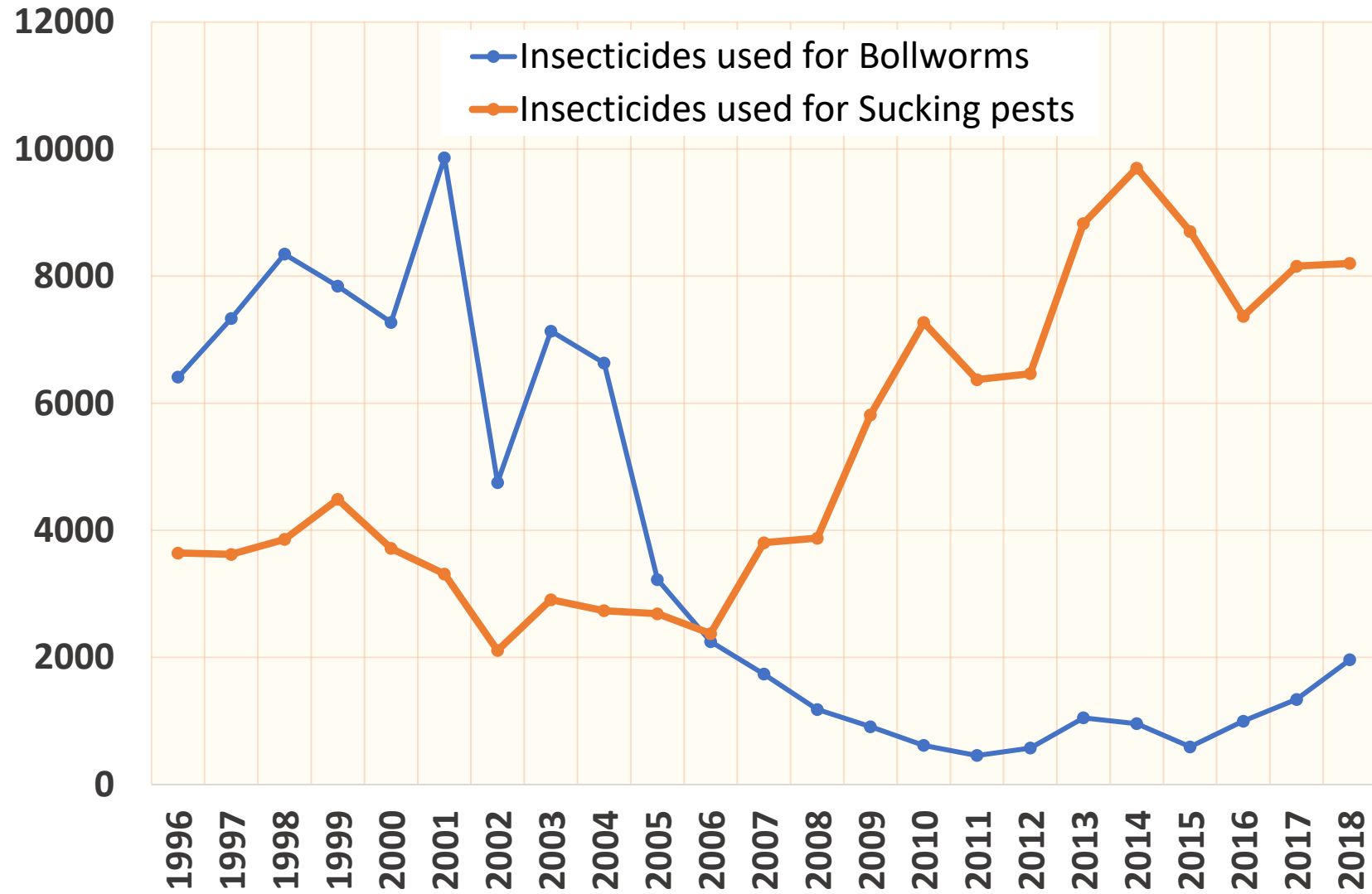
# Increase in insecticide usage on cotton (₹ crores)

Source: ICAC RECORDER (March 2020)



