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# Economics of *Bt* cotton in Haryana vis-a-vis Tamil Nadu

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**ABSTRACT:** The present study was conducted to study the economics of *Bt* cotton in Haryana *vis-a-vis* Tamil Nadu. The primary data were collected from 120 farmers *i.e.* 60 each from Haryana and Tamil Nadu acted as ultimate unit of the sample while the secondary data on area, production and productivity were pertained to the periods 1986-87 to 2015-16 was collected from various government publications. The area, production and productivity of cotton in Haryana and Tamil Nadu increase with average compound growth rates of 6.29 and 4.33 per cent / annum and 3.07 and 2.09 per cent / annum, 3.68 and -3.03 per cent / annum, respectively from the period 1986-1987 to 2015-2016 but area shows negative trend (-3.03 %) in case of Tamil Nadu. The comparative analysis of *Bt* cotton calculated for the crop year 2015 showed that / acre cost of cultivation varied between ₹ 35890 and ₹ 31736 in Haryana and Tamil Nadu, respectively. But due to yield variation among the two states, the significant difference in / unit cost of production was observed. It varied between ₹ 5836 and ₹ 4492 in Haryana and Tamil Nadu, respectively. Net return / acre of *Bt* cotton is ₹ -8000 and ₹ 1376 in Haryana and Tamil Nadu, respectively.

Per acre input utilization revealed that the use of bullock labour was observed more on small farmers followed by medium farmers and large farmers where as the usage of machine labour was found to be more on large farmers followed by medium and small farmers. The yield gap analysis revealed that the economic losses were found relatively higher in case of Haryana when compared to Tamil Nadu due to wide gap existed between potential yield, highest yield attained on farm and the average actual yield. The main production constraints noticed were non availability of adequate good quality seed, non availability of labour, poor quality insecticides/pesticides, unfavourable climatic conditions and lack of technical knowledge. The main marketing constraints were low price of *Bt* cotton produce, high regulation of market intermediates and lack of extension and marketing services.

**Key words :** Compound growth rate, constraints, costs and returns, yield gap analysis

Cotton is the most important cultivated commercial crop of India. It has great economic importance in the agrarian and industrial activities of our country. Cotton *(Gossypium* spp) popularly known as “White Gold” is a major commercial crop unanimously designated as “King of Fibres”. Cotton is being cultivated in 70 countries of the world with total area coverage of 31.24 million ha in 2015-2016. India is the largest cotton growing country in the world with 35.29 per cent of world cotton area followed by China (15.23 %). During the year 2015-2016, the area, production and productivity of cotton were 11.88 million hectares, 33.80 million bales and 484 kg/ha, respectively (Anonymous 2016). *Bt* cotton is playing immense role in enhancing the economy of the farmers in Haryana. Since *Bt* cotton is grown in Haryana there is substantial increase in production of cotton. During the

year 2015-2016, the area, production and productivity of cotton were 0.60 million ha, 1.50 million bales and 423 kg/ha, respectively (Anonymous, 2016). Cotton, at present, is not a very important crop for Tamil Nadu in terms of production and is grown on a very small area, compared to the national cotton land acreage (TN covers around 2 to 3 % of India's cotton land). However, consumption of cotton is the highest by the cotton mills of Tamil Nadu amongst all states. During the year 2015-2016, the area, production and productivity of cotton were 0.14 million ha, 0.50 million bales and 599 kg/ha, respectively (Anonymous, 2016). Despite being one the top most cotton growing countries in the world, the cotton yields in India are one of the lowest. A major reason for this low productivity is the severe insect pest incidence which causes extensive crop damage. As a result of this situation, the farmers have been highly dissatisfied and have been looking for cotton varieties that have pest resistance. Hence, *Bt* cotton was introduced in India to reduce the pesticide consumption thereby the farmers of Haryana and Tamil Nadu were also adopted *Bt* cotton technology to reduce the pest damage and the cost of production. The present study was, therefore undertaken to study the economics of *Bt* cotton cultivation, growth rates and to work out the index of yield gaps and economic losses in both the states of Haryana and Tamil Nadu.

