Weekly Publication of

Cotton Association of India

COTTON STATISTICS & NEWS

Edited & Published by Amar Singh

2016-17 • No. 3 • 19th April, 2016 Published every Tuesday

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Major Changes in Cotton Breeding Since 1970

A Professor and Agronomist in the Crop, Soil, and Environmental Sciences Department at the University of Arkansas, Dr. Bourland received B.S. (1970) and M.S. (1974) degrees from the University of Arkansas, and Ph.D. (1978) degree from Texas A&M University. His graduate school studies and career have focused on cotton breeding. He has developed several selection techniques, a cotton management program (COTMAN), and has released 79 cotton germplasm lines and four cotton cultivars. He also conducts cotton variety trials and serves as Center Director of the Northeast Research and Extension Center. He has authored or co-authored 87 refereed publications, 25 book chapters, 218 non-refereed publications and 108 abstracts. He received the ICAC International Cotton Researcher of the Year Award in 2010.

GUEST COLUMN

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For cotton to remain competitive, cotton cultivars must be bred to produce more cotton at lower costs and to produce enhanced fibre quality. Cotton breeding techniques relative to the mechanics of crossing and advancement of genetic lines have not changed since when I first became associated with cotton breeding in 1970. Available resources and specific breeding objectives dictate the exact procedures used within various breeding programs. However, the overall approach is similar across programs – crosses are made among parents differing for specific traits, segregating populations are grown, individual plants are selected from the segregating populations, seed from the individual plants are evaluated in progeny rows, seed from superior progeny rows are harvested and evaluated in replicated tests over multiple locations and years. The advent of transgenes into cotton has added an additional final step, i.e. backcrossing of transgenic genes into developed lines, into many programs prior to release of the cultivar.Six major areas of development that have occurred in cotton breeding since 1970 will be addressed in this paper.

1. Methods to Handle Samples

Personal computers, cone seeder planter units,and plot pickers with on-board weigh systems were not available in 1970 but have become standard equipment in most modern cotton breeding programs. Personal computers and associated equipment have facilitated rapid accomplishment of many time consuming, tedious tasks including randomising plots, printing (labels, field books, etc.), analyzing data, writing reports and generating presentations. Simple data analyses that might require several hours with a calculator are now completed with

a touch of a computer button. Some breeding programs now use bar coding to label seed cotton samples and/or subsequent fibre and seed samples. Bar coding helps to reduce errors, enhances speed of operation, and facilitates data entry.

Prior to the development of cone seeder planting units, plots were normally seeded by an individual "dribbling" seed through a funnel and pipe directly into the bed or through an adapted planter unit. Cone seeder planting units allow users to plant plots without stopping at each alley, thus greatly decreasing the time required to plant a test. By reducing the time required to plant, breeders can plant more plots with the same amount of resources. Vacuum planters that precisely distribute seed within a plot are now available, and can provide additional precision to breeding programs.

Most of the early progress is cotton breeding was accomplished by visual selection for yield. Visual ratings for yield are still sometimes used to advance lines, particularly in early generations. Bowman et al. (2004) found correlations between visual ratings and actual yields ranged from -0.22 to 0.70 across locations and breeders. Breeders differed in their ability to visually select high yielding genotypes.Three individuals with varying cotton breeding experience (ranging from >30 years to <1 year) visually rated progeny rows in Arkansas. Correlations with harvested yield increased slightly with years of experience. Considering only visual ratings, all three individuals would have discarded the highest yielding progeny row in the test. Breeding progress based upon visual ratings of yield may be limited to the cosmetic appearances of plants and bolls.

Mechanical plot pickers allow breeders to obtain accurate yield data at a much higher speed and lower cost than hand harvesting plots. The first mechanical plot picking machines required three to six persons on a two-row picker plus an additional crew to weigh and empty sacks. Presently available on-board weigh systems require only one person operating the machine, and thus can replace five to 10 persons using the old system. Since harvesting with an on-board weigh system does not physically tax the operator, the machine can operate more hours per day. The on-board weight system still requires the machine to stop, weigh, and dump samples between plots. Thus, the amount of time required to harvest plots with a weigh system is similar to using a picker modified to catch harvest in mesh bags. Increased efficiency in harvesting permits cotton breeders to expand testing and to obtain harvest weights in tests (e.g. progeny rows) where only visual estimation of yield was previously practical.

2. Development of Short-Season Cottons

All cottons possess indeterminate growth habits which means that vegetative growth continues (until cutout) after reproductive growth (fruiting) commences. To some extent, yield is enhanced as growing season lengthens, but costs and production risks also increase. Early maturing, short-season cottons became highly desired as the boll weevil (Anthonomousgrandis (Boheman)) advanced through the U.S. cotton belt in the early 20th century. Insecticide treatments for boll weevils would often exasperate other pests particularly the cotton bollworm, Heliocoverpazea(Boddie), and the tobacco budworm, Heliothisvirescens (F.), complex. Removing natural predation incited heavy infestation of this complex. The Heliothine complex quickly developed resistance to new insecticides and classes of insecticides as they became available.

