

## **BT Cotton and its Impact on Cropping Pattern in Punjab**

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### **Abstract**

*It was the common observation that area under BT cotton was increasing in the recent past. In order to quantify the impact of BT cotton on the existing cropping pattern, this study was conducted. A sample of 300 respondents comprising of small, medium and large category of the farmers was taken from the districts of Vehari, Multan, Bahawalpur (Cotton zone) and Jhang, TTS, Faisalabad (Central Zone). Data pertained to the two consecutive years i.e. 2008-09 and 2009-10. Empirical results revealed that BT cotton area was increasing firstly at the expense of wheat area and sugarcane area secondly. In cotton zone 8.15% and in the central zone 6.5% wheat area undergone to BT cotton. Similarly, 4.5% area of sugar cane from cotton zone and 1.5% in central zone shifted to BT cotton. Out of the total sampled farmers, 70% wheat growers and 28% sugarcane growers showed their interest to shift some areas from their respective crops to BT cotton. Thus, there were the chances that textile sector will groom but in future, it will create food insecurity problem.*

**Keywords:** BT cotton; Cropping Pattern; Farmer's Categories; Punjab

### **I. Introduction**

Cotton is produced in more than seventy countries. However, only four countries (China, the US, India and Pakistan) produce about two-thirds of the world's cotton. China is the largest cotton producer with a share of 25 percent, followed by the US (19%), India (14%) and Pakistan (9%). Nearly two-thirds of the world's cotton is consumed in three countries: China, India and Pakistan with shares of 35 percent, 15 percent and 10 percent, respectively. About one-third of global cotton production is traded internationally. The US is the largest exporter of cotton with a share of 41 percent in world exports, and China is the largest importer with a share of 19 percent in world imports (Cotton and Wool Year Book, 2008).

Cotton production is important to Pakistan's agriculture and the overall economy. Nearly 26 percent of all farmers grow cotton, and over 15 percent of Pakistan's total

cultivated area is devoted to this crop, with production primarily in two provinces: Punjab (80%), which has dry conditions, and Sindh (20%), which has a more humid climate (Government of Pakistan, 2000). Cotton and its products (yarn, textiles and apparel) contribute significantly to the gross domestic product (8%), total employment (17%), and, particularly, foreign exchange earnings (54%) of the country (Government of Pakistan, 2009). In addition, the cotton seed is crushed to make edible oil and livestock feed. Cotton picking is a labor-intensive activity and provides supplementary employment and income opportunities to rural farm and non-farm households. Because of their extensive forward and backward linkages, the cotton-textile sectors have important implications for national economic performance and poverty reduction (Cororaton and Orden, 2008).

In 2006, 4% of the cultivated area in Punjab was estimated to be under BT cotton cultivation (Rao, 2006). However, the last four to five years have seen an exponential increase in BT cotton cultivation in Pakistan, and this increase is higher than in China and India. Government of Pakistan approved field trials for only six BT cotton cases, but it is estimated that 70% of the 2009/2010 cotton crop was planted to BT (Carroll, 2009).

After the era of CLCV, the introduction of BT cotton has significantly win spread throughout the Punjab province of Pakistan. Its area has increasing trend over time. BT cotton has significantly changed the existing cropping pattern of the Punjab Agriculture Economy.

#### **a. Objectives of Study**

- i. To estimate the overtime trend of area under BT cotton in Punjab.
- ii. To see the BT cotton impact on existing cropping pattern through wheat and sugarcane.
- iii. Based on study findings recommendations and suggestions.

## **II. Review of literature**

Narayanamoorthy and Kalamkar (2006) examined BT Cotton Cultivation Economically Viable for Indian Farmers. They showed that the costs of cultivation required for BT cotton crop were substantially higher than that of non-BT crop. Contrary to the claim made by the seed company, BT cotton had not reduced the consumption of pesticides. In fact, farmers cultivating BT cotton crop had marginally higher expenditures on account of pesticides. However, productivity was found to be substantially higher in BT cotton than that of non-BT cotton varieties. The cost efficiency as well as profit per hectare was also found to be higher with those farmers cultivating BT cotton crop. BT cotton variety suggested the need to introduce various policy measures to sustain and improve the performance of BT cotton cultivation in India.

