

Economic implications of Indian cotton economy under WTO regime

ISABELLA AGARWAL*

Central Institute for Cotton Research, Regional Station, Coimbatore-641 003

**E-mail : is_agarwal@rediffmail.com*

ABSTRACT : The data pertaining to macro economic indicators like gross domestic products, exports and imports were collected for periods between 1980-1981 to 2010-2011. To study the implications of these changes on cotton production, the year 1994-1995 was bench marked. The years following 1980-1981 and preceding 1994-1995 were grouped as pre WTO period. The years after 1994-1995 till 2009-2011 were grouped as post WTO period. The post WTO period was bifurcated into pre *Bt era* (1995-1996 to 2001-2002) and post *Bt era* (2002-2003 to 2009-2011). The post *Bt era* showed an enormous increase in area, production and yield to the tune of 4.3 7, 9.72 and 5.12 per cent, respectively. The influx of *Bt* technology has been one of the factor in the phenomenal performance of cotton in India. Structural changes in costs are attributed to the changes in the quantity and quality of inputs associated with the technological process and also due to their prices. The changes in cost of cultivation and the relative shares of different inputs in the cost of cultivation of cotton at two points of time for all the eight cotton growing States showed that BC ratio was high during post *Bt era*. The changing pattern of raw cotton exports were estimated by obtaining the transitional probability matrices. The Markov chain analysis of raw cotton exports from India has indicated China as the most stable market which has depicted an increase in its import share from the pre-reform period to the post-reform period (*Bt era*).

Key words : Direction of trade, economics of production, WTO

Cotton is one of our largest agricultural crops and happens to be the mainstay of our textile sector, which is one of our largest manufacturing industries. Management of external trade plays an important role in this. The end of the Multi Fibre Agreement (MFA) and increased use of genetically modified (GM) cotton have profoundly altered world cotton markets in recent years. has long been the world's largest cotton producer and consumer, but in recent years its soaring economy and global textile trade liberalization have driven its cotton imports far beyond any other markets. World cotton trade is largely defined by its two dominant participants: China for imports and the United States for exports. Globally, more than 70 countries produce and export cotton. Of these, just eight countries are responsible for almost 80 per cent of global output China, the United States, India, Pakistan, Uzbekistan, Turkey, Brazil and Australia. Significantly, cotton remains the world's single

most important fibre in textile production, with a share of about 40 per cent in recent years. The world's cotton market is dominated by the USA, the third largest producer after China and India. The country exports almost 70 per cent of its cotton. The USA is followed by Uzbekistan, Australia, Brazil and Greece, in exports. These top five exporters contribute 70 per cent of all cotton exports. More recently, major cotton growers like China have also become significant importers, raising the imported share of consumption once again.

The Indian textile industry is the second largest in the world, second to China. The total supply of cotton in the market has got a boost not only because of liberalization in India but also because of industrialization and geographical change of mills. The elimination of quota restrictions under Multi Fibre Arrangement (MFA) and the implementation of World Trade Organisation (WTO) Agreement on Textile and

Clothing have increased the potential for global trade in textile thus providing greater export opportunity and at the same time exposing the domestic industry to higher import penetration. With the dismantling of the quota regime, the top textile importing countries like U.S.A. and the European Union are looking towards India for meeting their import requirements. China and India are the biggest winners of the withdrawal of the Multi-Fibre Agreement (MFA), since both countries currently face the highest export tax equivalent of quotas of between 9 per cent and 34 per cent. India has an abundant supply of locally grown long staple cotton, which provides India with a competitive edge for manufacture of wider width fabrics, as other countries, like China and Pakistan, have relatively lower supply of locally grown long staple cotton. However, India and China are the only two countries which have upgraded their technologies to the fullest and doubled their production levels since the past few years.