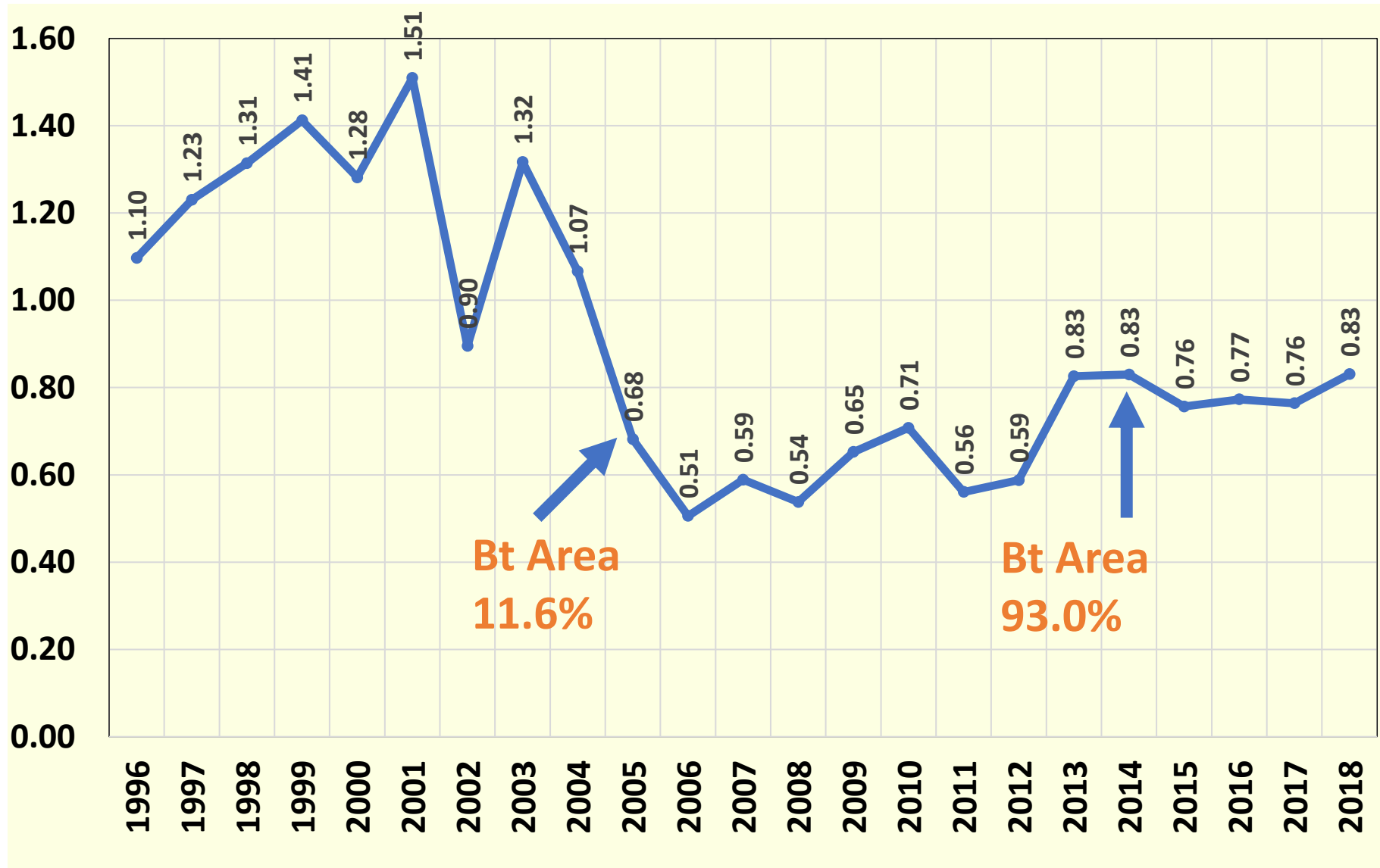
# Insecticide usage (Mt) on cotton

Source: ICAC RECORDER (March 2020)



