

# The Story of American Bollworm

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He has received number of internationally reputed awards for his contribution to the research field.



Every 2nd week of the month, Dr. K.R. Kranthi would share his expert views on recent updates on cotton research).

### American bollworm does not exist in America

It is ironical that the 'American bollworm' never existed in America. The scientific name of the 'American bollworm' is Helicoverpa armigera. It is generally believed that the worm that voraciously feed on green bolls of cotton may have arrived from America and therefore the name 'American bollworm'. But this is not true because there was never a trace of this species in America. The species occurs in central and southern Europe, China, India, Pakistan, Nepal, Bangladesh, Africa, Australia, Newzealand and many other countries in Austral-Asia. It is interesting that the insect species acquired the false title of 'American' obviously without a passport, because it was observed as a pest, first on American cotton species in India during the early 1970s. The scientific name of American cotton species is Gossypium hirsutum. It was introduced into India by the East India Company in 1790. The British tried hard to cultivate the American cotton species in various parts of the country because it provided ideal raw material for the mills in Manchester and Lancashire. They did not actually succeed. When the British left India, only 2-3% of the area was under American cotton. The rest was under the native Desi species Gossypium arboreum and Gossypium herbaceum. The American cotton species now occupies 95% of the area in India.

## The American bollworm was not a major pest of Cotton in India before 1980

It is interesting that cotton was not listed as a host crop of Helicoverpa armigera in India by eminent entomologists Prof Lefroy and Prof Fletcher in the list of host crops prepared by them in 1906 and 1914 respectively. There were only two isolated references of Kaushik et al., 1969 and Manjunath, 1974 who reported occurrence of Helicoverpa armigera on Hybrid-4 cotton. Prof MRGK Nair listed Helicoverpa armigera as a minor pest of cotton in a text book published in 1975. The spectacular development of American cotton hybrid 'H-4' in 1970 by Indian scientists using signaled the arrival of Gossypium hirsutum hybrid cotton technology in India. The area under American cotton species was about 50% from 1970 to 1990. It was during this time that the cotton bollworm Helicoverpa armigera gained the status of a major pest. The occurrence was mainly on American cotton. By 1985 the American bollworm became a monster on cotton in India. The main probable reasons were theincrease in the area under American cotton hybrids coupled with introduction of synthetic pyrethroids into India in 1980. Synthetic

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pyrethroid insecticides were introduced to control the cotton leafworm Spodoptera litura, pink bollworm and spotted bollworm. Repeated application of pyrethroids caused outbreaks of Helicoverpa armigera by disturbing the natural control ecosystem which would otherwise keep American bollworms under check.

## Why is it difficult to control the American bollworm?

The American bollworm feeds on 181 plant species which includes weeds and crops. The insect can adapt in a vast range of temperatures from temperate to tropical climate. They are strong fliers and can fly for hundreds of kilometers. They undergo diapauses to overcome adverse conditions. Helicoverpa armigera has an enormous range of enzymes that confer it the capability to adapt to various crops and also to several insecticides that are used in pest management. Thus the worms (larvae) are a challenge for pest control specialists.

The pest finds food all round the year all across the country. The main crops subjected to severe damage are cotton, pigeonpea, chickpea and tomato. Other crops such as, cowpea, sorghum, maize, bajra, groundnut, bhendi, chillies, coriander and vegetable crops are also damaged. On cotton, each moth lays about 500 to 3000 eggs singly on leaves, buds, flowers and green bolls. After hatching the larvae scrape on leaves and 1-2 days later cause



severe damage to fruiting parts. The larva feeds on green bolls by keeping half its body outside. In the history of insect resistance to insecticides, Heicoverpa armigera tops the list with more than 650 reported cases of resistance, accounting for 6.0% of all reports on insecticide resistance. Thus the propensity to develop resistance is the highest in all the known insect species. In India the American bollworm was found to have developed resistance to all the recommended insecticides, except the recently released insecticides such as Spinosad, Indoxacarb, Rynaxypyr, Flubendiamide and Emamectin benzoate. The pest has strong potential to develop resistance in the shortest possible time to many pesticides. Over the past 3 decades, cyclic peaks of infestation were observed once every 5-6 years., mostly exacerbated because of insecticide interventions.