Smale et al. (2009) compiled a survey of 137 peer-reviewed studies conducted during 1996-2007 that examined the impact of biotech crops on farmers, consumers, industry, and international trade in developing countries. This literature is dominated by studies on BT cotton, indicating the importance of this crop in GM economic research. Of the studies, 63 analyzed the impact of insect resistant cotton.

Cabanilla et al. (2005) used the estimated percentage difference in the yield and cost of production of BT and non-BT cotton in other countries. They provided an ex-ante

assessment of the impact of BT cotton in China using field trial data supplemented by a general equilibrium model.

Abdullah (2010) proved that popularity of BT cotton is growing at an exponential rate in Punjab, Pakistan. He viewed that BT cotton was not susceptible to the bollworm complex; however, the incidence of SBW remained consistent on BT cotton throughout the season without any significant change. BT cotton was not found to be resistant against sucking pests, especially the newly emerged MB pest. However, growth regulator was found to be a good choice for controlling the jassids and whitefly populations on BT cotton. The study can be further strengthened by extending the study period beyond 2006 for a year-to-year variability impact for general conclusions.

Nazli (2010) examined the four large cotton producing countries. She found that Pakistan was the only one that had not commercially adopted BT cotton by 2010. She analyzed the data collected through a farm household survey using structured questionnaires in January-February 2009 in two cotton-growing districts of Pakistan: Bahawalpur and Mirpur Khas. The economic impact of BT varieties was examined by addressing the issue of self-selection bias that arises when assignment is not random. The results of the qualitative survey identified the slow legislative process; cumbersome procedures for the development, approval, testing and commercialization of biotech products; lack of skilled human resources; and, weak research infrastructure as the major factors hindering the commercial release of BT cotton.

Ahsan et al. (2011) identified the superior genotype with comparative growth and yield performance of four cotton cultivars namely, CIM-496, BH-162, VH-144 and BT-121. They concluded that BT-121 is the most suitable cotton variety for good quality higher seed cotton yield. They recommended for general cultivation in arid to semi-arid tropics. No doubt BH-162 and CIM-496 yielded fiber with better staple length and fineness but unfortunately, agronomic performance of these cultivars was unacceptable which was likely due to several factors such as, susceptibility to virus infection, lack of ability to exploit a long season environment while tolerating intermittent periods of heat and drought stress. There is also a dire need to screen more genotypes and to verify their usefulness for cultivation in broader agro-ecological zones of the world as proved.

### III. Methodology

In order to estimate the impact of BT cotton on existing cropping pattern in Punjab, a survey was conducted in the central Punjab as well as cotton belt of the Punjab Province. A sample of 300 respondents was taken from the districts of Vehari, Multan, Bahawalpur, Toba Tek Sing, Jhang and Faisalabad. A proportionate sample of 50 respondents from each district was taken for study. This sample was comprised of small, medium and large farmers. A detailed questionnaire was used for data collection. Data were pertaining to the year of 2008-9 and 2009-10. After collecting the data it was passed through necessary analysis. During estimation crop share in the total cropped area were estimated by the following procedure.

$$\text{Cropped Area} = \sum \text{Crop Area (Acres) during the year} \\ + \text{Area soon more than once}$$

$$\text{ith Crop share} = (\text{area in acres under ith crop} / \text{total cropped area}) * 100$$

**a. Farmer Perception:**

If the respective farmer showed the interest that he wanted to forgo some area to be under wheat for the cultivation of BT cotton, then he was marked as one otherwise zero. Similarly same pattern was adopted for sugar cane crop.

**b. Farmer Categories:**

Small farmer were those who were cultivating less than 12.5 acres of land, medium were cultivating from 12.5 to less than 25 acres and those cultivating more than 25 acres of irrigated land were taken as large farmers. (Agri census 2000)

**IV. Results and Discussion:**

The data collected from the different categories of the farmers from cotton zone and central zone of the Punjab were analyzed. The empirical results drawn are depicted below:

**Table 1 (a) Percent of cropped area under different crops for the years 2008 and 2009, in cotton and central zones of Punjab. (Individual Farmer Categories)**

