

Comparative economic analysis of *Bt* and non *Bt* cotton

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ABSTRACT : The study is based on primary data obtained from 50 *Bt* cotton and 50 non *Bt* cotton farmers of Haveri district of Karnataka. The data were collected from the sample farmers by survey method. The data were analyzed using descriptive statistics and partial budgeting analysis. The results of the study indicated that *Bt* cotton farmers were relatively younger than non *Bt* cotton farmers, who readily accepted the *Bt* cotton technology. *Bt* cotton was found to be more productive yielding on an average 9.15 q/ac when compared to non *Bt* cotton with 6.84 q/ac. It was found to be superior in terms of gross income and net income over non *Bt* cotton. The benefit cost ratio amply demonstrated the profitability of *Bt* cotton with 1: 2.09. The partial budgeting analysis has suggested that farmers could benefit to the tune of Rs. 9882/ac by adopting *Bt* cotton technology. Further, the study indicated that there has been rapid expansion of area under *Bt* cotton registering an impressive growth of 183 per cent during the last decade (2002-2003 to 2009-2010).

Key words: *Bt* cotton, cost of cultivation, economic feasibility, partial budgeting

Cotton is an important fibre crop in many parts of the world. Cotton contributes substantially to export basket and national income of India. The cotton industry provides livelihood to more than 15 million people. After 2003 – 2004, the area under the crop started increasing because of *Bt* cotton introduction. The area and production under cotton grew at a compound growth of 1.2 per cent and 12 per cent during the last decade. This indicated very clearly that *Bt* cotton has contributed substantially to area and production. *Bt* cotton technology has proved to be boon to Indian farmers as they have been incurring huge losses due to boll worm attack to the tune of 20 – 50 per cent.

India is the third largest cotton producing country in the world sharing 13 per cent in the total world's cotton production. The yield/unit is lowest in the world. The major factor hindering the performance of cotton is incidence of serious pests such as bollworm. Huge amount of money has to be spent on pesticide use which accounts for over 40 per cent of the total cost of cultivation. In order to combat the menace of pests, a new technology of *Bt* cotton has been evolved. Karnataka is one state where the *Bt* crop has occupied significant area. Though the crop has expanded rapidly in the state providing livelihood to cotton farmers. Keeping in view the role played

by *Bt* cotton in the economic development of the region, a study was undertaken to assess its economics.

MATERIALS AND METHODS

The present study was carried out in Haveri district of Karnataka state has a larger area under cotton cultivation. Haveri falls under northern transitional zone of Karnataka. The district has 109231 ha of land under cotton cultivation. A multistage random sampling technique was adopted for selection of taluks, villages and sample farmers. In the first stage, Hirekerur taluk within Haveri district having highest area under cotton was selected. In the second stage, 5 villages with high concentration of area under cotton were selected at random namely, Rattihalli, Kod, Battikoppa, Bogavi, and Suttaghi. From each village, 10 farmers cultivating *Bt* cotton and another 10 farmers cultivating non *Bt* cotton were selected, thus making a total sample of 50 farmers each for *Bt* cotton and non *Bt* cotton cultivation. For evaluating the set objectives of the study, primary data were collected from the sample farmers by survey method with the help of well – designed interview schedule by personally contacting the sample farmers. The data covered

general information, land holding, farm inventory, cultivation aspects, inputs, yields etc., The data were analyzed using descriptive statistics like averages, percentages etc, to obtain meaningful results. Partial budgeting technique was also used to appraise the economic viability of *Bt* cotton technology *vis a vis* non *Bt* cotton.

RESULTS AND DISCUSSION

General characteristics of sample farmers : Table 1 portrays the general characteristics of sample farmers. It may be observed that the average size of *Bt* cotton farms was 7.02 ac and that of non *Bt* cotton farms was 6.80 ac. Majority of the farmers with relatively larger holdings inclined to cultivate *Bt* cotton. Being endowed with large holdings, they are in position to allocate some proportion of land resources to cultivate commercial crops like *Bt* cotton. The age wise distribution of farmers indicated that majority of them were in the age group of 45-46 years. *Bt* cotton farmers were relatively younger who readily accepted *Bt* technology. The educational status of farmers showed that over 94 per cent of *Bt* cotton and 84 per cent of non *Bt* cotton farmers were literates. This suggested educational status had positive impact on adoption level of *Bt* cotton. Further, the average family size of *Bt* and non *Bt* cotton farms was 5 and 7 person, respectively.