#### Bt Cotton and American bollworm

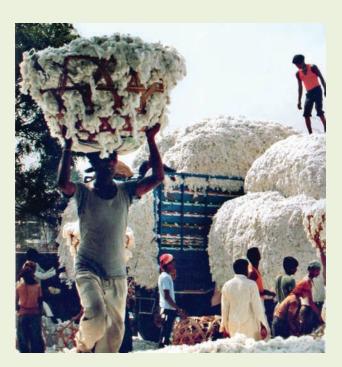
Over the past 10 years, Bt cotton has been effectively controlling the bollworm. Bollgard-II with two genes was introduced 7 years ago and confers excellent control efficacy apart from being an effective tool of resistance management. However, it is important to ensure that Insect Resistance Management (IRM) strategies are followed to delay the resistance development in the bollworms. The basic question is -Will the bollworm return back? The answer will be -Beware, this is one insect species whose potential to 'return back with vengeance' should never be underestimated.

## Demand for Cotton Seed Augurs Well for Good Acreage

The Association has recently released its monthly estimates for May of the cotton crop for the season 2012-13 season. The State-wise production estimates of the Association along with the market arrivals are given below:

CAI's Estimates of Cotton Crop										
as o	n 6th June									
		(iı	n lakh bales)							
State	Produ	ction	Arrivals as							
	2012-13	2011-12	on 31.05.13							
Punjab	15.50	18.00	15.25							
Haryana	23.50	27.50	22.25							
Upper Rajasthan	7.50	10.00	7.50							
Lower Rajasthan	8.00	7.75	8.00							
Total North Zone	54.50	63.25	53.00							
Gujarat	85.00	114.00	82.25							
Maharashtra	71.50	72.00	70.50							
Madhya Pradesh	18.00	18.00	17.50							
Total Central Zone	174.50	204.00	170.25							
Andhra Pradesh	74.00	58.00	70.00							
Karnataka	13.00	13.00	12.25							
Tamil Nadu	5.00	5.00	3.25							
Total South Zone	92.00	76.00	85.50							
Orissa	3.00	2.00	3.00							
Others	2.00	2.00	2.00							
Total	326.00	347.25	313.75							
Loose Cotton	26.00	26.00	26.00							
All-India	352.00	373.25	339.75							





The Association has also drawn the Cotton Balance Sheet for 2012-13 and 2011-12 which is reproduced below:

	(in lakh bales)
2012-13	2011-12
53.21	53.27
352.00	373.25
20.00	9.00
425.21	435.52
240.00	217.68
22.00	21.63
16.00	16.00
-	127.00
278.00	382.31
147.21	-
-	53.21*
	53.21 352.00 20.00 425.21 240.00 22.00 16.00 - 278.00

The Association released its May estimates (as on 31st May 2013) of the cotton crop for the season 2012-13. CAI has placed the cotton crop for the season 2012-13 at 352 lakh bales. The projected Balance Sheet drawn by the CAI for the year 2012-13 estimated the total cotton supply at 425.21 lakh bales while the domestic consumption is estimated at 278 lakh bales, thus leaving an available surplus of 147.21 lakh bales. The arrivals as on 31st May 2013 are placed at 339.75 lakh bales.

Looking at the reported demand for cotton seed, it is very likely that cotton is going to see once again a good acreage level in the ensuing season.

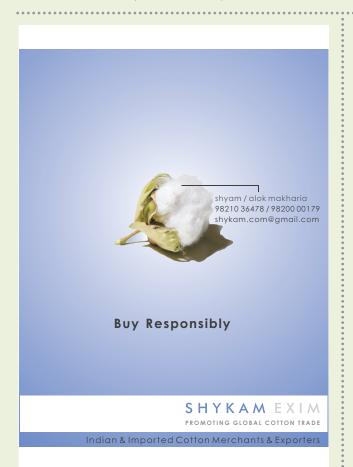
## Update on Cotton Acreage

(Area in lakh ha)