Crops with years	Vehari			Multan			Bahawalpur			Toba Tek Sing			Jhang			Faisalabad		
	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Wheat 2008 (% of cropped area)	42	36	35	42	37	32	44	34	28	38	36	29	40	36	30	40	35	32
Wheat 2009 (% of cropped area)	40	32	27	34	27	25	40	28	21	32	32	26	38	34	28	34	32	24
Cotton 2008 (% of cropped area)	35	36	35	28	34	36	31	36	37	30	35	38	25	30	35	24	28	32
Cotton 2009 (% of cropped area)	42	44	42	35	45	42	40	45	45	42	46	44	38	42	40	32	34	38
S.cane 2008 (% of cropped area)	15	19	22	18	20	24	15	17	20	14	16	18	12	15	18	15	16	20
S.cane 2009 (% of cropped area)	14	17	21	16	19	21	13	15	19	13	15	16	12	14	16	14	14	18

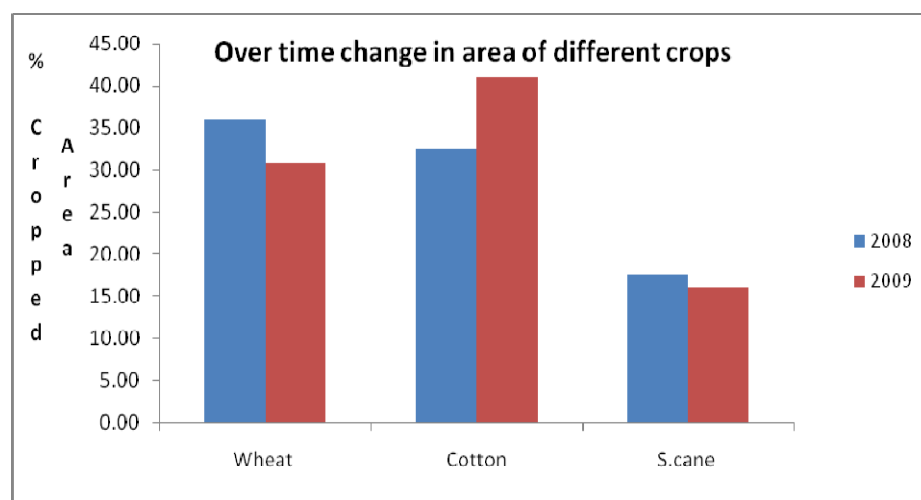
S= Small                      M= Medium                      L= Large

The data in Table-1(a) show the area under wheat, cotton and S-cane for two consecutive years, 2008-09 and 2009-10. It was observed during the survey that almost all the respondents belonging to different categories were cultivating BT cotton. It was also noted that there was an increasing trend of area under BT cotton over time.

In the year 2008-9 in district of Vehari, wheat was being grown on 41% of the cultivated area of small farmers, 36% on medium farms and 35% of the total area of large farms. In Multan, 42%, 37% and 32% of the total area for small, medium and large farms respectively was found under wheat crop. In all the districts some decreasing trend of area under wheat for small, medium and large category of the farmers was noted.

In the year 2009-10, Area under wheat was less than the area under wheat in previous year in all the districts. As in district Vehari it declined from 42 % to 40% on small farms, 36% to 32% for medium farms and from 35% to 27% in case of large farms. Similarly in the district of Multan, wheat area declined from 42% to 34%, 37% to 27% and 32% to 25% for small, medium and large farms respectively. Same pattern was observed in all the districts in both zones. (Fig-1)

**Figure 1 Over time change in area of different crops**



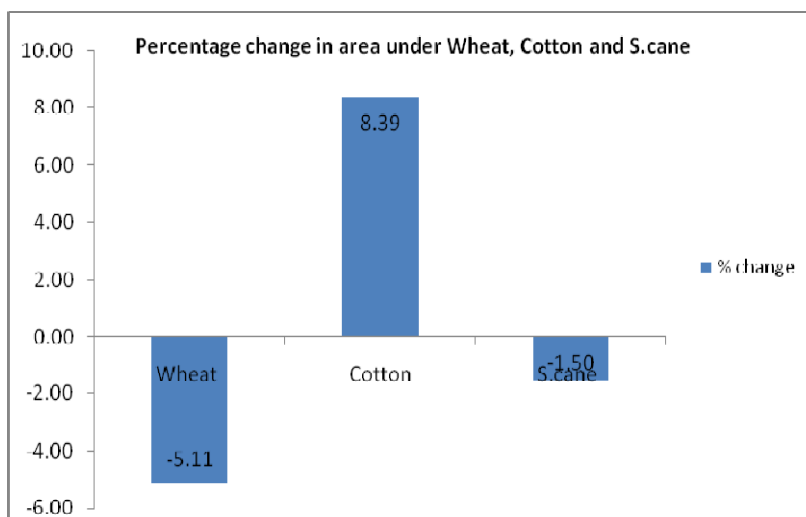
On the other side area under BT cotton showed an increasing trend over time. In the district of Vehari, it rose to the limit of 42 % in 2009-10 from 35% in 2008-09 for large farmers. In the district of Bahawalpur, cotton area increased from 30% to 42% on small farm, 35% to 46% on medium farms and from 25% to 30% of the total area on large farmers. In all the districts some increasing trend of area under BT cotton was noted in the year of 2009-10. (table-1b)