MATERIALS AND METHODS

With the above cotton trade scenario and projections, the present study is intended to bring about the prospects of Indian cotton in the domestic as well as world market and modalities for becoming the leading exporter of cotton in the international market. With these priorities under consideration, the following objectives have been formulated for the present study - to analyse the growth of production of cotton in India; to study the export and import structure of cotton in pre and post WTO periods and to assess the structure and direction of Indian cotton *vis-à-vis* other major cotton growing countries under changing trade scenario. The study is based on secondary data collected from various published sources for periods between 1980-1981 to 2010-2011. A combination of techniques like growth rate analysis, percentage analysis and first order

Markov model was used to analyse the data.

RESULTS AND DISCUSSION

1. Production performance of cotton in India

Analysis of growth of area, production, and yield of cotton was estimated for the period from 1980-1981 to 2010-2011. The total period was divided into three sub- periods as given below.

- (i) Pre WTO period (1980-1981 to 1994-1995).
- (ii) Post WTO period (1995-1996 to 2010 -2011).
 - a) Pre *Bt era* (1995-1996 to 2001-2002)
 - b) Post *Bt era* (2002-2003 to 2010-2011)

Growth rate was computed for the entire period from 1980-1981 to 2010-2011. With the implementation of the agreement on agriculture in 1994, the international trade opportunities are expected to change as trade barriers are reduced and freer trade takes place. To study the implications of these changes on cotton production, the year 1994-1995 was benchmarked. The years following 1980-1981 and preceding 1994-1995 were grouped as pre-WTO period. The years after 1994-1995 till 2010-2011 were grouped as post WTO period. The post WTO period was bifurcated into Pre *Bt era* (1995-1996 to 2001-2002) and post *Bt era* (2002-2003 to 2010-2011). The compound growth rates of area, production and yield of cotton are reported in Table 1.

During the pre WTO period, the area of cotton was almost stagnant around 7.82 in 1980-1981 to 7.87 mill ha. during 1994-1995 with a negative growth rate of 0.23 per cent. There was an increase in production (7 mill. bales to 12 mill bales) and yield of cotton (152 to 257 kg/ha) to the tune of 3.83 and 4.07 per cent respectively during the same period showing less impressive growth. The performance of cotton was quite enormous in the post WTO period between 1995-1996 to 2010-2011.

The area, production and yield had grown

Table 1. CGR of area, production, and productivity of cotton during pre and post WTO periods (%)

Period	Area	Production	Yield
Pre WTO period 1980-1981 to 1994-1995	-0.23	3.83***	4.07***
Post WTO period 1995-1996 to 2010-2011	0.85*	7.35**	6.45**
Post WTO period	Pre <i>Bt era</i> 1995-1996	to 2001-2002	
	-0.86*	3.44	4.37*
	Post <i>Bt era</i> 2002-2003	to 2010-2011	
	4.37***	9.72***	5.12***
Overall period 1980-1981 to 2010-2011	0.97	5.42**	4.41**

at 0.85, 7.35 and 6.45 per cent, respectively during post WTO period. Area under cotton increased to almost 11 mill ha, production to 33 million bales and yield around 500 kg/ha. Post WTO period was further bifurcated as pre *Bt era* (1995-1996 to 2001-2002) and post *Bt era* (2002-2003 to 2010-2011) to know the trend of cotton due to the advent of *Bt* cotton. During the pre *Bt* period, it was not a good picture for cotton as the area decreased to 8.73 mill ha from 9.04 mill ha showing a negative significant growth rate of 0.86 per cent.

The production and yield showed a minimal increase in growth rate to the tune of 3.44 and 4.37 per cent respectively. Unlike pre *Bt era*, the post *Bt era* showed an enormous increase in area, production and yield to the tune of 4.37, 9.72 and 5.12 per cent, respectively. The area increased from 7.67 per cent to 11 per cent, threefold increase in production from 13 to 33 mill bales and yield from 300 kg/ha to 502 kg/ha, respectively. The influx of *Bt* technology has been one of the factor in the phenomenal performance of cotton in India. Overall, the performance of cotton area, production and yield with lot of fluctuations in between has shown a

positive trend to the tune of 0.97, 5.42 and 4.41 per cent respectively.