Sr.			Normal on	Area Sown				Difference in area compare to			
No		of Year*	Week**	2013	2012	2011	2010	Corr. Week	2012	2011	2010
1	2	3	4	5	6	7	8	9	10	11	12
	North West India										
1.	Haryana	5.82	4.49	4.50	4.82	5.5	3.14	0.01	-0.32	-1.00	1.36
2.	Punjab	5.24	4.70	4.20	4.00	4.5	5.59	-0.50	0.20	-0.30	-1.39
3.	Rajasthan	4.18	1.71	2.00	1.85	2.2	1.07	0.29	0.15	-0.20	0.93
4.	Uttar Pradesh		0.24	0.23	0.30	0.25	0.17	-0.01	-0.07	-0.02	0.06
	Central India										
1.	Gujarat	26.97									
2.	Madhya Pradesh	6.55									
3.	Maharashtra	40.71									
4.	Orissa	0.98									
	Southern Peninsula										
1.	Andhra Pradesh	20.09									
2.	Karnataka	5.28	0.59	0.77	0.79	0.68	0.30	0.18	-0.02	0.09	0.47
3.	Tamil Nadu	1.28									
	East & North East India										
1.	West Bengal										
	Others	0.43									
		117.53	11.72	11.70	11.76	13.13	10.27	-0.02	-0.06	-1.43	1.43

(\*Normal area mentioned above is average of three years (2010-11, 2011-12 and 2012-13) 3rd advance estimate, Source : DES, DAC, Krishi Bhawan)

(\*\* It is average of last three years (column Nos.6, 7 and 8) (Source: Directorate of Cotton Development, Mumbai)



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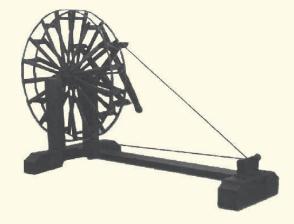
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## Cotton Production in the World: A Decade in Review

The International Cotton Advisory Committee (ICAC) has focussed on 2013-14 cotton production in its latest release of June 3 pertaining to world cotton situation.

The Cotlook A Index fell to around 90 cents per pound towards the end of May 2013, and the China Cotton Index (Type 328) fell to 19,350 yuan per ton, or 142 cents per pound, during the same period. Assuming the current Chinese reserve policy continues as announced by the government, the Cotlook A Index is projected to average 88 cents per pound in 2012-13 and 115 cents per pound in 2013-14.

An estimated 29.8 million hectares of cotton area is forecast in 2013-14. As a result, global cotton production is forecast to drop from a record of 27.8 million tons in 2011-12 to 26.4 million tons during 2012/-3, and further to 25 million in 2013-14.

Cotton planting in China for 2013-14 is almost complete. All planting is expected to be completed by the first week in June. In 2013-14, Chinese cotton planted area is projected at 4.6 million hectares, a 15 percent reduction from ten years ago; and production is forecast at 6.7 million tons, the second lowest crop in a decade.

Since 1955-56, India has led the world in cotton

area. However, with a 10-year yield average of 500 kgs. per hectare, India has the lowest yield among the top cotton producing countries. Cotton planting this season has been normal, but the monsoon will determine if last season's area can be maintained. In 2013-14, record cotton area is projected at 11.9 million hectares, up 51 percent from 2003-04; and cotton production is projected at 6.2 million tons, more than double the 3 million tons of production in 2003-04. However, the lack of rainfall has affected soil moisture in Gujarat, Maharashtra and Andhra Pradesh where area might be reduced by 5 percent to 10 percent.

In the United States, cotton was planted at a rapid pace in the month of May. In 2013-14, U.S. cotton area is projected at 3.4 million hectares, a 30 percent reduction from 4.8 million hectares ten years ago, and cotton production is projected to decline from 4 million tons in 2003-04 to 3 million tons in 2013-14.

In Pakistan, cotton is being planted at a good pace in Punjab and Sindh. In 2013-14, cotton area is projected at 2.9 million hectares, cotton yield at 708 kgs. per hectare and cotton production at 2 million tons, the same as the previous season and similar to the10-year average.