The present study was undertaken in Haryana and Tamil Nadu states. Sirsa and Hisar district of Haryana and Salem and Dharmapuri district of Tamil Nadu were randomly selected to represent a case study. Then, one block was randomly selected from each selected districts of Haryana and Tamil Nadu for the present study *i.e.* Uklana block from Hisar district, Mandi Dabwali block from Sirsa district, Dharmapuri block from Dharmapuri district and Aattur block from Salem district. From each selected blocks, two villages were also randomly selected. Thus in total following eight villages were selected for present study. These villages were Mugalpur and Sahu from Uklana block in Hisar district and Kharian and Risalia Khera from Mandi Dabwali block from Sirsa district in Haryana. Similarly in Tamil Nadu, Onniyampatti and Andipatti from Dharmapuri block in Dharmapuri district and Thalavalpatti and Puthiragoundampalayam from Aattur block in Salem district were selected. From the selected villages, random samples of 15 respondents from each village were selected. Farmers were divided into three categories *i.e.* small, medium and large based on their size of operational holdings by cumulative total method

**Table 1.** Categorization of sample farmers

| States | Districts | Group size | | | Total selected farmers |
|---|---|---|---|---|---|
| | | Marginal and small (<5 ac) | Medium (5.01-10 ac) | Large(>10 ac) | |
| Haryana | Hisar | 7 | 9 | 14 | **30** |
| | Sirsa | 9 | 8 | 13 | **30** |
| Tamil Nadu | Dharmapuri | 14 | 11 | 5 | **30** |
| | Salem | 12 | 12 | 6 | **30** |
| **Total** | | **42** | **40** | **38** | **120** |

(Table 1). In all, 120 farmers distributed into three categories were selected for the present study.

To fulfil the objectives of the study, the data collected was subjected to statistical analysis. Tabular analysis was adopted to analyze the cost and returns of farmers in two states.

**Growth rate analysis :** For studying the compound growth rates (C. G. R.) in area, production, and productivity of cotton for the Haryana, Tamil Nadu and overall India were calculated for the period of 30 years *i.e.* 1986-1987 to 2015-2016. The compound growth rates were computed using the exponential function of the form:

$Xt = ab^t u_t$

$\text{Log } Xt = \text{Log } a + t \text{ Log } b + \text{Log } ut$

Where,

$X_t$ = Area/production/ productivity/of cotton in year't'

t = Time elements which take the value 1, 2, 3, 4,.....in

a = Intercept

b = Regression coefficient

$u_t$ = Standard error term

Compound growth rates were worked out as follow:

Compound growth rate (r) = (b-1) x100

**Yield gap analysis :** Yield gap and index of yield gap were assessed by employing the following formulas:

Yield gap I = Potential yield - Average actual yield

Yield gap II = Highest yield attained on farm - Average actual yield

Index of yield gap I = Yield gap I / Potential yield

Index of yield gap II = Yield gap II / Highest yield attained on farm

Information regarding various production and marketing constraints were collected from the respondents by survey method through personal interview with the help of pre-tested schedule designed for the study. With respect to the various production and marketing constraints faced by the *Bt* cotton growers, the multiple responses of the farmers to a particular problem was presented in a tabular form.

**Cost of cultivation of *Bt* cotton in Haryana and Tamil Nadu :** The cost and returns on overall farms in Haryana and Tamil Nadu have been compared in Table 2 per ac cost of production was found to be more in Haryana (₹ 35890) as compared to that of Tamil Nadu (₹ 31736). The average yield of *Bt* cotton was 6.15 and 7.8 q/ac in Haryana and Tamil Nadu, respectively. The slight variation in yield is due to whitefly attack and lack of adequate irrigation in former case. The average cost of cultivation was ₹ 5836 and ₹ 4492 in Haryana and Tamil Nadu, respectively. Hence, there was significant difference in cost of cultivation among the states, Haryana incurred higher costs. The rental value of land was contributed highest to the total cost in both the states which accounted for ₹ 10295 (28.68 %) and ₹ 5280 (16.64 %) followed by expenses incurred on picking was ₹ 5700 (15.88 %) and ₹ 5121 (16.14 %) in Haryana and Tamil Nadu, respectively. The gross return/ac in Haryana was ₹ 27890 and ₹ 33112 in Tamil Nadu. It is mainly due to lower yield in Haryana due to

