



RESEARCH ARTICLE :

Cost structure of Bt cotton in Bharuch district of South Gujarat

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SUMMARY : This study was undertaken to determine economic analysis of production of Bt cotton in Bharuch district of South Gujarat during the year 2019-20. The study indicated that Bt cotton was a labour-intensive crop as farmer incurred highest share of 27.85 per cent and 10.95 per cent of cost of cultivation on hired labour charges and family labour charges, respectively. Overall, per hectare Cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were found to be Rs. 54840, Rs. 55847, Rs. 63487, Rs. 63808 and Rs. 71448, respectively. The average annual yield of Bt cotton was 21.15 quintal per ha. Per quintal average cost of production over Cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were in the tune of Rs. 2592.90, Rs. 2640.52, Rs. 3001.74, Rs. 3016.92 and Rs. 3378.16, respectively. On over all basis, per hectare farm business income, family labour income and net income were Rs. 55410.66, Rs. 46763.66 and Rs. 38802.66, respectively. The returns per rupee on investment on Cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were Rs. 2.01, Rs. 1.97, Rs. 1.73, Rs. 1.72 and Rs. 1.54 per hectare of Bt cotton cultivation, respectively.

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BACKGROUND AND OBJECTIVES

Cotton is also known as “white gold” and “king of appraisal fibre”. Cotton is the most important fibre crop plays a vital role in economy. Cotton is a soft, fluffy staple fibre that grows in a boll or protective case, around the seeds of the cotton plants of the genus *Gossypium* in the mallow family Malvaceae. The fibre is almost pure cellulose. Under natural conditions, the cotton boll will increase the dispersal of the seeds.

In India, there are ten major cotton growing states which are divided into three zones, viz., North zone, Central zone and South

zone. North zone consists of Punjab, Haryana, and Rajasthan. Central zone includes Madhya Pradesh, Maharashtra and Gujarat. South zone comprises Andhra Pradesh, Telangana, Karnataka and Tamil Nadu. Besides these ten states, cotton cultivation has gained momentum in the Eastern state of Orissa. Cotton is also cultivated in small areas of non-traditional states such as Uttar Pradesh, West Bengal and Tripura.

There are four cultivated species of cotton viz., *Gossypium arboreum*, *G. herbaceum*, *G. hirsutum* and *G. barbadense*. The first two species are diploid (2n=26) and are native to old world. They are

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also known as Asiatic cottons because they are grown in Asia. The last two species are tetraploid ($2n=52$) and are also referred to as New World Cotton. *G. hirsutum* is also known as American cotton or upland cotton and *G. barbadense* or Sea Island cotton or Peruvian cotton or Tanguish cotton or quality cotton. *G. hirsutum* is the predominant species which alone contributes about 90 per cent to the global production. Perhaps, India is the only country in the world where all the four cultivated species are grown on commercial scale.

Gujarat is a vibrant state in agricultural sector in terms of gross production, productivity per hectare, adoption of innovations and technologies, crop diversification, introduction of new crops, post-harvest technology and management. Gujarat has diversified cropping pattern including the food grains and pulses, cash crops and oil seeds. Cotton is an important crop of the state which covered 26.24 lakh hectares area under cultivation and produced 328 lakh bales during 2018-19. (source: <https://www.indiastat.com>).

RESOURCES AND METHODS

The study was conducted in Bharuch district of South Gujarat region. The selection of Bt cotton growers were made by adopting the multistage random sampling technique. At the first stage, Bharuch district was selected purposively from South Gujarat on the basis of having highest area and production. At the second stage, two talukas were selected randomly from Bharuch district. Jhagadia and Valiya talukas from Bharuch district were selected. The list of villages growing Bt cotton was collected from the respective taluka Panchayat office and from this list, six villages were selected randomly from each selected taluka at the third stage. In all, twelve villages were selected randomly from the selected talukas. The primary data required for the study was collected through personal interview with the help of pre-tested comprehensive schedule during agricultural year 2019-20.

Cost concepts:

The farm management cost concept approach was widely used in economic analysis for evaluating crop profitability. Widely used cost research methodology concepts were cost A, cost B_1 , cost B_2 , cost C_1 and cost C_2 . The different cost items used in the present analysis that was included under each cost concept are detailed

below with their imputation procedures. The cost concepts used in the present analysis are those laid down in the farm management studied.

Cost A: It includes:

- Value of hired human labour.
- Value of hired bullock labour.
- Value of owned bullock labour.
- Value of owned machinery labour.
- Hired machinery charges.
- Value of seeds.
- Value of manures.
- Value of fertilizers.
- Value of plant protection chemicals/insecticides/pesticides/ fungicide.
- Irrigation charges.
- Depreciation on implements, machinery and farm building.
- Land revenue and taxes.
- Interest on working capital.
- Miscellaneous expenses.