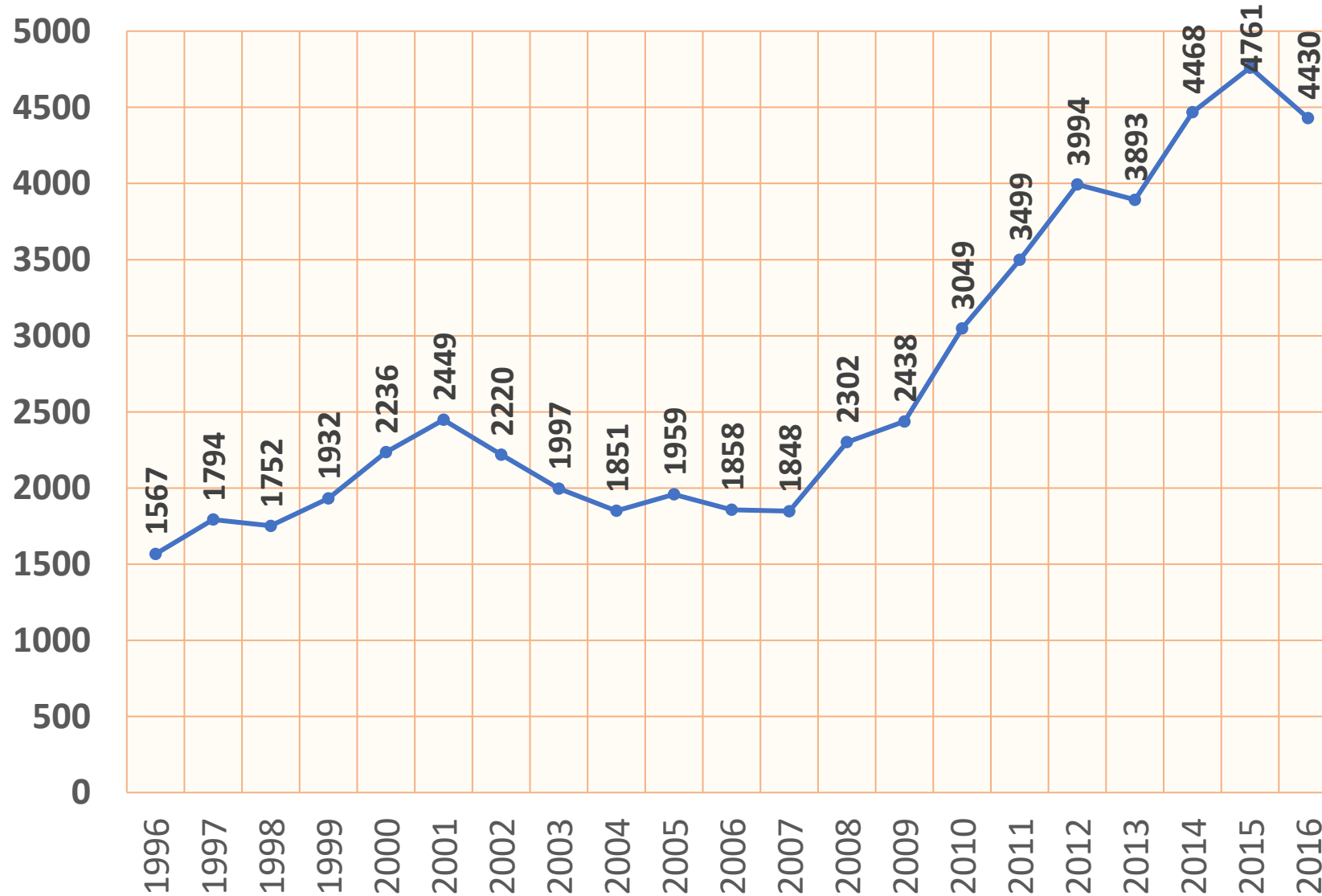
# Increase in insecticide usage on cotton Kg/ha

Source: ICAC RECORDER (March 2020)