In the 1960's, damages and increased control costs associated with boll weevil and the Heliothine complex was hindering the profitability of cotton production in the Mississippi River Delta of the U.S. In response to this problem, Dr. R.R. Bridge was employed by the Mississippi Agriculture and Forestry Experiment Station and given the challenge to breed short-season cottons. Bridge met that challenge by developing and releasing cotton cultivars that not only matured about 10 days earlier than standard cultivars, but also produced nearly 10% higher yields.

Bridge and McDonald (1987) documented that an unprecedented shift from full-season to short season cultivars had occurred in most U.S. cotton growing areas in a span of about 10 years. This shift was primarily driven by economics and insect pest management. Parvin et al. (1987) indicated that a1-week earlier crop maturation was accompanied by a 7% increase in yield, 8% increase in net revenue, and a 27-day shorter harvest season. A 2-week enhancement of maturity increased yield by 12% and net revenue by 13%. These benefits drove the shift from full-season to short-season cultivars. Short-season cultivars substantially decreased pest control, harvest and economic risks associated with cotton production.

3. Use of Morphological Traits for Host Plant Resistance

Great variation exists for morphological traits within the cotton germplasm, and variation for

these traits are available to cotton breeders. Jenkins and Wilson (1996) included morphological traits along with earliness, biochemical mutants, and exotic cytoplasms as sources of pest resistance in cultivated cottons. Most of morphological traits were found to infer increased resistance to one pest but increased susceptibility to another. For example, Frego (or rolled) bract was associated with increased resistance to boll weevil and the bollworm/tobacco budworm complex, but Fregobract lines were highly susceptible to tarnished plant bugs (Lyguslineolaris Palisot de Beauvois).

Several germplasm lines having single or combinations of the resistance traits (10 morphological traits and six cytoplasms listed) are available (Jenkins and Wilson, 1996). Of the 10 listed morphological traits, Upland cultivars having the pilose, Frego bract, red plant, yellow pollen, orange pollen, or male sterile traits have not been released. Cultivars possessing glabrous, okra-leaf, nectariless and high gossypol have been developed and made commercially available.

Morphological traits for host plant resistance is listed among the six major areas in this paper because of the time and effort that has been made to take advantage of the traits. The glabrous (smoothleaf) trait is the only one of these traits that has been widely utilised in commercial cultivars. Acceptance of the glabrous trait is based on its relation to improved cotton grades – less trash, less lint cleaning required - rather than its relation to host plant resistance. The low employment of these traits suggests that some traits may have negative relationships with yield and/or the optimum use of the traits will require more extensive evaluation on a system level that considers both agronomic and pest-related factors.

4. Advances in Fibre Testing – HVI and AFIS

Evaluation of cotton fibre quality has evolved from subjective determination of fibre quality by a cotton classer to sophisticated machine classing used throughout the industry today. The cotton classer would visually determine a grade for a cotton lint sample based color and trash. Fibre length was estimated by touch rather than sight. Cotton breeders would often take much time "pulling" and examining fibres when making individual plant selections. Micronaire, a measure of fineness of fibre based on resistance to airflow through a specified sample, became a part of the USDA Official Classification procedure in 1966, and soon became widely used by cotton breeders.

Cooperative efforts by USDA and equipment manufacturers began in the mid-1960's to develop High Volume Instrument (HVI) systems for classing cotton (Ramey, 1999). By 1991, USDA began classing allcotton samples provided to the department with the HVI system. Today, HVI class data are accepted throughout the world and is the foundation on which cotton is traded. With this broad use of HVI, genetic improvements of HVI-measured traits became important to cotton breeding programs. HVI-measured traits normally include micronaire, fibre length, length uniformity, strength, elongation, and short-fibre index.

The Advanced Fiber Information System (AFIS) was developed by the cooperative efforts of USDA Agricultural Research Services at Clemson, SC, and Schaffner Technologies, with research beginning in 1982 (Bragg and Shofner, 1993). AFIS provides data regarding about 20 fibre properties based on individual fibre analysis, but does not include measurement of tensile properties of the fibre. AFIS requires extensive and careful preparation of samples, and considerable time to evaluate a sample. Thus, time and cost of obtaining AFIS data are much greater than obtaining HVI data. Kelly et al. (2012) found that improvement in fibre length could effectively be done using either HVI or AFIS data, and that differences in fibre quality improvement were minimal between the two fibre testing methods.