However, Cost A can also be divided into two parts viz., Cost A_1 and Cost A_2 , if tenant farmers were there in the study, but not at single tenant farmer was found in the study. Hence, Cost A as such was considered without dividing into Cost A_1 and Cost A_2 .

Cost B_1 :

Cost A_1 + interest on value of owned fixed capital assets (excluding land).

Cost B_2 :

Cost B_1 + rental value of owned land.

Cost C_1 :

Cost B_1 + Imputed value of family labour.

Cost C_2 :

Cost B_2 + Imputed value of family labour.

Cost of production per quintal:

Total cost of cultivation/yield of main product in quintal.

Cost of production on different costs:

Different costs viz., cost A, cost B_1 , cost B_2 , cost C_1 and cost C_2 , where calculated on yield of main product.

Income measures:

The various income measures used in the present study was shown as under.

Gross income:

It is the total value of main product as well as of by product.

$$GI = (Q_m \times P_m) + (Q_b \times P_b)$$

where,

GI = Gross income (Rs.)

Q_m = Quantity of main product (qn)

P_m = Price of main product (Rs.)

Q_b = Quantity of by product (qn)

P_b = Price of by product (Rs.).

Returns over variable cost (RVC):

$$RVC = \text{Gross income} - \text{Cost } A_1$$

Farm business income (FBI):

FBI = Gross income - Cost A_2 (Here, Cost A_2 equally treated as a Cost A).

Family labour income (FLI):

$$FLI = \text{Gross income} - \text{Cost } B_2.$$

Net income (NI):

$$NI = \text{Gross income} - \text{Cost } C_2.$$

Returns per rupee (RPR):

$$RPR = \frac{\text{Gross income}}{\text{Cost } C_2}$$

OBSERVATIONS AND ANALYSIS

The findings of the present study as well as relevant discussion have been summerized under following heads:

Input cost structure:

Bt cotton is one of the major commercial and cash crops occupying a prominent place in the Indian economy and India is the leading country in the world for Bt cotton production. Therefore, cost of cultivation of Bt cotton is of vital importance for all including researchers and policy makers.

The details about component wise costs for Bt cotton cultivation on different size of farms per hectare are studied and the results are furnished in Table 1. The data pertaining to different cost incurred to raise Bt cotton crop are presented in Table 1. The expenditure made on inputs for overall farms showed that the highest cost was

Table 1: Item wise break up of cost of cultivation per hectare for Bt cotton

Sr. No.	Items	Physical unit	Cost of cultivation	
			Value (Rs.)	Percentage
1.	Human labours (Man days)			
	Hired	112.48	20245	27.85
	Family	24.23	7961	10.95
2.	Seed (Kg)	2.04	4181	5.75
3.	FYM (Kg)	842.47	843	1.16
4.	Chemical fertilizer (Kg)			
	N	122		
	P	21	2719	3.74
	K	0		
5.	Plant protection chemical	-	3130	4.31
6.	Machine charges (Hrs.)	12	3851	5.30
7.	Irrigation charges (Hrs.)	16.18	969	1.33
8.	Miscellaneous	-	13694	18.84
9.	Depreciation	-	915	1.26
10.	Interest on working capital	-	4293	5.91
11.	Interest on fixed capital	-	1007	1.39
12.	Rental value of owned land	-	7640	10.51

Source: Field survey

made on labour charges (38.85%), followed by miscellaneous costs (18.84%), cost of seeds (5.75%), machine charges (5.30%), cost of plant protection chemical (4.31%), fertilizer expenditure (3.74%),

irrigation charges (1.33%), depreciation (1.26 %) and farm yard manures (1.16%). The highest not payable but accounted expenditure was rental value of owned land (10.51 %) followed by interest on working capital

Table 2: Estimation of different costs

Sr. No.	Different costs	Overall (Rs./ha)
1.	Cost A	54840
2.	Cost B ₁	55847
3.	Cost B ₂	63487
4.	Cost C ₁	63808
5.	Cost C ₂	71448

Table 3: Per hectare output, cost, gross income and net return of Bt cotton

Sr. No.	Particulars	Per hectare
1.	Output (qn)	21.15
2.	Cost of cultivation (Rs.)	71448
3.	Gross income (Rs.)	110250.66
4.	Net income (Rs.)	38802.66
5.	Per quintal cost of production (Rs.)	3378.16