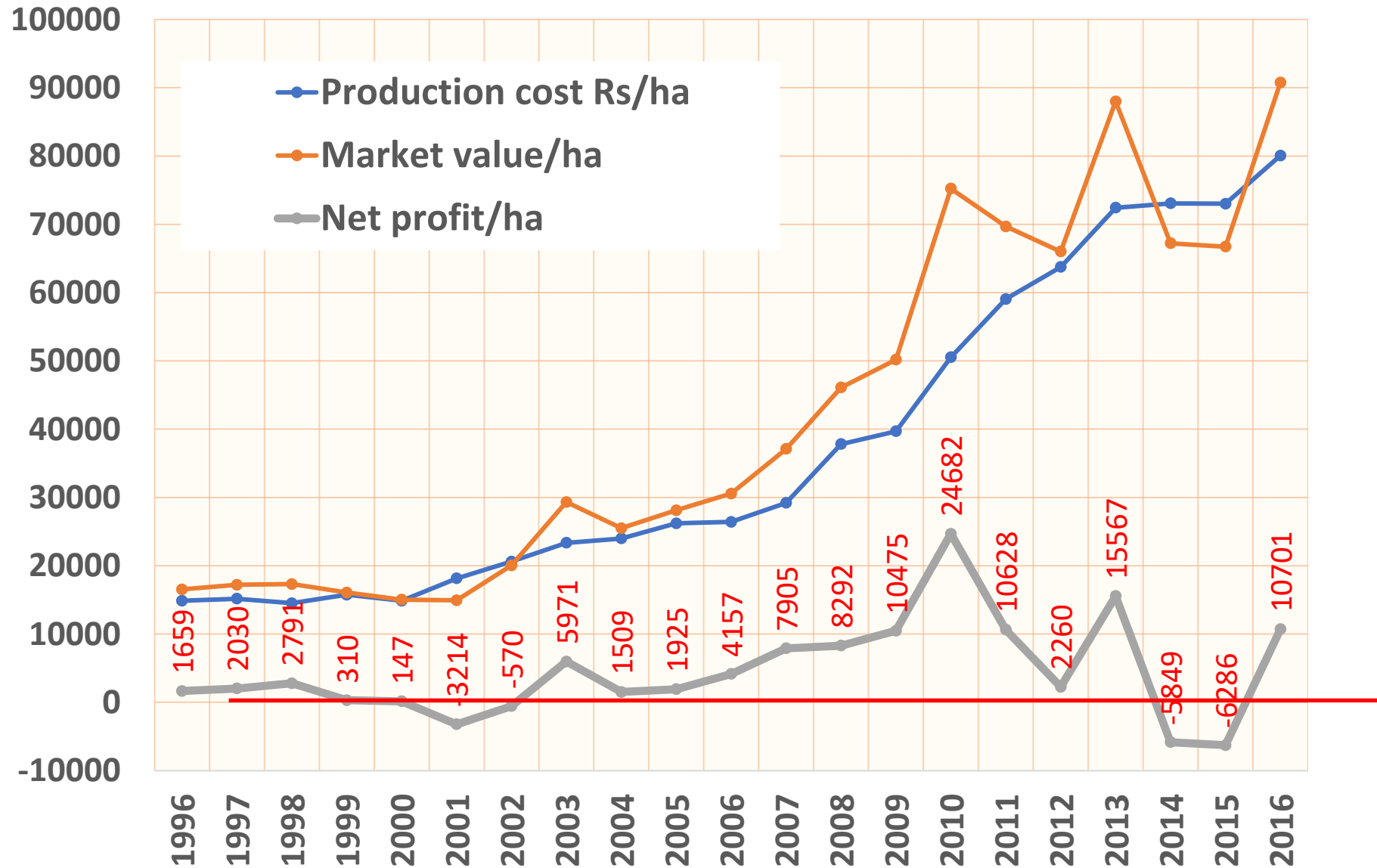
# Cost of production ₹ per Q seed-cotton

[https://eands.dacnet.nic.in/Cost\\_of\\_Cultivation.htm](https://eands.dacnet.nic.in/Cost_of_Cultivation.htm)