**Table 2.** Comparative economics of *Bt* cotton in Haryana and Tamil Nadu (2015-2016) (₹/ac)

| Sr.No | Item | Haryana | Tamil Nadu |
|---|---|---|---|
| 1 | Preparatory tillage | 1272 (3.54) | 1817 (5.72) |
| 2 | Pre-sowing irrigation | 600 (1.67) | 445 (1.40) |
| 3 | Sowing | 400 (1.11) | 481 (1.52) |
| 4 | Ridging | 110 (0.31) | 402 (1.27) |
| 5 | Seed | 1800 (5.01) | 2037 (6.42) |
| 6 | Seed treatment | 0 (0.00) | 0 (0.00) |
| 7 | FYM | 442 (1.23) | 328 (1.03) |
| 8 | Fertilizer nutrients | | |
| | A. Nitrogen | 720 (2.01) | 710 (2.24) |
| | B. Phosphatic | 874 (2.43) | 785 (2.47) |
| | C. Potassic | 172 (0.48) | 395 (1.24) |
| | D. ₹inc sulphate | 198 (0.55) | 466 (1.47) |
| | Total fertilizer invested | 1964 (5.47) | 2361 (7.44) |
| 9 | Fertilizers application | 133 (0.37) | 140 (0.44) |
| 10 | Irrigation | 1812 (5.05) | 1717 (5.41) |
| 11 | Hoeing/weeding | 2507 (6.98) | 2669 (8.41) |
| 12 | Plant protection | 1927 (5.37) | 1246 (3.93) |
| 13 | Harvesting/picking | 5700 (15.88) | 5121 (16.14) |
| 14 | Miscellaneous | 157 (0.44) | 147 (0.46) |
| | **Total (1 - 14)** | **18827 (52.46)** | **18911 (59.59)** |
| 15 | Interest on working capital | 2260 (6.29) | 2269 (7.15) |
| **16** | **Variable cost (A)** | **21087 *(58.75)*** | **21180 (66.74)** |
| 17 | Transportation charges | 292 (0.81) | 380 (1.20) |
| 18 | Management charges | 2108 (5.87) | 2448 (7.71) |
| 19 | Risk factor | 2108 (5.87) | 2448 (7.71) |
| 20 | Rental value of land | 10295 (28.68) | 5280 (16.64) |
| **21** | **Fixed cost (B)** | **14803 (41.24)** | **10556 (33.26)** |
| **22** | **Total cost (A+B)** | **35890(100.00)** | **31736(100.00)** |
| **23** | **Production (0)** | **6.15** | **7.8** |
| | A. Main product | 26445 | 31980 |
| | B. By product | 1445 | 1132 |
| **24** | **Gross return** | **27890** | **33112** |
| 25 | Return over variable cost | 6803 | 11931.9 |
| **26** | **Net return over total cost** | **-8000** | **1376** |
| 27 | Cost of production/q | 5836 | 4492 |
| **28** | **Return/rupee of investment*** | **1.32** | **1.56** |

Note: Figures in the parentheses indicate percentage to the total cost

*Over variable cost

whitefly attack and lack of adequate rainfall. Whereas Tamil Nadu (₹ 1376) recorded significant difference in net return over Haryana (₹ -8000), because of lower cost of cultivation. Return / rupee of investment was 1.32 and 1.56 in Haryana and Tamil Nadu respectively, where Tamil Nadu recorded significant cost benefit ratio.