5. DNA Marker Assisted Selection

Efficiency of selection is a fundamental component for trait improvement. Selection can be highly efficient for traits such asmorphological traits for which there are visual clues. Selection efficiency is, however, reduced in situations where accuracy and/or precision of trait measurement is affected by environment or is difficult to measure due to time, cost, or subjectivity in scoring.

Markers based upon polymorphism at the DNA level are increasingly being used in cotton breeding to follow specific traits, monitoring transgenic trait introgression, constructing genetic maps, in maintaining genetic purity via fingerprinting, and in studies on the evolution and diversity within the genus Gossypium. The status of marker availability and their use has recently been reviewed by Rahman et al. (2009) and markers associated with numerous yield, fiber quality, and biotic/abiotic traits have been identified (Mei et al., 2014). Marker assisted selection is now being advanced, and is being used by many cotton breeders to enhance efficiency of selection by identifying individual plants that

likely possess desired genes rather than simply identifying ones that possess desired phenotype. Marker assisted selection is still in its infancy, but provides great promise for future development.

6. Advent of Transgenic Cotton Cultivars

Undoubtedly, the greatest change that has occurred in cotton breeding since 1970 has been the introduction of transgenic cultivars in the 1990's. Since they became commercially available in Arkansas, transgenic cultivars increased from less than 1% of cotton acreage in 1995 to more than 99% in 2004. Similar shifts have occurred in most areas of the U.S. Transgenes inferring insect resistance (BT genes) and tolerance to specific herbicides are now widely available in well-adapted cultivars.

The first transgenic cultivars were simply established older cultivars (recurrent parents) with an additional transgene inserted. Several studies showed that agronomic performances of the transgenic cultivars were similar to their recurrent parent (e.g, Bourland et al. 1997; Bryant et al. 2003, May et al., 2003). To some degree, these similarities facilitated quick acceptance of the new transgenic cultivars. Most transgenic cultivars are still derived from backcrossing transgenes into conventional lines rather than by forward crossing. Thus, conventional cotton breeding techniques are still widely used through the industry. As soon as a promising conventional line is identified, specific transgenes are inserted using an aggressive backcross program.

A growing problem with the transgenic technology is the adventitious presence of transgenes. In the past, accidental crossing of genotypes increased diversity, and probably led to many improved cultivars. Such accidental crosses have sometimes provided unexpected combinations of traits, but were of little concern to the cotton breeding community. However, the transgenes now serve as clear markers unintended introgression, and have produced practical and legal restraints to breeding. Maintaining pure lines requires careful attention from the initial cross through seed increases of selected lines.

Conclusion

Amazing changes have occurred in cotton breeding over the past 45 years. These changes have been enabled breeders to handle many more number of plots and to better identify and measure variation, which has led to improved cultivars. As new methods are refined and established, cotton breeding certainly has a bright future.

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Courtesy : Cotton India 2015-16

(The views expressed in this column are of the author and not that of Cotton Association of India)

Cotton arrivals continue to lag behind in 2015-16 season

The Cotton Association of India (CAI) has released its March estimate of the cotton crop for the 2015-16 season, which began on 1st October 2015. The CAI has placed its March estimate of the cotton crop for the 2015-16 season at 341.00 lakh bales of 170 kgs. each. The projected Balance Sheet drawn by the CAI estimated total cotton supply for the season 2015-16 at 428.60 lakh bales while the domestic consumption is estimated at 305.00 lakh bales thus leaving an available surplus of 123.60 lakh bales. A statement containing the State-wise estimate of the cotton crop and the Balance Sheet for the season 2015-16 with the corresponding data for the previous crop year is given below.

The arrivals of cotton during the ongoing 2015-16 season continue to lag behind the last year. The arrivals during 2015-16 season upto the end of March 2016 which are estimated at 280.15 lakh bales are lower by about 12% than 318.45 lakh bales arrived upto the same period last year. This reduction in arrivals during the ongoing cotton season is a clear indication of a lower crop this year.

CAI's Estimates of Cotton Crop as on 31st March 2016 for the Seasons 2015-16 and 2014-15

(in lakh bales)

State	Production *		Arrivals As on 31st March 2016 (2015-16)
	2015-16	2014-15	
Punjab	8.25	13.00	7.80
Haryana	16.00	23.50	13.85
Upper Rajasthan	5.25	6.50	4.70
Lower Rajasthan	10.50	10.50	10.25
Total North Zone	**40.00**	**53.50**	**36.60**
Gujarat	93.00	108.00	73.15
Maharashtra	77.50	78.50	63.25
Madhya Pradesh	19.00	18.00	16.40
Total Central Zone	**189.50**	**204.50**	**152.80**
Telangana	56.50	55.25	47.50
Andhra Pradesh	23.00	25.75	17.50
Karnataka	19.00	30.50	16.00
Tamil Nadu	7.00	7.25	4.50
Total South Zone	**105.50**	**118.75**	**85.50**
Orissa	4.00	4.00	3.25
Others	**2.00**	**2.00**	**2.00**
Total	**341.00**	**382.75**	**280.15**