# Net returns (₹/ha)

[https://eands.dacnet.nic.in/Cost\\_of\\_Cultivation.htm](https://eands.dacnet.nic.in/Cost_of_Cultivation.htm)



## After 2005

1. Low stagnant yields in past 15 years
2. Despite more than 100% increase in fertilizer use
3. In 6 years: Bt-Resistant Pink bollworm (PBW)
4. Resurgence of sucking pests and PBW
5. Insecticide use has been increasing after 2005
6. In 13 years: 302% increase in cost of cultivation
7. In 15 years: 450% increase in labour costs
8. Negative net returns in 2014 & 2015
9. Hybrid seed costs: Trait fee Rs 7437 crores



# IS BT COTTON THE ANSWER FOR INDIAN COTTON WOES?

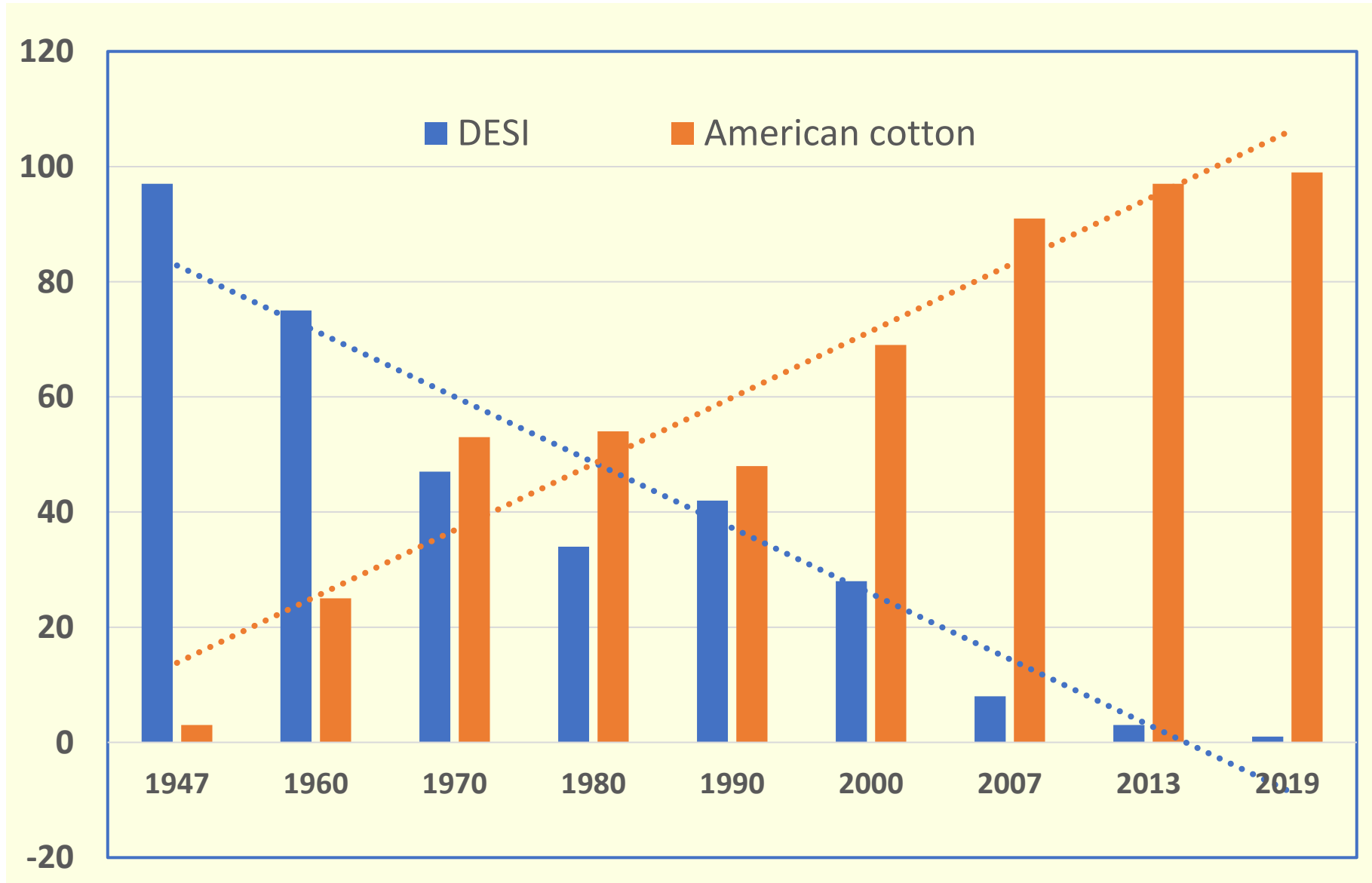
**No**

**India has the answers**

## India has the answers

1. Native Desi species
2. Enriching soil health
3. Conserving native friendly insects
4. Use the Indian Neem tree and selective insecticides
5. High Density short season cotton for high yields