Cost of cultivation of *Bt* cotton and non *Bt* cotton : The details pertaining of cost of cultivation of *Bt* cotton and non *Bt* cotton is depicted in the Table 2 under two categories of cost. It could be observed that/ac cost of cultivation of *Bt* cotton and non *Bt* cotton was in the order of Rs. 15797 and Rs. 16836, respectively. The cost of cultivation of non *Bt* cotton has higher by Rs. 1039. As usual human labour was the major component accounting for 25.57 per cent in *Bt* and 25.07 per cent in non *Bt* cotton respectively. The cost of bullock labour, fertilizers, plant protection chemicals was found to be lower in case of *Bt* cotton at Rs. 1516, Rs.

1624 and Rs. 1580 as compared to non *Bt* cotton at Rs. 2024, Rs.1780 and Rs. 2788/ac, respectively. The cost of seeds was higher in case of *Bt* cotton (Rs.1897) as compared to non *Bt* cotton (Rs. 1408). The proportion of fixed costs was marginally higher in *Bt* cotton farms (Rs.4049) as compared to non *Bt* cotton farms at Rs. 3634. The *Bt* cotton seeds was expensive because of their inherent special qualities, such as high yield potential, resistance to pests which the conventional non *Bt* cotton seeds lack. It is significant to note that the expenditure on account of plant protection was higher in case of

Table 1. General characteristics of sample farmers

| Particulars | <i>Bt</i> cotton farms | Non <i>Bt</i> cotton farms |
|--------------------------|------------------------|----------------------------|
| Land holding (ac) | 7.02 | 6.80 |
| Area under cotton (ac) | 3.64 | 3.14 |
| Age (y) | 45 | 47 |
| Family size (Number) | 5 | 7 |
| Education (literate) (%) | 94 | 82 |

non *Bt* cotton at (Rs. 2788) as compared to Rs. 1580 only in case of *Bt* cotton. This was mainly because of higher infestation of bollworms and sucking pests on non *Bt* cotton. Frequent sprays of plant protection chemicals led to higher expenditure where as this was not in case of *Bt* cotton as this was resistant to bollworms.

Yields and income : The details pertaining to income is given in Table 3. The average productivity/ac was 9.15 q in *Bt* cotton and 6.84 q in non *Bt* cotton. Per ac gross income from sale of *Bt* cotton was higher (Rs. 32995) as compared to non *Bt* cotton (Rs. 24152). The net income of *Bt* cotton (Rs.17198) was higher than non *Bt* cotton (Rs.7316). These results in accordance of this results reported by Hungar *et al.*, 2009.

Economic feasibility of *Bt* cotton technology : The economic feasibility of *Bt* cotton technology was tested using partial budgeting analysis (Table 4). The results in the table indicated that additional net income due to adoption of *Bt* cotton technology was estimated

Table 2. Economics of *Bt* cotton and non *Bt* cotton cultivation (Rs./ac)

| Particulars | <i>Bt</i> cotton | | Non <i>Bt</i> cotton | |
|----------------------------|------------------|----------------|----------------------|----------------|
| | Amount | Total cost (%) | Amount | Total cost (%) |
| Variable costs | | | | |
| Seeds | 1897 | 12.01 | 1408 | 8.37 |
| FYM | 696 | 4.41 | 536 | 3.19 |
| Human labour | 4038 | 25.57 | 4220 | 25.07 |
| Bullock labour | 1516 | 9.6 | 2024 | 12.03 |
| Fertilizers | 1624 | 10.28 | 1780 | 10.53 |
| Plant protection | 1580 | 10.01 | 2788 | 16.56 |
| Interest | 397 | 2.52 | 446 | 2.65 |
| Total variable cost | 11748 | 74.4 | 13202 | 78.4 |
| Fixed costs | | | | |
| Depreciation | 715 | 4.52 | 685 | 4.07 |
| Land revenue | 50 | 0.3 | 50 | 0.3 |
| Rent | 1870 | 11.83 | 1870 | 11.11 |
| Interest | 1414 | 8.95 | 1029 | 6.12 |
| Total fixed costs | 4049 | 25.6 | 3634 | 21.6 |
| Total cost | 15797 | 100 | 16836 | 100 |

to be Rs. 9742/ac. The debit side of partial budgeting indicated the additional expenditure on account of *Bt* cotton and credit side indicated the expected additional income from this technology. The net difference between credit and debit sides represented the net income due to technology. Thus, it may be concluded that *Bt* cotton farmers could reap an additional income