*Note: (1) * Including loose*

(2) Loose figures are taken for Telangana and Andhra Pradesh separately as proportionate to the crop for the purpose of accuracy

The Balance Sheet drawn by the Association for 2015-16 and 2014-15 is reproduced below:-

(in lakh bales)

Details	2015-16	2014-15
Opening Stock	73.60	53.85
Production	341.00	382.75
Imports	14.00	12.00
Total Supply	**428.60**	**448.60**
Mill Consumption	271.00	278.00
Consumption by SSI Units	24.00	27.00
Non-Mill Use	10.00	10.00
Exports		60.00
Total Demand	**305.00**	**375.00**
Available Surplus	123.60	
Closing Stock		73.60

COTAAP Corner

Events for March- April 2016

The cotton crop season is almost over. Farmers are busy harvesting the *rabi* crop and preparing the land for the *kharif* season. The farmers, along with the COTAAP team and the Coordination Committee members are reviewing the efforts taken last year and searching for better options in crop, variety and practices. Meetings are being conducted with farmers to find out the facts and problems faced by them in order to solve these through improved technology.

Anti-contamination awareness training programme No 2

Under the PPP-IAD project of COTAAP funded by the Department of Agriculture, Maharashtra State, a specially formulated training programme has been completed successfully. In its three phases, the programme covered ways of creating awareness amongst farmers regarding identification and control of diseases and pest, proper methods of harvesting and anti-contamination practices.

The last phase was conducted on 23rd February 2016 at Akulkheda village. Dr. G. R. Anap, Scientist, CIRCOT, interacted with farmers during this training. Prior to the program, Dr. Anap visited the COTAAP campus and saw the cotton samples collected by COTAAP staff over the last four years. He was appreciative of the efforts taken and proposed that a project on testing fibre quality of the collected cotton could be conducted in collaboration with CIRCOT. A periodical qualitative analysis of stored samples will be a valuable database for researchers and stakeholders in the cotton industry. Dr. Anap also had an informal meeting with members of the coordination committee.

Along with Dr. Anap, COTAAP Trustee, Shri. Pradipbhai Gujarathi, Taluka Agriculture Officer, Shri. D. K. Kadlag and advisor of COTAAP Shri Vasantbhai Gujarathi were present as chief guests for the programme. During the training, Dr. Anap covered in detail topics like the importance of clean cotton, different types of contaminants of cotton; care to be taken to avoid contamination, etc.

Shri. D. K. Kadlag expressed his satisfaction over the way the PPP project was being implemented by COTAAP. The cotton harvesting bags provided by COTAAP to the beneficiaries of PPP project were also displayed as a novel means to avoid contamination in cotton.

The cotton plucking machines COTAAP purchased from SIMA were demonstrated at the programme venue. Overall, the interactive programme not only showed farmers how to harvest, store and transport avoiding contamination, but also helped the experts to realise the problems faced at field level by farmers during the harvesting process.

AICRP meet

The All India Co-ordinated Research Project annual meeting was held from 7th to 9th of April 2016 at APMC, Krushi Bazar, Surat. Scientists from different cotton research stations across India presented and discussed the research conducted during the year 2015-16 and what would be the direction of research of All India Coordinated Research Project in the year 2016-17. The opening ceremony was conducted in the presence of Dr. A. N. Sabbalpara (Director of Research, NAU, Navsari), Dr. A. H. Prakash (Project Coordinator, AICRP, Coimbatore), Dr. K. R. Kranthi (Director, CICR, Nagpur), Dr. P. G. Patil (Director, CIRCOT, Mumbai), Dr. C. J. Dangria (V.C., NAU, Navsari), Shri. Ramanbhai Patel (President, APMC, Surat).

Impressed by the effective work done in the field of agricultural extension, COTAAP was invited by AICRP to attend the meeting and was represented by Prof. Prashant Vijay Bhavsar, Coordination

Speakers at the training programme.

Farmers attend the training programme at Akulkheda

Committee member of COTAAP Research Foundation. The main aim was to know the latest findings and recommendations by the scientists and to formulate package of practices to be recommended for the coming season. There was special focus on the pink boll worm, and its alarming outbreak in certain parts of India. Sessions for day one included - Review of Results of AICRP trials during 2015-16, Public Private interaction meets, Discussion on key issues of cotton and Central variety identification committee meets. Sessions for day 2 included discipline wise discussion of results of 2015-16 and formulation of technical programme for 2016-17 in four different subjects - Plant breeding, Agronomy, Agricultural Entomology and Plant Pathology.