# Desi cotton declined from 97% to 1%





# PA 812

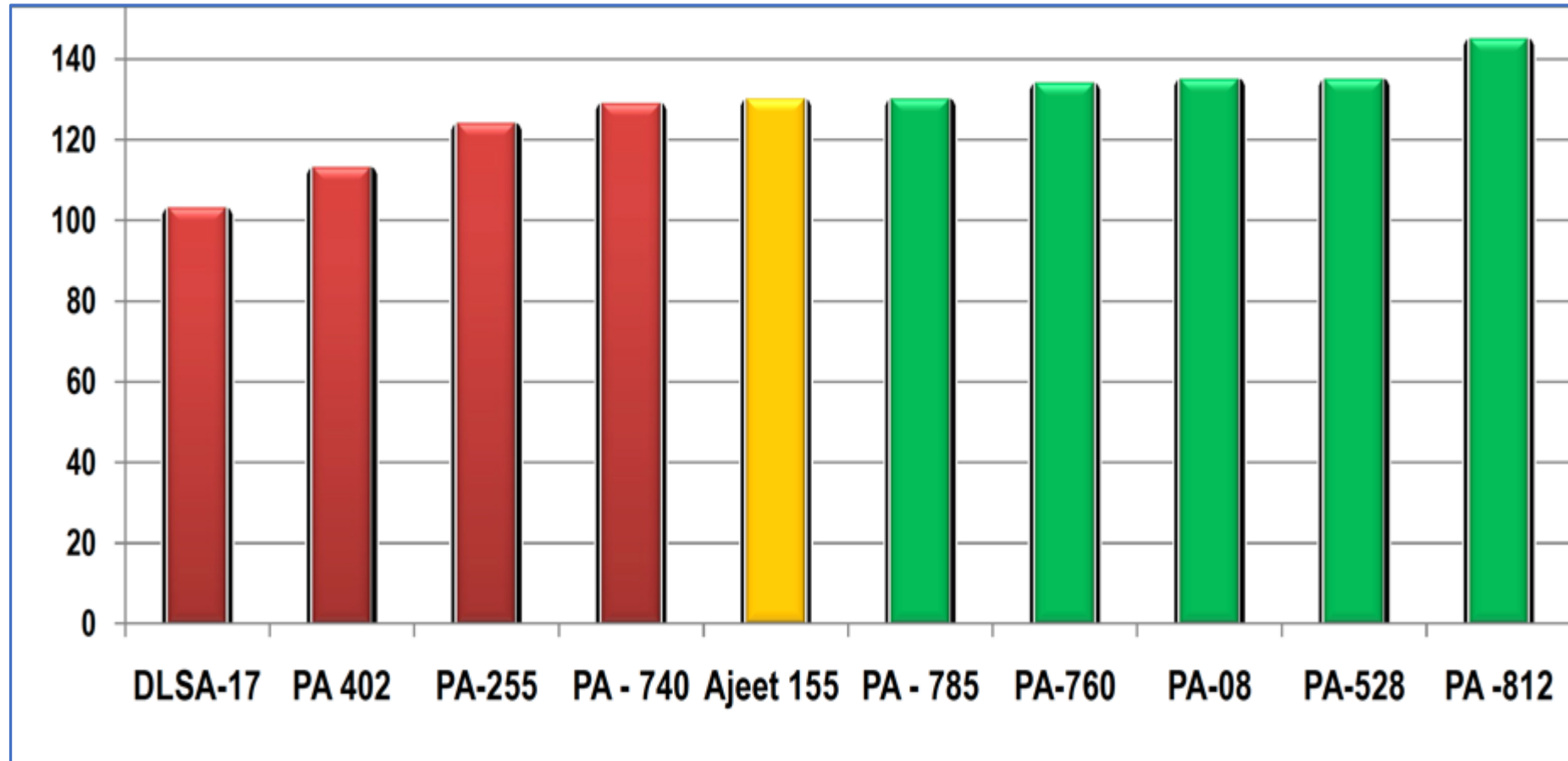
Fibre length

# 32<sub>mm</sub>

# Yield and fibre properties of new Desi varieties

Variety	Yield (Kg/ha)	Length (mm)	Mic	Strength g/tex
PA-255	1177	27.4	4.6	28.8
PA-08	1982	28.3	4.7	28.7
PA-528	1240	29	4.8	30.9
PA-760	1176	29.9	4.4	29.1
PA-402	1089	27.4	4.7	28.4
TKA-9102/3	977	29.7	4.5	30.2
DLSA-17	1138	29.5	4.6	29.6
PA-740	1312	28.3	4.7	31.1
<b>PA-812</b>	<b>1222</b>	<b>32.3</b>	<b>4.4</b>	<b>30.7</b>
<b>PA-785</b>	<b>1248</b>	<b>29.8</b>	<b>4.4</b>	<b>30.6</b>
<b>Ajeet-155 BG-II</b>	<b>928</b>	<b>29.1</b>	<b>4</b>	<b>28.4</b>

# Spinning consistency index of new Desi varieties



# Validation of HDPS in India 2016-2020

Scientists from all the cotton research stations in India validated the technology

Some examples:

S.No	Variety tested	Spacing	Check	Yield increase			State	References
				T	C	%		
1	CCH4474	90X10	75X45	32.20	26.84	<b>36.8</b>	Tamilnadu	Nalayani et.al., 2018
2	PKV081	60X10 BBF	60X10 Flat	31.34	21.84	<b>30.31</b>	MH (Vid)	Palaswar et.al., 2017
3	PKV081,NH615,Suraj	45X10	75X10	24.28	18.18	<b>25.12</b>	MH (Vid)	Parihar et.al., 2018