(Source: ICAC Monthly - 03.06.2013)



June 03, 2013								
Seasons begin on August 1					llion Metrie			
	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14		
				Est.	Proj.	Proj.		
BEGINNING STOCKS								
WORLD TOTAL	12.257	11.942	8.676	9.580	14.259	17.853		
China (Mainland)	3.321	3.585	2.688	2.087	6.181	8.931		
USA	2.188	1.380	0.642	0.566	0.729	0.876		
PRODUCTION*								
WORLD TOTAL	23.503	22.247	25.368	27.793	26.360	25.089		
China (Mainland)	8.025	6.925	6.400	7.400	7.300	6.700		
India	4.930	5.185	5.865	6.345	5.967	6.205		
USA	2.790	2.654	3.942	3.391	3.771	3.017		
Brazil	1.214	1.194	1.960	1.877	1.263	2.054		
Pakistan	1.926	2.070	1.907	2.294	2.093	1.422		
Uzbekistan	1.000	0.850	0.910	0.880	1.000	1.000		
Others	3.617	3.369	4.385	5.601	4.966	4.692		
CONSUMPTION*								
WORLD TOTAL	23.862	25.520	24.502	22.102	23.765	24.307		
China (Mainland)	9.265	10.192	9.580	8.635	8.290	8.041		
India	3.872	4.300	4.509	3.700	5.000	5.500		
Pakistan	2.519	2.393	2.100	2.163	2.444	2.493		
East Asia & Australia	1.714	1.892	1.796	1.646	1.858	1.923		
Europe & Turkey	1.458	1.600	1.549	1.495	1.509	1.553		
Brazil	1.000	1.024	0.958	0.888	0.897	0.918		
USA	0.771	0.773	0.849	0.718	0.740	0.740		
CIS	0.596	0.604	0.577	0.551	0.608	0.630		
Others	2.666	2.743	2.583	2.305	2.419	2.508		
EXPORTS								
WORLD TOTAL	6.609	7.798	7.636	9.819	9.693	9.041		
USA	2.887	2.621	3.130	2.526	2.885	2.333		
India	0.515	1.420	1.085	2.159	1.530	1.474		
Brazil	0.596	0.433	0.435	1.043	0.879	0.689		
Australia	0.261	0.460	0.545	1.010	1.100	1.238		
CFA Zone	0.469	0.560	0.476	0.592	0.787	0.959		
Uzbekistan	0.650	0.820	0.600	0.550	0.653	0.653		
IMPORTS								
WORLD TOTAL	6.647	7.928	7.725	9.794	9.693	9.041		
China	1.523	2.374	2.609	5.342	3.760	3.196		
East Asia & Australia	1.714	1.989	1.825	1.999	2.262	2.224		
Europe & Turkey	0.862	1.170	0.972	0.710	1.012	1.075		
Pakistan	0.417	0.342	0.314	0.191	0.521	0.519		
CIS	0.231	0.209	0.132	0.098	0.122	0.112		
TRADE IMBALANCE 1/	0.038	0.130	0.089	-0.025	0.000	0.000		
STOCK ADJUSTMENT 2/	0.007	-0.122	-0.051	0.013	0.000	0.000		
ENDING STOCKS								
WORLD TOTAL	11.942	8.676	9.580	15.259	17.853	18.636		
China (Mainland)	3.585	2.688	2.087	6.181	8.931	10.766		
USA	1.380	0.642	0.566	0.729	0.876	0.821		
ENDING STOCKS/MILL USE (%)								
WORLD-LESS-CHINA(M) 3/	57	39	50	67	58	48		
CHINA (MAINLAND) 4/	39	26	22	72	108	134		
Cotlook A Index 5/	61.20	77.54	164.26	100.01	88*			

SUPPLY AND DISTRIBUTION OF COTTON

1/ The inclusion of linters and waste, changes in weight during transit, differences in reporting period and measurement error account for difference between world imports and exports. Difference between calculated stocks and actual; amounts for forward seasons are anticipated.

2/

3/ 4/ World-less-China's ending stocks divided by World-less-China's mill use, multiplied by 100. China's ending stocks divided by China's mill use, multiplied by 100.

5/ U.S. Cents per pound

The price projection for 2012/13 is based on the ending stock/mill use ratio in the world-less-China in 2010/11(estimate), in 2011/12(estimate) and in 2012/13(projection), on the ratio of Chinese net imports to world imports in 2011/12 (estimate) and 2012/13 (projection), and on the average price for the first ten months of 2012/13. 95% confidence interval: 85 to 93 cents per pound