The pink bollworm and whiteflies have created havoc all over India. Since pink bollworm is seen as a major problem in the Chopda region, COTAAP is planning to implement a "Pink Bollworm awareness program".

Our representative attended the Entomology sessions on second day, conducted by Dr. Sandhya Kranthi, Dr. B. Dharajyoti, Dr. Rishikumar and Dr. H.R. Desai. The latter pointed out that research on pink bollworm has started from 2015-16, that training programmes for farmers were being arranged and Pheromone traps were also being distributed to them. Meetings were being conducted for ginners to create awareness about cleanliness at ginning level, and to advise them to destroy cotton squares at gin level and set light traps to break dormancy of pest.

Since whiteflies and pink bollworms are the major menaces faced by cotton farmers, the following points of interest were noted during these two sessions.

Topic : Whiteflies

Conducted by : Dr. Rishikumar

Causes of severe incidence of white flies in North India :	Remedies Suggested :
1. > Congenial climate for eruption of white flies (rainfall followed by high humidity) 2. > Susceptible hybrids. 3. > Delayed sowing. 4. > Excessive application of nitrogenous fertilizers and insufficient application of P and K. 5. > Use of pyrathroids, acephate, fipronil and mixtures of pesticides. 6. > Pesticide resistance developed in insects. 7. > Incorrect methods of spraying.	1. Use of resistant varieties e.g. Amravati, Kanchan, Supriya, LPS 144. 2. Use of Neem oil + Soap or washing powder in early stages. 3. Using pesticides like Pyriproxifel, Buprofezin, Diafenthiurion, Spiromesifen, Ethion or Triazophos.

Topic : Pink Bollworm

Conducted by : Dr. C. J. Dangria, Dr. R. P. Singh and Dr.K. R. Kranthi

Reasons for severe incidence of pink bollworms in India	Remedial Measures Suggested.
1. > Early sowing and late harvesting is responsible for its spread through generation to generation. 2. > Pink bollworm is more serious pest than white flies. 3. > Pink bollworm has acquired resistance to Bt technology. 4. > At the time of introduction of Bt cotton technical knowledge was not provided to the farmers about importance of sowing refuge for sustenance of Bt technology. 5. > Use of insecticides in early stages of cotton invites pink bollworm. 6. > Mono + Acephate combination kills the natural enemies along with sucking pest on cotton. It also converts early varieties into late varieties by inducing vegetative growth and resulting in less square and ball formation on cotton plant. 7. > Farmers are not able to detect pink bollworm in early stages of cotton. 8. >Monocropping i.e more and continuous coverage of cotton (on vast cultivable land) and lack of crop rotation is resulting into low yield of cotton. 9. > Varietal problem i.e short duration of long duration varieties sown in the same area. So there is no break up for the life cycle of pink bollworm. 10. > The ginning mills were also one of the sources of infection. 11. > Ignorance of farmers to sow refuge at border is also one of the reasons of infection.	1) Refugee seeds must be sown. 2) Use of Pheromone traps to and light traps to farmers. 3) Ginners should be advised. 4) No early sowing and no late harvesting (Further rocrop should be avoided). 5) Select short duration and resistant varieties. 6) Biological controls – Trichograma bactrii. Use of Beveriabassiana, Verticiliumlecanni, etc. must be practiced. 7) Use of pesticides like Quinalphos, Chloropyriphos, Thiodicarbetc should be advised. Unnecessary mixing of insecticides should be avoided.

SAGA OF THE COTTON EXCHANGE

By Madhoo Pavaskar

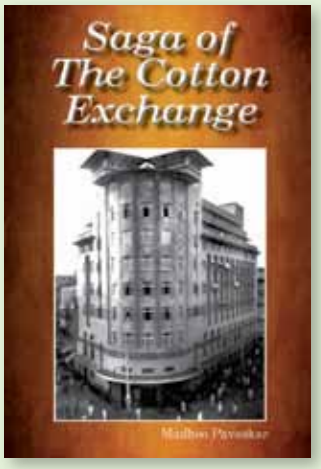
Chapter 8

Death of a Futures Market

(Contd. from Issue No.2 dtd. 12.04.2016)

Death of Cotton Futures

Not that Mr. Natu was unaware of the dissatisfactory nature of the hedge contract devised by the East India Cotton Association at the instance of the Forward Market Commission. But he appeared to be helpless in the new politico-economic environment, where the emphasis was on building a socialistic pattern of society through controlling the channels of distribution rather than the means of production. The inevitable consequence of this policy was the frequent and unwarranted intervention in the working of the market mechanism in the hope that such intervention can assist in stabilising commodity prices and bring about a more equitable distribution of the available supplies among the consumers.