Table 3. Yield and income of *Bt* cotton and non *Bt* cotton (Rs./ac)

| Particulars | <i>Bt</i> cotton | Non <i>Bt</i> cotton |
|---------------------------|------------------|----------------------|
| Yield (q) | 9.15 | 6.84 |
| Gross income | 32995 | 24152 |
| Total cost of cultivation | 15797 | 16836 |
| Net income | 17198 | 7316 |
| Total variable cost | 11748 | 13202 |
| Income over variable cost | 21247 | 10950 |
| B.C ratio | 01:02.1 | 01:01.4 |

of Rs. 9742/ac due to adoption of technology. The non *Bt* cotton farmers who lag behind in accepting this vital new technology have forgone this benefit. Similar results were also reported by Naryana Murthy and Kalamkar (2006).

Diffusion of *Bt* cotton technology :

Quantum of *Bt* cotton seeds sold in the study region was taken as yardstick to study diffusion of *Bt* cotton technology. The details of seeds of *Bt* cotton sold in the area is given in the Table 5. It could be seen in the table that 1291 kgs of seeds was sold in the study area covering an area of 1143 ac during 2002-2003 which eventually increased to 2276 ac during 2004-2005. The quantity of seeds sold in the area tripled to 3655 kgs during 2009-2010, registering an increase of 183.10 per cent over the base period 2002-

Table 4. Partial budgeting analysis of *Bt* and non *Bt* cotton (Rs./ac)

| Particulars | Rs. | Credits | Rs |
|----------------------------------|-----|---|-------|
| 1 Additional cost | | Decrease in costs | |
| Seeds | 489 | 1. Savings due to reduced use of plant protection chemicals | |
| FYM | 160 | 2. Savings due to labour | 1208 |
| | | 3. Fertilizers | 182 |
| | | 4. Bullock labour | 156 |
| | | 5. Interest on working capital | 508 |
| | | | 49 |
| 2 Decrease in income | | Increase in Income | |
| Value of cotton stalks lost | 42 | Value of additional yield | 8330 |
| Total of debits (A) ¹ | 691 | Total of credits (B) | 10433 |
| Net gain : B - A | | | 9742 |

2003. It is heartening to note that the sale of non *Bt* cotton seeds declined over the years. During 2002-2003, the quantity of non *Bt* cotton seeds sold in the region was 7260 kg which later decreased by 87.77 per cent during 2009-2010. During the initial years of introduction of *Bt*

cotton, quantity of seeds sold in the area was very less due to lack of awareness of its potential benefits among the farmers. Between the years from 2005-2010 there has been manifold increase in the quantity of *Bt* cotton seeds used and its area. As the years passed by, the farmers

Table 5. Diffusion of *Bt* cotton technology as evident by sale of seeds and expansion in the area.

| Year | <i>Bt</i> cotton | | | Non <i>Bt</i> cotton | | |
|----------------------------------|------------------------|------------------|--|------------------------|------------------|--|
| | Seeds sold (000 kg) | Area (000 ac) | Percentage change in seeds and area | Seeds sold (000 kg) | Area (000 ac) | Percentage change in seeds and area |
| 2002-2003 | 12.91 | 11.43 | - | 72.60 | 23.19 | - |
| 2003-2004 | 15.54 | 13.75 | 20.36 | 58.02 | 18.54 | 20.09 |
| 2004-2005 | 25.72 | 22.76 | 65.49 | 50.16 | 16.02 | 13.55 |
| 2005-2006 | 26.70 | 23.63 | 3.83 | 42.94 | 13.72 | 14.41 |
| 2006-2007 | 27.78 | 24.58 | 4.05 | 25.56 | 8.17 | 40.47 |
| 2007-2008 | 29.59 | 26.19 | 6.53 | 18.84 | 6.02 | 26.30 |
| 2008-2009 | 32.64 | 28.88 | 9.34 | 13.80 | 4.41 | 26.76 |
| 2009-2010 | 36.55 | 32.35 | 11.99 | 8.88 | 2.84 | 35.66 |
| Overall percentage change | | 183.10 | | -87.77 | | |

became aware of economic advantage of *Bt* cotton and started its adoption. The process has been going on unabatedly leading to rapid expansion in the area of *Bt* cotton and drastic reduction in the area of non *Bt* cotton (Anchal and Sangeetha, 2010).

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Recieved for publication : April 16, 2013

Accepted for publication : July 9, 2014