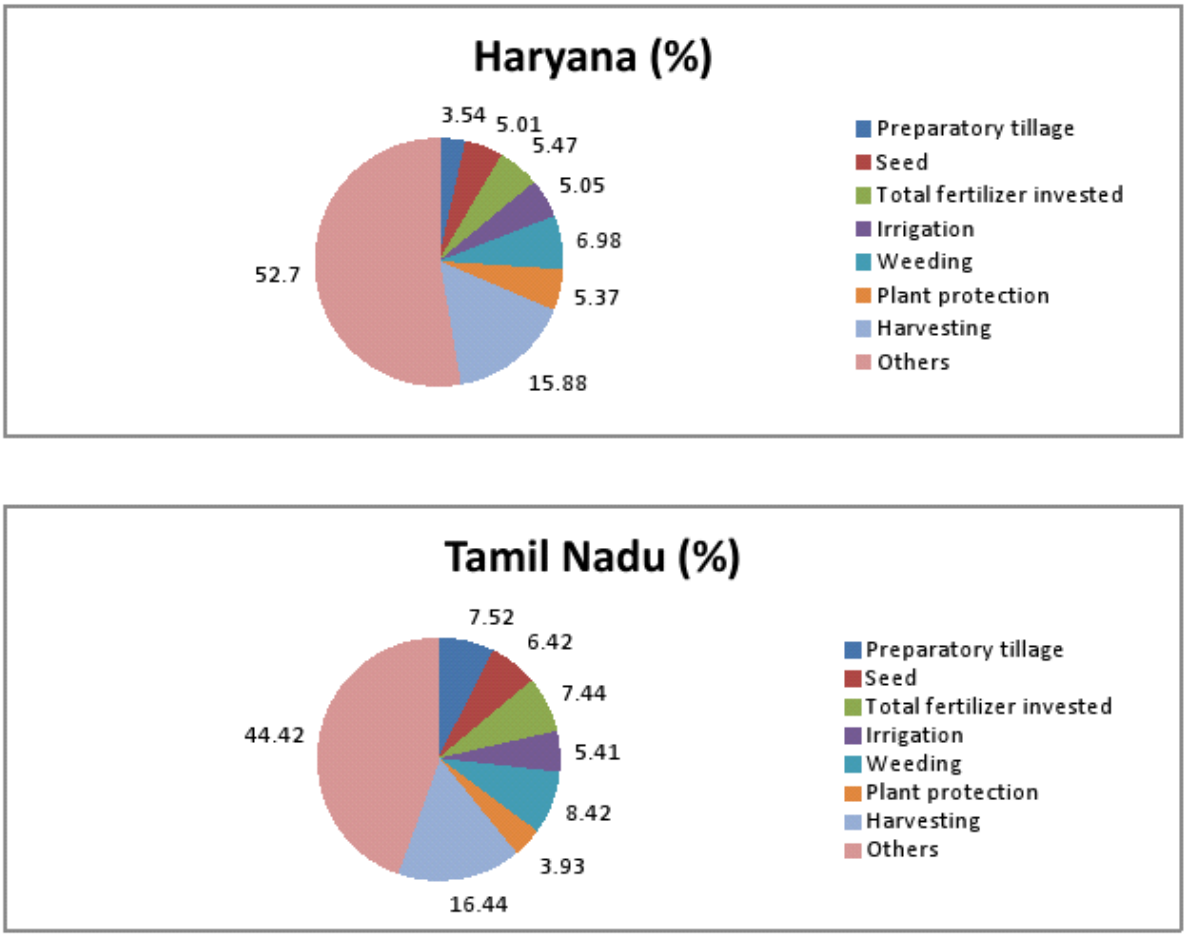


**Fig. 1.** Costs and returns of *Bt* cotton in Haryana and Tamil Nadu

To conclude among the two states Tamil Nadu faired well in yield levels, net returns, gross returns and return / rupee of investment due to better management practices and adequate irrigation facilities. But farmers of Haryana got poor yield and net returns due to sudden and severe pest outbreak mainly whitefly which worsen the economic condition of Haryana farmers which made most of the cotton farmers miserable and in distress situation. So, in nutshell Tamil Nadu shared better results than Haryana.

**Per acre input utilization of *Bt* cotton in Haryana and Tamil Nadu :** Data in the Table 3 and 4 depict information on the use of inputs in *Bt* cotton labour for *Bt* cotton sample as a whole was 46.35 (*i.e.* 46 man days) in case of Haryana where as in Tamil Nadu it was 55.27 (*i.e.* 55 man days), while, total bullock labour in Haryana and Tamil Nadu was 0.20 and 0.30, respectively. Inter-group comparison revealed that with increase in size of holding, there was decrease in / ac use of human labour. Results presented in table revealed that the level of fertilizer use increase with increase in size of holding. The level of fertilizer use by small farmers was near

**Table 3.** Per acre input utilization of *Bt* cotton in Haryana (2015-2016)

| Sr. No | Input | Unit | Physical quantity | | | |
|---|---|---|---|---|---|---|
| | | | Small | Medium | Large | **Overall** |
| 1 | **Hired human labour** | | | | | |
| | Male | Days | 10.62 | 10.28 | 10.06 | **10.32** |
| | Female | Days | 15.92 | 15.42 | 25.15 | **18.83** |
| | **Total** | | **26.54** | **25.70** | **35.21** | **29.15** |
| 2 | **Family labour** | | | | | |
| | Male | Days | 7.08 | 6.85 | 6.71 | **6.88** |
| | Female | Days | 10.62 | 10.28 | 10.06 | **10.32** |
| | **Total** | | **17.70** | **17.13** | **16.77** | **17.20** |
| 3 | **Total human labour** | | | | | |
| | Male | Days | 17.69 | 17.14 | 16.77 | **17.20** |
| | Female | Days | 26.54 | 25.70 | 35.21 | **29.15** |
| | **Total** | | **44.23** | **42.84** | **51.98** | **46.35** |
| 4 | Bullock labour | Days | 0.40 | 0.20 | 0 | **0.20** |
| 5 | Machine labour | h | 4.50 | 5.40 | 6.90 | **5.60** |
| 6 | Seeds | g | 750 | 800 | 850 | **800** |
| 7 | Manure | Cl | 4.73 | 4.42 | 4.11 | **4.42** |
| 8 | Fertilizer | | | | | |
| | N | kg | 101.86 | 102.28 | 104.28 | **102.81** |
| | P | kg | 50.00 | 48.55 | 47.05 | **48.53** |
| | K | kg | 10.00 | 9.50 | 9.50 | **9.67** |
| | **Total** | | **161.86** | **160.33** | **160.83** | **161.01** |
| 9 | Yield | | | | | |
| | Main produce | Ws. | 5.86 | 6.05 | 6.54 | **6.15** |