Far from developing the commodity futures markets with a view to improving their hedging and pricing efficiency, the Forward Market Commission became an instrument to implement the government policy of controlling the market mechanism, which as later events showed neither brought about any distributive justice nor resulted in efficient allocation of resources. With low relative price ceilings on cotton, while the cotton production stagnated from the late fifties to the late sixties, the supply of cloth failed to increase. Consequently, both the cotton growers and consumers suffered.

True, the Indian Cotton Contract ran without much difficulty through the 1957-58 and 1958-59 cotton seasons — thanks to the comparatively satisfactory crop situation during these two years. Yet, even Mr. Natu frankly admitted that "while the existing contract has been found to be a workable contract, it appears to be unsatisfactory from the point of view of hedging. The basis of the contract, viz. Moglai Jarilla 25/32" is one of the most inferior varieties. There is too large a difference between the price of the basis variety and the price of the most superior variety tenderable against the contract and consequently the hedge contract price is unable to reflect the general level of cotton prices."

Mr. Natu was clearly in a dilemma. As he puts it: "In evolving a satisfactory hedge contract at the East India Cotton Association, there has been a conflict between two considerations, viz. framing a balanced and realistic contract and framing a contract which would curb inflationary pressures within the economy and exert a sobering influence on prices. Experience has shown that it is extremely difficult to reconcile these two considerations when the commodity concerned is in short supply, the demand for it is on the increase and the prices showed an upward tendency."Unfortunately, in consonance with the avowed government policy, Mr. Natu opted for a contract which he honestly believed could help curb the inflationary pressures raging in the economy. The result was the evolution of an unrealistic hedge contract, which discouraged not only speculation but hedging as well. On the top of it, the contract was continuously subjected to such severe restrictions as special margin deposits and ceilings within ceilings, which tended to reduce the liquidity of the market year after year, as may be seen from Table-2, which summarises the data on the total tenders issued against the hedge contract and the amounts cleared each year at the Clearing House of the Cotton Exchange.

Table-2 vividly discloses that both the amounts cleared and the tenders issued declined considerably since 1954-55. This decline evidently reflects the fall in the volume of business in the cotton hedge contract traded at the East India Cotton Association. And when it is recognised that this fall coincides with the onset of regulation by the Forward Markets Commission, it is at once clear that a noose was slowly being tightened around the neck of the cotton futures market in Bombay from year to year. Not only did the market function under severe constraints imposed by the Forward Markets Commission through various

TABLE-2

Tenders Issued and Amounts Cleared Against Hedge Contracts at EICA, 1940-41 to 1965-66

Year	Tenders (in bales)	Amounts Cleared (Rs. crorers)
1940-41	3,39200	8.67
1941-42	3,46,800	8.73
1942-43	36,350	11.67
1943-44	1,01,750	3.10
1944-45	4,87,750	8.65
1945-46	3,54,050	10.45
1946-47	1,78,850	7.92
1947-48	1,21,050	19.75
1948-49	-	2.77
1949-50	-	0.30
1952-53	1,19,500	3.95
1953-54	1,63,850	7.09
1954-55	33,100	5.66
1955-56	-	4.12
1956-57	18,700	4.82
1957-58	14,250	3.35
1958-59	17,350	3.48
1959-60	4,700	1.93
1960-61	2,800	2.00
1961-62	-	0.85
1962-63	9,300	2.03
1963-64	45,050	2.19
1964-65	6,550	0.88
1965-66	9,300	0.43

Note : Hedge trading was not permitted in 1950-51 and 1951-52.

regulatory measures, but since 1959, on quite a few occasions, the Commission asked the EICA to skip different deliveries of the hedge contract for fear that they may aggravate the rising trend in cotton prices. Besides, at several other times, though the hedge contract was permitted, it was mostly limping with little trading in it, as prices had already reached the prescribed ceilings. Small wonder, not infrequently the trading hall of the Cotton Exchange gave a deserted look.

In the circumstances, it is not surprising that the Commission finally decided to use its rope to put an end to the cotton futures market in Bombay. The cotton crop in 1965-66, the last year in which the cotton hedge contract was permitted, was only 4.8 million bales, compared to 5.6 million bales in the immediately preceding year. Fearing a short crop for the second year in succession in 1966-67, the Commission did not allow the East India Cotton Association to open its hedge contract during that season. Since then, though futures trading in cotton has not been statutorily banned under the Forward Contracts (Regulation) Act, such trading has never been permitted.