2. Growth of exports and imports of cotton

With the substantial economic growth India has enjoyed over the past decade, Indian cotton consumption has risen 35 per cent. While impressive, this growth has been outpaced by the 105 per cent increase in production resulting from improved yields. India has thus enjoyed a surplus of production over consumption since 2003-2004, contributing to its emergence as one of the world’s top exporters of raw cotton. Among the most important destinations for Indian cotton exports (based on value) are China (46.7%), Pakistan (20.5%), and Bangladesh (12.1%).As given in Table II, during the pre WTO period, the imports were higher than the exports. The export was almost nil until 1995-1996. The imports increased from 7 lakh tonnes during 1980s to 13 lakh tonnes during 1990s. During the post WTO period, the quantity of imports almost remained stagnant at 13 lakh tonnes and gradually reduced during post *Bt era* from 17 lakh bales of 170kgs each to 5 lakh bales of 170 kgs each.

Due to increased yield during the post *Bt era*, the surplus could be diverted for export to the other countries namely China, Pakistan, Bangladesh, Indonesia and Thailand. China was working overtime to supply the West with clothes, textiles and furnishings. But it lacked cotton to meet this demand. So, when Indian production expanded, China became a natural outlet for it. Exports soared. Soon, India became the world’s

Table 2. Growth of exports and imports of cotton Import quantity (in Tonnes)

Pre WTO period		Post WTO period	
1980s	1990s	Pre <i>Bt era</i> (1996 to 2002)	Post <i>Bt era</i> (2002 to 2011)
71031	1330590	1388900	1291320
Export quantity (Tonnes)			
	Nil	392360	6512530

number two exporter after the United States. In late summer 2008, the Indian government increased the guaranteed minimum support price for cotton by 30 per cent to 50 per cent (depending on quality). When cotton prices collapsed last fall, it became more profitable for Indian farmers to sell their cotton to the Cotton Corporation of India or India's National Agricultural Marketing Federation than to sell it on the domestic or international market. Consequently, Indian cotton exports fell drastically (by 68%), from 7.0 million bales in 2007-2008 to 2.0 million bales in 2008-2009.

3. Changes in economies of production of cotton : Structural changes in costs are

attributed to the changes in the quantity and quality of inputs associated with the technological process and also due to their prices.

North zone : The results in the Table IIIa show the structural changes in the cost of cultivation of cotton in north zone comprising of Punjab and Haryana. The total cost of cultivation of cotton has gone up from Rs. in pre WTO period to Rs and Rs/ha in pre and post *Bt era* of post WTO period, respectively.. The increase has occurred in all major items of cost like human labour, bullock labour, seed, irrigation and fertilizer. Among operational cost items, human labour recorded the maximum share in the increase in the cost of cultivation over time.

Table 3a. Average cost structure and changes in economics of cotton cultivation in north zone during pre and post WTO period (Rs/ha)

Particulars	Pre WTO period		Post WTO period		Per cent share in total change	
	1980-1981 to	1995-1996	2002-2003			
	1994-1995	to 2001-2002	to 2010-2011	(b-a)/TC*100	(c-a)/TC*100	
	a	B	C			
Human labour	1961.98	5595.39	9424.66	32.17	28.15	
Seed	126.43	414.60	1923.30	2.55	6.78	
Plant Protection	560.88	2600.36	3025.82	18.06	9.30	
Others*	3894.70	9226.72	18682.38	47.21	55.78	
Total cost	6543.98	17837.06	33056.16	100.00	100.00	
Yield (qtl/ha)	11.60	8.89	16.02	-23.33	38.16	
COC	6543.95	17836.84	33055.26	172.57	405.13	
Gross return	9352.91	16108.77	37645.86	72.23	302.50	
B:C Ratio/ha	1.43	0.92	1.12			