about same to that of medium and large farmers However, the use of bullock power was observed more on large farmers followed by small farmers and medium farmers Comparison of input use between different size groups indicated that / ac use of human labour and fertilizer was highest (about 44 man days and 162 kgs) in small size group of Haryana and in case of Tamil Nadu, the bullock labour was highest (4.50 man days) in small size group. In Haryana, the yield of *Bt* cotton was highest (*i.e.* 6.54 q / ac ) in large size group of holding and lowest (*i.e.* 5.86 q / ac ) in small size group of holding. Similarly, in Tamil Nadu also, the yield of *Bt* cotton was highest (*i.e.* 8.30 q / ac ) in large size group of holding and lowest (*i.e.* 7.43 q / ac ) in small size group of holding.

**Growth rate analysis :** In Haryana the area, production and productivity of cotton was increased with average compound growth rates of 0.76, 3.07 and 2.09 % / annum, respectively from the period 1986-87 to 2015-16 due to favorable crop growing suitability fac tors and

**Table 5.** CGR of area, production and productivity of cotton in Haryana

| Year | Area | Production | Productivity |
|---|---|---|---|
| 1986-1987 to 1995-1996 | 0.74 | 0.36 | -3.45 |
| 1996-1997 to 2005-2006 | -0.03 | 0.70 | 0.63 |
| 2006-2007 to 2015-2016 | 2.99 | 3.91 | 0.89 |
| **1986-1987to2015-2016** | **0.76** | **3.07** | **2.09** |

**Table 4.** Per acre input utilization of *Bt* cotton in Tamil Nadu (2015-16)

| Sr. No | Input | Unit | Physical quantity | | | |
|---|---|---|---|---|---|---|
| | | | Small | Medium | Large | Overall |
| **1** | **Hired human labour** | | | | | |
| | Male | Days | 12.22 | 12.28 | 12.34 | **12.28** |
| | Female | Days | 18.33 | 18.42 | 30.84 | **22.53** |
| | **Total** | | **30.55** | **30.70** | **43.18** | **34.81** |
| **2** | **Family labour** | | | | | |
| | Male | Days | 8.15 | 8.19 | 8.22 | **8.19** |
| | Female | Days | 12.22 | 12.28 | 12.34 | **12.28** |
| | **Total** | | **20.37** | **20.47** | **20.56** | **20.47** |
| **3** | **Total human labour** | | | | | |
| | Male | Days | 20.36 | 20.46 | 20.56 | **20.46** |
| | Female | Days | 30.55 | 30.70 | 43.18 | **34.81** |
| | **Total** | | **50.91** | **51.16** | **63.74** | **55.27** |
| 4 | Bullock labour | Days | 4.50 | 3.10 | 1.80 | **3.13** |
| 5 | Machine labour | h | 3.00 | 5.30 | 6.10 | **4.80** |
| 6 | Seeds | g | 790 | 850 | 870 | **837** |
| 7 | Manure | Cl | 3.51 | 3.27 | 3.05 | **3.28** |
| 8 | Fertilizer | | | | | |
| | N | kg | 100.14 | 101.00 | 103.28 | **101.47** |
| | P | kg | 44.94 | 43.61 | 42.27 | **43.61** |
| | K | kg | 22.22 | 22.00 | 21.66 | **21.96** |
| | **Total** | | **167.3** | **166.61** | **167.21** | **167.04** |
| 9 | Yield | | | | | |
| | Main produce | Qtls. | 7.43 | 7.68 | 8.30 | **7.80** |

price support along with state government support (Table 5).