All efforts by the East India Cotton Association to revive futures trading have thereafter been in vain. Even the two expert committees—one headed by the renowned agricultural economist Prof. M.L. Dantwala in 1966 and the other more recently in 1981 headed by the eminent economist Prof. A.M. Khusro, who later became Member of the Planning Commission—recommended the resumption of futures trading in cotton to ensure orderly marketing in the commodity. But these recommendations too fell on the deaf ears of the authorities. Truly, the cotton futures market at Bombay, which functioned for more than a century and at one time became the largest market in Asia, breathed its last in 1966. Surprisingly, the authorities still seem to believe that the absence of such a market can yet pave the way for price stability in cotton, which has continued to elude the economy even after nearly two decades of the death of cotton futures. Meanwhile, the trading hall at the Cotton Exchange Building, which once echoed the deafening noises of cotton traders through the length and breadth of Kalbadevi Road, is now silent and houses a branch office of a nationalised bank. Alas! King Cotton lost his throne.

The Dirge on Futures

The strategy of co-operation, instead of confrontation, adopted by Mr. MadanmohanRuia with the Forward Markets Commission, after the exit of Sir Purshotamdas from the East India Cotton Association, no doubt did not succeed in the end in the face of the populist pressures on the government. But it still led to the survival of the cotton futures market for almost a decade after Mr. Ruia assumed the reins of the Cotton Exchange, True, the market functioned under severe strains. Yet, astonishingly, it fulfilled to a great extent its role during those hard times. It would therefore not be out of place to sing a dirge on cotton futures, especially since its role has still not been understood in many a quarter.

A study of profits and losses from hypothetical hedges in the cotton futures market at Bombay for six seasons, namely, 1953-54, 1954-55, 1956-57, 1957-58, 1958-59 and 1962-63 (the years when the market

functioned relatively more actively) disclosed that the Indian Cotton Contract offered adequate hedging protection to the short basis hedgers (like mills and those merchants who make forward sales of cotton mills on delivery contracts and enter into long hedges), though it discouraged indiscriminate long-basis hedging on the part of cotton merchants and stockists.Moreover, even if the returns to the long basis hedgers (who hedge their stocks and forward purchases through sales in the futures market) were by and large negative on stereotyped hedging due to the 'bearishness' of the cotton hedge contract, it should be recognised that in practice hedges are always discretionary and selective. Hence, merchants and stockists place short hedges (sell futures) only when their stocks are large and the market is expected to move adversely to their detriment. The fact tenders were issued from time to time against the cotton hedge contract also clearly evidences the selective use of the cotton futures market by the dealers and stockists, notwithstanding that the hedge contract as designed was unfavourable to them.

Apart from its hedging utility, albeit limited, there is reason to believe that the cotton futures market may have also partly reduced the seasonal variations in the ready price of cotton. A study of seasonal variations in wholesale prices of certain commodities carried out by the Reserve Bank of India in 1965 indicated that the amplitude of seasonal fluctuations in wholesale prices (i.e. differences between the minimum and maximum of seasonal indices) of commodities like cotton, served by well-knit futures markets, was much smaller than in major food crops like rice and wheat which had no organised futures markets.In fact, among individual commodities, the average amplitude of seasonal fluctuation in wholesale prices for the period from 1951-52 to 1964-65 was the lowest for raw-cotton, being only 4.2 per cent. Although several factors besides futures trading may account for the small seasonal swing in cotton prices, the available data clearly indicated that the functioning of the cotton futures market had in no way widened the seasonal variations in cotton prices, as erroneously feared by the Forward Markets Commission.

Evidently, the conflicting allegations that the cotton futures market functioned against the interests of the cotton growers or those of the consumers of cloth were ill-founded. Paradoxical though it may seem, the demise of the cotton futures market in 1966 had hurt the cotton growers and cloth consumers far more than either the cotton merchants or the mills.

Cotton Consumption - Cotton Year-wise

(In Lakh bales)

Month	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15 (P)	2015-16 (P)
Oct.	17.33	18.32	16.54	18.13	22.09	17.77	21.84	24.03	24.17	24.70
Nov.	17.81	16.94	16.94	18.47	21.09	18.34	21.09	22.96	25.05	23.34
Dec.	18.49	18.86	17.98	19.49	22.57	20.13	22.63	25.16	25.89	25.43
Jan.	18.22	18.54	16.93	19.54	22.1	20.33	23.3	25.19	25.77	25.15
Feb.	17.11	18.14	16.23	18.81	20.23	20.31	22.24	23.22	24.58	24.51
March	18.39	18.45	17.51	20.01	21.77	20.38	23.61	25.07	26.18	
April	18.06	17.98	17.12	20.53	20.17	20.31	23.22	24.32	25.57	
May	17.89	18.95	17.83	20.93	18.64	21.27	22.85	24.38	25.62	
June	17.85	18.55	18.01	20.71	18.23	21.17	22.51	24.11	25.61	
July	18.42	18.5	18.98	22.11	19	22.14	24.11	24.54	25.56	
Aug.	18.58	17.62	18.59	21.73	18.64	22.08	24.23	24.46	25.86	
Sept.	18.03	16.9	18.29	21.42	21.71	21.46	23.7	25.81	24.58	
Total	**216.18**	**217.75**	**210.96**	**241.88**	**246.23**	**245.47**	**275.34**	**293.24**	**304.43**	**123.13**