Table 3b. Average cost structure and changes in economics of cotton cultivation in central zone during pre and post WTO period (Rs/ha)

Particulars	Pre WTO period		Post WTO period		Per cent share in total change	
	1980-1981 to	1995-1996	2002-2003			
	1994-1995	to 2001-2002	to 2010-2011	(b-a)/TC*100	(c-a)/TC*100	
	a	B	C			
Human labour	1394.57	3357.78	6783.05	30.63	27.28	
Seed	231.09	608.76	2021.56	5.89	9.07	
Plant protection	425.76	777.49	1130.05	5.49	3.57	
Others*	3669.73	7385.98	15537.31	57.99	60.09	
Total cost	5721.15	12130.01	25471.97	100.00	100.00	
Yield (q/ha)	6.87	6.59	12.34	-4.17	79.58	
COC	5710.97	12130.01	25472.03	112.40	346.02	
Gross return	6800.35	13182.67	28352.27	93.85	316.92	
B:C Ratio per ha	1.20	1.07	1.10			

Table 3c. Average cost structure and changes in economics of cotton cultivation in south zone during pre and post WTO period (Rs./ha)

Particulars	Pre WTO period		Post WTO period		Per cent share in total change	
	1980-1981 to	1995-1996	2002-2003			
	1994-1995	to 2001-2002	to 2010-2011	(b-a)/TC*100	(c-a)/TC*100	
	a	B	C			
Human labour	1974.25	6330.30	8583.47	36.06	33.36	
Seed	267.04	803.06	1548.85	4.44	6.47	
Plant protection	600.52	1377.13	1430.12	6.43	4.19	
Others*	4343.98	10754.93	15434.01	53.07	55.98	
Total cost	7185.79	19265.43	26996.44	100.00	100.00	
Yield (q/ha)	8.57	9.12	13.83	6.42	61.44	
COC	7185.78	19265.43	26996.32	168.10	275.69	
Gross return	8705.61	18287.89	29190.00	110.07	235.30	
B:C Ratio/ha	1.23	0.96	1.10			

Nearly 45 to 50 per cent of the increase in total cost is accounted by the human labour and plant protection chemical alone. The relative shares of different inputs in the cost of cultivation of cotton at two points of time are also given in the table. The share of seed has gone up and that of pesticides has come down especially during post *Bt era*. The extent of change in prices, yield and gross returns for cotton over time is given in the table. When the extent of change in physical input over time for cotton is compared with the change in cost, the increase in labour cost is entirely due to the changes in wage rate, the change in cost of manure used for cotton is due to physical quantity of manure used as well as its prices over the years. The gross return from cotton crop recorded an increase of 324.93 per cent during the post *Bt* period. The increase in gross return from cotton is attributable to the increase in the main product as well as increase in their prices over the years. Though there has been a spurt in yield during the post *Bt* period, the BC ratio was (1.13) in this period and higher from pre *Bt* period (0.79) when compared with pre WTO period (1.27).

Central zone : The results in the Table IIIb show the structural changes in the cost of cultivation of cotton in South Zone. (Gujarat, Maharashtra, Madhya Pradesh). The total cost

of cultivation of cotton has gone up from Rs. 6522.21 in pre WTO period to Rs.14165.30 and Rs.27579.06/ha in pre and post *Bt era* of post WTO period respectively.. The increase has occurred in all major items of cost like human labour, bullock labour, seed and fertilizer. Nearly 40 to 45 per cent of the increase in total cost is accounted by the human labour and seed alone. The share of seed has gone up and that of pesticides has come down especially during post *Bt era*. The extent of change in prices, yield and gross returns for cotton over time is given in the table. The gross return from cotton crop recorded an increase of 375.34 per cent during the post *Bt* period. The increase in gross return from cotton is attributable to the increase in the main product as well as increase in their prices over the years. There has been a spurt in yield to the tune of 66 per cent during the post *Bt* period. The BC ratio was higher in this period (1.33) and less from pre *Bt* period (1.21) when compared with pre WTO period (1.19).