4	ARBC 64 / Bindas BG-II	45X15	90X60	26.12	20.35	<b>22.09</b>	Kar (Dha)	Harshana et.al., 2018
6	RAHC 1012	60X15	60X45	19.22	15.66	<b>18.52</b>	Kar (Rai)	Alur et.al., 2020
7	NH615	60X10	70x10	16.79	14.89	<b>11.32</b>	MH (Nan)	Pandangle et.al., 2020
8	Suraj	60X10	90x10	15.00	11.45	<b>23.67</b>	Telangana	Ramprasad et.al., 2019
9	TCH 1819	75X10	75X30	27.15	21.56	<b>20.59</b>	TN	U. Maheshwari et.al., 2019
10	Phule Dhanvantry	45X15	45X30	23.06	17.50	<b>24.11</b>	MH(Vid)	Blaise et.al., 2020
11	F2383	67.6X10	67.5X60	24.18	21.34	<b>11.75</b>	Raj	Singh and Singh, 2016



# Bt-Hybrids

1. Seeds will be unaffordable for high density
2. Low density planting and long duration
3. Pink boll worm damage
4. High fertilizer use
5. Higher sucking pest infestation
6. Increasing pesticide use
7. Stagnant yields

# Bt-Hybrids

1. Hybrids are unsuitable for rainfed
2. Hybrids represent 'value capture' to force recurrent use
3. Only seed companies have been promoting hybrids
4. China & Pakistan tested and abandoned hybrid technology
5. China has an area of less than 5.0% under Bt-hybrids

**India has all the answers  
It is just a matter of self belief, scientific  
efforts and time**

**Thank you**