(P) = Provisional

Source: Office of the Textile Commissioner

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UPCOUNTRY SPOT RATES

(Rs./Qtl)

Sr. No.	Growth	Grade Standard	Grade	Staple	Micronaire	Strength /GPT	Spot Rate (Upcountry) 2015-16 Crop APRIL 2016					
							11th	12th	13th	14th	15th	16th
1	P/H/R	ICS-101	Fine	Below 22mm	5.0-7.0	15	8492 (30200)	8492 (30200)	8492 (30200)	8633 (30700)	H	8633 (30700)
2	P/H/R	ICS-201	Fine	Below 22mm	5.0-7.0	15	8633 (30700)	8633 (30700)	8633 (30700)	8773 (31200)		8773 (31200)
3	GUJ	ICS-102	Fine	22mm	4.0-6.0	20	5540 (19700)	5540 (19700)	5624 (20000)	5624 (20000)		5568 (19800)
4	KAR	ICS-103	Fine	23mm	4.0-5.5	21	7227 (25700)	7227 (25700)	7311 (26000)	7311 (26000)	O	7255 (25800)
5	M/M	ICS-104	Fine	24mm	4.0-5.0	23	8464 (30100)	8464 (30100)	8548 (30400)	8548 (30400)		8492 (30200)
6	P/H/R	ICS-202	Fine	26mm	3.5-4.9	26	9336 (33200)	9336 (33200)	9336 (33200)	9448 (33600)	L	9336 (33200)
7	M/M/A	ICS-105	Fine	26mm	3.0-3.4	25	7930 (28200)	7930 (28200)	8014 (28500)	8014 (28500)		7958 (28300)
8	M/M/A	ICS-105	Fine	26mm	3.5-4.9	25	8548 (30400)	8548 (30400)	8633 (30700)	8633 (30700)		8577 (30500)
9	P/H/R	ICS-105	Fine	27mm	3.5.4.9	26	9617 (34200)	9617 (34200)	9617 (34200)	9729 (34600)	I	9617 (34200)
10	M/M/A	ICS-105	Fine	27mm	3.0-3.4	26	8267 (29400)	8267 (29400)	8323 (29600)	8323 (29600)		8267 (29400)
11	M/M/A	ICS-105	Fine	27mm	3.5-4.9	26	8858 (31500)	8858 (31500)	8914 (31700)	8914 (31700)	D	8858 (31500)
12	P/H/R	ICS-105	Fine	28mm	3.5-4.9	27	9729 (34600)	9729 (34600)	9729 (34600)	9842 (35000)		9729 (34600)
13	M/M/A	ICS-105	Fine	28mm	3.5-4.9	27	9195 (32700)	9195 (32700)	9251 (32900)	9251 (32900)		9195 (32700)
14	GUJ	ICS-105	Fine	28mm	3.5-4.9	27	9251 (32900)	9251 (32900)	9308 (33100)	9308 (33100)	A	9280 (33000)
15	M/M/A/K	ICS-105	Fine	29mm	3.5-4.9	28	9505 (33800)	9505 (33800)	9617 (34200)	9617 (34200)		9589 (34100)
16	GUJ	ICS-105	Fine	29mm	3.5-4.9	28	9505 (33800)	9505 (33800)	9589 (34100)	9589 (34100)	Y	9533 (33900)
17	M/M/A/K	ICS-105	Fine	30mm	3.5-4.9	29	9701 (34500)	9701 (34500)	9786 (34800)	9842 (35000)		9814 (34900)
18	M/M/A/K/T/O	ICS-105	Fine	31mm	3.5-4.9	30	9954 (35400)	9954 (35400)	10039 (35700)	10095 (35900)		10095 (35900)
19	A/K/T/O	ICS-106	Fine	32mm	3.5-4.9	31	10320 (36700)	10320 (36700)	10404 (37000)	10404 (37000)		10404 (37000)
20	M(P)/K/T	ICS-107	Fine	34mm	3.0-3.8	33	13947 (49600)	13947 (49600)	13947 (49600)	13947 (49600)		13947 (49600)

Standard Descriptions with Basic Grade & Staple in Millimetres based on Upper Half Mean Length [By law 66 (A) (a) (4)]

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