South zone : The results in the Table IIIc show the structural changes in the cost of cultivation of cotton in South Zone (Andhra Pradesh, Karnataka, Tamil Nadu). The total cost of cultivation of cotton has gone up from Rs. 7559.50 in pre WTO period to Rs. 19723.67 and

Rs. 36717.52/ha in pre and post *Bt era* of post WTO period respectively. The cost of seed as a whole remained almost stable (4.6 to 5.9 per cent) than other inputs. Nearly 44 per cent of the increase in total cost is accounted by the human labour, bullock labour, seed and fertilisers. The share of seed and pesticides has come down especially during post *Bt era*. The gross return from cotton crop recorded an increase of 349.86 per cent during the post *Bt* period. The increase in gross return from cotton is attributable to the increase in the main product as well as increase in their prices over the years. Though there has been a spurt in yield during the post *Bt* period, the BC ratio was (1.16) in this period and higher from pre *Bt* period (1.06) when compared with pre WTO period (1.20).

4. Structural change and direction of trade in Indian cotton

The structural changes in the share of exports of cotton are to be analyzed through a first order Markov model (Mahadevaiah *et.al.*, 2003 and Kumar.P. *et.al.*, 2007). The important aspect in Markov chain analysis is the estimation of the transitional probability matrix. The trading in cotton, both domestic and international, is subject to several government interventions. The changing pattern of raw cotton exports were estimated by obtaining the transitional probability matrices for the annual export data of raw cotton (in terms of volume and value) for the period 1985-1986 to 2010-2011.

These analyses were carried out separately for pre reforms period (1985-1986 to 1994-1995) and post reforms period (1995-1996 to 2010-2011). The major cotton importers from India, i.e. Bangladesh, China, Japan, Korea, Thailand and the UK were considered for analysis. The cotton trade with the remaining countries was pooled under 'other countries'.

The results of transitional probability matrix for the pre-reforms period (1985-1986 to

1994-1995) and post-reforms period (1995-1996 to 2010-2011) are presented in Tables IVa, IVb and IVc, respectively. It is evident that China has been the only stable importer of Indian cotton, as reflected by the high probability of retention that increased from 0.04 during the pre reforms period to 0.62 during the post WTO pre *Bt* period to 0.71 during post *Bt era*. This implied that the share of import by China increased from four per cent during the pre reforms period to 62 per cent and 72 per cent during the post reforms period including the pre and post *Bt era*. Besides, China is a major competitor to India in the export of fabrics and readymade garments. Italy and Thailand have depicted low probability retention of 0.67 and 0.54, respectively during the pre-reforms period which reduced to almost zero during the post liberalization period, indicating that they were the unstable importers of Indian cotton.

The transition probabilities for the remaining importing countries, *viz.*, Bangladesh and UK were found as zero in both the periods, indicating instability in India's exports to these countries. Interestingly, the minor importers of raw cotton, the 'other countries' category, had remained the most stable and loyal markets for Indian cotton which is shown by their retention probability which had increased from 0.09 during the pre reforms period to 0.21 during the post reforms period. China, in addition to its higher probability of retention is likely to gain from the switch over from Korea and Bangladesh with a high probability of 0.91 and 0.62, respectively. Bangladesh has zero probability of retention of its own share of imports of Indian cotton but is likely to gain 44 per cent from Japan, 53 per cent from other countries and 3 per cent from China. The 'other countries' group importing Indian cotton with relatively high retention probability (21 %) is likely to gain from China (20 %) and Japan (20 %). The Markov chain analysis of raw cotton exports from India has indicated China

Table 4a Transitional probability matrix of cotton export during pre WTO period (1985-1986 to 1984-1985)