**Table-1 (b) Percent of cropped area under different crops for the years 2008 and 2009, in cotton and central zones of Punjab( Total farmers)**

Crops with years	Total				% change			
	S	M	L	Overall	S	M	L	Overall
Wheat 2008 (% of cropped area)	41	35.67	31	36	-	-	-	-
Wheat 2009 (% of cropped area)	36.3	30.8	25.2	31	-5	-5	-6	-5
Cotton 2008 (% of cropped area)	28.8	33.2	35.5	33	-	-	-	-
Cotton 2009 (% of cropped area)	38.2	42.7	41.8	41	9	10	6	8
S .cane 2008 (% of cropped area)	14.8	17.2	20.3	17	-	-	-	-
S. cane 2009 (% of cropped area)	13.7	15.7	18.5	16	-1	-1.5	-2	-1.5

Another effort during the survey was made to identify the area which was being replaced by BT cotton. As it was Kharif crop, there were two possibilities that either farmers were replacing Kharif sugarcane by BT cotton or they were reducing wheat area to be grown by BT cotton in the month of February. As a whole it was observed that wheat area declined by 5% and sugar cane by 2% over two consecutive years. On the other hand area under BT cotton increased to the limit of 8% over this period. (Fig-2)

**Figure 2**



The data given in Table-2 depict that in the district of Vehari, 70% of the small farmers were of the view that they were increasing BT cotton by reducing wheat area, 65% medium farmers of this district, and 50% large farmers responded for the replacement of wheat by BT cotton. In the same district 28% small farmers, 30% medium and 45% large farmers replaced sugarcane with BT cotton. The other farmers of the district of Bahawalpur and Multan cotton zone also followed the same pattern. (Table-2)

**Table 2 Increase in BT cotton area at the cost of Wheat and S. cane area in Punjab**

Crops	Vehari			Multan			Bahawalpur			Toba Tek Sing			Jhang			Faisalabad			Overall		
	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L	S	M	L
Wheat	70	65	50	72	68	51	60	62	54	76	66	50	60	60	51	63	58	50	67	63	51
S.Cane	28	30	45	25	28	49	33	33	44	20	28	45	25	30	40	34	40	42	28	32	44
Others	2	5	5	3	4	0	7	5	2	4	6	5	15	10	9	3	2	8	5	5	5

On overall basis 67% of the small farmers, 63 % medium and 51% large farmers witnessed that they were replacing wheat by BT cotton while 28 % small, 32% medium and another 44% of the larger farmers replied that they were replacing Sugarcane with

BT Cotton. It was also observed majority of small farmers were replacing BT cotton with wheat while great majority of the large farmers found in favor of the replacement of sugarcane by BT cotton. The detail is given in Table-2.

## V. Conclusion

Based on the empirical data and its analysis, it was concluded that BT cotton was getting much popularity in the province of Punjab Pakistan. The cultivation of this crop found having negative impact on the area under wheat and sugarcane (spring crop). It was also concluded that a great majority of the small farmers (70%) left their land from wheat as fellow just to grow BT cotton in the months of February-March. Similarly 44% large farmers said that they were willing to grow BT cotton in same month instead of sugarcane.

## VI. Suggestions

As wheat, cotton and sugarcane are the three major crops being grown in Punjab. They are individually supporting to three important local industries i.e. food, textile and sugar. Any imbalance in cultivation of said crops will create a serious problem for the whole economy. Just to save the economy from such kind of crisis, it is suggested that extension wing of the agriculture department should launch a strict action plan for the cultivation of these crops on specified areas. Furthermore one village on crop is another important idea that if followed, will not only save the aforesaid industries but also some other issues related to agricultural inputs will be solved. There should be implementation of some strict policy for the allocation of area under different crops so that such challenges could be overcome well in time otherwise economy will bear too much cost as there is an increasing demand of food due to rapidly growing population.

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