Table 4: Cost of production per quintal on different costs

Sr. No.	Cost	Cost of production (Rs./qn)
1.	Cost A	2592.90
2.	Cost B ₁	2640.52
3.	Cost B ₂	3001.74
4.	Cost C ₁	3016.92
5.	Cost C ₂	3378.16

Table 5: Income measures of Bt cotton cultivation (Rs./ha)

Sr. No.	Particulars	Overall
1.	Gross income	Rs. 110250.66
2.	Return over variable cost	Rs. 55410.66
3.	Family labour income	Rs. 46763.66
4.	Farm business income	Rs. 55410.66
5.	Net income	Rs. 38802.66
6.	Returns per rupee	1.54

Table 6: Returns per rupees on investment in Bt cotton cultivation

Sr. No.	Cost	Overall
1.	Cost A	2.01
2.	Cost B ₁	1.97
3.	Cost B ₂	1.73
4.	Cost C ₁	1.72
5.	Cost C ₂	1.54

(5.91 %) and interest on fixed capital (1.39 %).

Cost of cultivation over different cost concepts:

Estimates of different costs such as cost A, cost B₁, cost B₂, cost C₁ and cost C₂ were calculated and presented in Table 2.

The results obtained for different cost concepts of Bt cotton were presented in Table 2. It is revealed from the Table 2 that cost A, cost B₁, cost B₂, cost C₁ and cost C₂ were found to be Rs. 54840, Rs. 55847, Rs. 63487, Rs. 63808 and Rs. 71448, respectively. These findings are consistent with the results obtained by Mane *et al.* (2014).

Per hectare output, cost, gross income and net return of Bt cotton:

The details of yield, cost gross income and returns are presented in the Table 3. The data encircled in the table revealed that per hectare average output of Bt cotton was accounted to 21.15 qn with per quintal cost of Rs. 3378.16. The cost of cultivation for Bt cotton was estimated to the tune of Rs. 71448 per ha. Average per hectare gross income and net income from cultivation of Bt cotton was Rs. 110250.66 and Rs. 38802.66, respectively. These findings were consistent with the result obtained by Gamanagatti *et al.* (2012).

Per quintal cost of production:

The per quintal cost of production was worked out on the basis of different cost concepts are presented in Table 4.

It is revealed from the Table 4 that the average cost of production over cost A, cost B₁, cost B₂, cost C₁ and cost C₂ were in the tune of Rs. 2592.90, Rs. 2640.52, Rs. 3001.74, Rs. 3016.92 and Rs. 3378.16, respectively.

Income measures:

A comparison of various income measures from Bt cotton cultivation in the study area are given in the Table 5.

Farm business income represents returns over variable cost due to absence of leased land among respondents. On an average, the farm business income from Bt cotton cultivation was worked out to Rs. 55410.66 per ha. The family labour income from cotton cultivation was worked out to Rs. 46763.66 per ha. It was also revealed from the Table 5 that the return per

rupee from cultivation of Bt cotton was Rs. 1.54. These findings were in the line of results obtained by Mane *et al.* (2014).

Returns per rupee on investment:

Return per rupee on investment is one of the effective methods to measure the economic feasibility of any crop. The details on returns per rupee on investment are presented in Table 6. It was evident from Table 6 that on an overall basis, returns per rupee on investment on cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were Rs. 2.01, Rs. 1.97, Rs. 1.73, Rs. 1.72 and Rs.1.54 per ha of Bt cotton cultivation, respectively. It indicated that if the farmers were invested one rupee then they would earn Rs. 2.01, Rs. 1.97, Rs. 1.73, Rs. 1.72 and Rs. 1.54 over cost A, cost B₁, cost B₂, cost C₁ and cost C₂, respectively. This showed better return over the investment in Bt cotton cultivation.

Conclusion:

The study indicated that Bt cotton was a labour-intensive crop as farmer incurred highest share of 27.85 per cent and 10.95 per cent of cost of cultivation on hired labour charges and family labour charges, respectively. Overall, per hectare Cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were found to be Rs. 54840, Rs. 55847, Rs. 63487, Rs. 63808 and Rs. 71448, respectively. The average annual yield of Bt cotton was 21.15 quintal per ha. Per quintal average Cost of production over Cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were in the tune of Rs. 2592.90, Rs. 2640.52, Rs. 3001.74, Rs. 3016.92 and Rs. 3378.16, respectively. On over all basis, per hectare farm business income, family labour income and net income were Rs. 55410.66, Rs. 46763.66 and Rs. 38802.66, respectively. The returns per rupee on investment on Cost A, Cost B₁, Cost B₂, Cost C₁ and Cost C₂ were 2.01, 1.97, 1.73, 1.72 and 1.54 per hectare of Bt cotton cultivation, respectively.

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