(Source : ICAC Monthly June 2013)

in Millir [ By law Sr. No. 1 P/H	metres based	d on Uppe 4) ] Grade/												
No. Gro			Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [ By law 66 (A) (a) (4) ]						Spot Rate (Upcountry) 2012-13 Crop June 2013					
	H/R	Standard	Grade	Staple	Micronaire	Strength /GPT	3rd	4th	5th	6th	7th	8th		
2 P/H		ICS-101	Fine	Below 22mm	5.0 - 7.0	15	10151 (36100)	10151 (36100)	10151 (36100)	10292 (36600)	10292 (36600)	10432 (37100)		
	H/R	ICS-201	Fine	Below 22mm	5.0 - 7.0	15	10404 (37000)	10404 (37000)	10404 (37000)	10545 (37500)	10545 (37500)	10686 (38000)		
3 GU	IJ	ICS-102	Fine	22mm	4.0 - 6.0	20	7311 (26000)	7311 (26000)	7311 (26000)	7311 (26000)	7311 (26000)	7311 (26000)		
4 KA	R	ICS-103	Fine	23mm	4.0 - 5.5	21	8548 (30400)	8548 (30400)	8548 (30400)	8548 (30400)	8548 (30400)	8548 (30400)		
5 M/	Μ	ICS-104	Fine	24mm	4.0 - 5.5	23	9589 (34100)	9589 (34100)	9589 (34100)	9589 (34100)	9589 (34100)	9589 (34100)		
6 P/H	H/R	ICS-202	Fine	26mm	3.5 - 4.9	26	10348 (36800)	10461 (37200)	10517 (37400)	10517 (37400)	10517 (37400)	10601 (37700)		
7 M/	/M/A	ICS-105	Fine	26mm	3.0 - 3.4	25	9617 (34200)	9758 (34700)	9758 (34700)	9758 (34700)	9758 (34700)	9758 (34700)		
8 M/	/M/A	ICS-105	Fine	26mm	3.5 - 4.9	25	10039 (35700)	10123 (36000)	10123 (36000)	10123 (36000)	10123 (36000)	10123 (36000)		
9 P/H	H/R	ICS-105	Fine	27mm	3.5 - 4.9	26	10489 (37300)	10601 (37700)	10657 (37900)	10657 (37900)	10657 (37900)	10742 (38200)		
10 M/	M/A	ICS-105	Fine	27mm	3.0 - 3.4	26	9842 (35000)	9983 (35500)	9983 (35500)	9983 (35500)	9983 (35500)	9983 (35500)		
11 M/	M/A	ICS-105	Fine	27mm	3.5 - 4.9	26	10320 (36700)	10404 (37000)	10404 (37000)	10404 (37000)	10404 (37000)	10404 (37000)		
12 P/H	H/R	ICS-105	Fine	28mm	3.5 - 4.9	27	10601 (37700)	10714 (38100)	10770 (38300)	10770 (38300)	10770 (38300)	10854 (38600)		
13 M/	M/A	ICS-105	Fine	28mm	3.5 - 4.9	27	10742 (38200)	10882 (38700)	10882 (38700)	10882 (38700)	10882 (38700)	10882 (38700)		
14 GU	IJ	ICS-105	Fine	28mm	3.5 - 4.9	27	10742 (38200)	10826 (38500)	10770 (38300)	10770 (38300)	10770 (38300)	10798 (38400)		
15 M/	M/A/K	ICS-105	Fine	29mm	3.5 - 4.9	28	10826 (38500)	10967 (39000)	10967 (39000)	10967 (39000)	10967 (39000)	10967 (39000)		
16 GU	IJ	ICS-105	Fine	29mm	3.5 - 4.9	28	10826 (38500)	10967 (39000)	10910 (38800)	10910 (38800)	10910 (38800)	10939 (38900)		
17 M/	M/A/K	ICS-105	Fine	30mm	3.5 - 4.9	29	10966 (39000)	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)	11107 (39500)		
18 M/N	M/A/K/T/O	ICS-105	Fine	31mm	3.5 - 4.9	30	11135 (39600)	11248 (40000)	11248 (40000)	11248 (40000)	11248 (40000)	11248 (40000)		
19 K/A	A/ T/O	ICS-106	Fine	32mm	3.5 - 4.9	31	11417 (40600)	11529 (41000)	11529 (41000)	11529 (41000)	11529 (41000)	11529 (41000)		
20 M(I	P)/K/T	ICS-107	Fine	34mm	3.0 - 3.8	33	13638 (48500)	13638 (48500)	13638 (48500)	13638 (48500)	13638 (48500)	13638 (48500)		

(Note: Figures in bracket indicate prices in Rs./Candy)