	Bangladesh	China	Italy	Japan	Korea	Uk	Thailand	Other countries
Bangladesh	0.00	0.00	0.00	0.91	0.00	0.09	0.00	0.00
China	0.00	0.04	0.01	0.61	0.00	0.00	0.22	0.13
Italy	0.00	0.06	0.67	0.25	0.02	0.00	0.00	0.00
Japan	0.12	0.33	0.00	0.07	0.00	0.01	0.00	0.47
Korea	0.00	0.91	0.00	0.00	0.02	0.00	0.07	0.00
Uk	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	0.00	0.23	0.00	0.00	0.00	0.00	0.54	0.23
Other countries	0.00	0.57	0.05	0.08	0.17	0.04	0.00	0.09

Table 4b. Transitional probability matrix of cotton export during post WTO period (1995-1996 to 2001-2002)

	Bangladesh	China	Italy	Japan	Korea	Uk	Thailand	Other countries
Bangladesh	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
China	0.05	0.62	0.03	0.17	0.00	0.05	0.08	0.00
Italy	0.00	0.75	0.00	0.00	0.00	0.13	0.12	0.00
Japan	0.16	0.00	0.00	0.61	0.00	0.00	0.00	0.23
Korea	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Uk	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.68
Thailand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Other countries	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.29

Table 4c. Transitional Probability Matrix of cotton export during Post WTO period (2002-03 to 2010-11)

	Bangladesh	China	Italy	Japan	Korea	Uk	Thailand	Other countries
Bangladesh	0.00	0.62	0.03	0.08	0.00	0.00	0.22	0.05
China	0.03	0.71	0.00	0.00	0.01	0.00	0.05	0.20
Italy	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Japan	0.44	0.16	0.02	0.04	0.05	0.00	0.09	0.20
Korea	0.00	0.91	0.00	0.02	0.07	0.00	0.00	0.00
UK	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Other countries	0.53	0.26	0.00	0.00	0.00	0.00	0.00	0.21

as the most stable market which has depicted an increase in its import share from the pre reform period to the post reform period.

CONCLUSIONS

The Markov chain analysis of raw cotton exports from India has indicated China as the most stable market which has depicted an increase in its import share from the pre-reform

period to the post-reform period. Indian cotton prices are greatly influenced by the global prices; barring for couple of years, India has created new record production and yet the prices have also either made new highs or have remained at elevated levels. As a result, the global demand and supply will have a greater bearing on the cotton prices in India. The acreage in China under cotton has been declining despite very high support prices at home. This could be

because the acreage is being allotted to other food crops. If the trend continues, the import dependence of cotton will not reduce and China could continue to import higher cotton. In recent years, China has been the largest buyer of Indian cotton. The other two nations that are crucial for exporters in India are Pakistan and Bangladesh. USDA estimates that Pakistan will need to increase its imports by around 140 per cent due to lower cotton crop and higher consumption of the raw material, Bangladesh will increase its imports by 12 per cent. The total requirement of cotton of the Indian neighborhood estimated by USDA itself is going to be around 218 lakh Indian bales of 170 kg each and a 30 per cent market share works out to be around 65 lakh bales. World cotton trade is projected to trend upward at 2.2 per cent a year until 2019,

China is projected to account for half of the global increase in cotton imports. There is a very positive picture for Indian exporters, as the imports of cotton in most of its client countries is expected to increase.

REFERENCES

Mahadevaiah, G.S., P.C. Ravi and P.G. Chengappa, 2005. Stability Analysis of Raw Cotton Export Markets of India – Markov Chain Approach, *Agricul. Eco. Res. Revi.* **18** : 253-59.

Pramod Kumar, P.S. Badal, and Lalith Achoth , 2007, Changing direction of Indian mango exports. *Ind. J. Agric. Mktg.*, **21** : 130-37.

Received for publication : August 1, 2014

Accepted for publication : February 19, 2015