The perusal of Table 6 showed that the production and productivity of cotton in Tamil Nadu increase with average compound growth rates of 0.53 and 3.68 per cent/ annum, respectively from the period 1986-87 to 2015-16 in Tamil Nadu but it shows negative trend (-3.03 %) in terms of area. The increase in production and productivity were higher as compared to area due to development of *Bt* hybrids and improvement of management.

**Table 6.** CGR of area, production and productivity of cotton in Tamil Nadu

| Year | Area | Production | Productivity |
|---|---|---|---|
| 1986-1987 to 1995-1996 | 0.20 | 0.25 | 0.03 |
| 1996-1997 to 2005-2006 | -0.57 | 0.15 | 0.90 |
| 2006-2007 to 2015-2016 | 5.09 | 1.22 | -3.67 |
| **1986-1987 to 2015-2016** | **-3.03** | **0.53** | **3.68** |

**Yield gap analysis :** There have been always yield gaps on the farmer's field. There exist some fac tors responsible for low yields compared to potential yield and highest yield attained on particular farms. The yield gap I is denoted by gap between potential yield and average ac tual yield of respondent farmers and yield gap II is denoted by gap between highest yield attained on farm of respondent farmers and ac tual average yield on the farms. A wide gap existed in the *Bt* cotton productivity in both the states (*i.e.* Haryana and Tamil Nadu) are given in Table

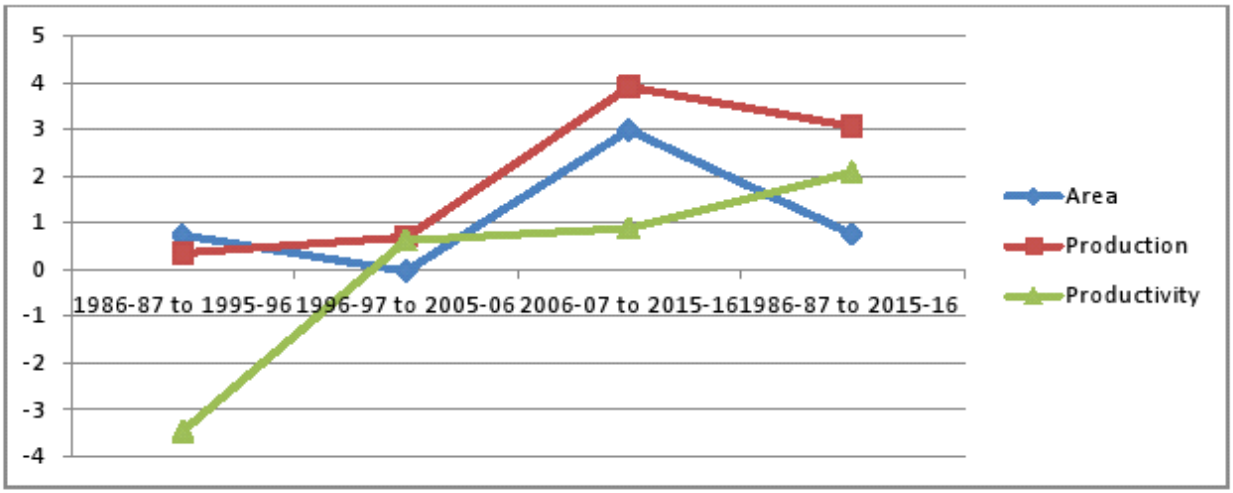


**Fig. 2.** CGR of area, production and productivity of cotton in Haryana

7. The / ac magnitude of yield gap I was found 8.50 q in Haryana where as it was 5.70 q / ac in Tamil Nadu. Similarly yield gap II for *Bt* cotton in Haryana and Tamil Nadu was noticed as 2.50 and 4.20 q / ac . The index of yield gap I and II for *Bt* cotton were found 0.59 and 0.29 in Haryana where in Tamil Nadu it was 0.42 and 0.35. The economic losses due to the yield gap were found very high as presented earlier through yield gaps 8.50 q / ac overall in case of *Bt* cotton in Haryana but in case of Tamil Nadu it was about 5.70 q / ac . Hence, the economic losses were found relatively higher in case of Haryana when compared to Tamil Nadu. The yield gap was observed due to inadequate crop stand, seedling burning due to high temperature at emergence, late rainfall coinciding with flowering and boll formation, sucking pests especially the whitefly, mealy bug, cotton leaf curl virus (CLCuV) disease and wilting at maturing.

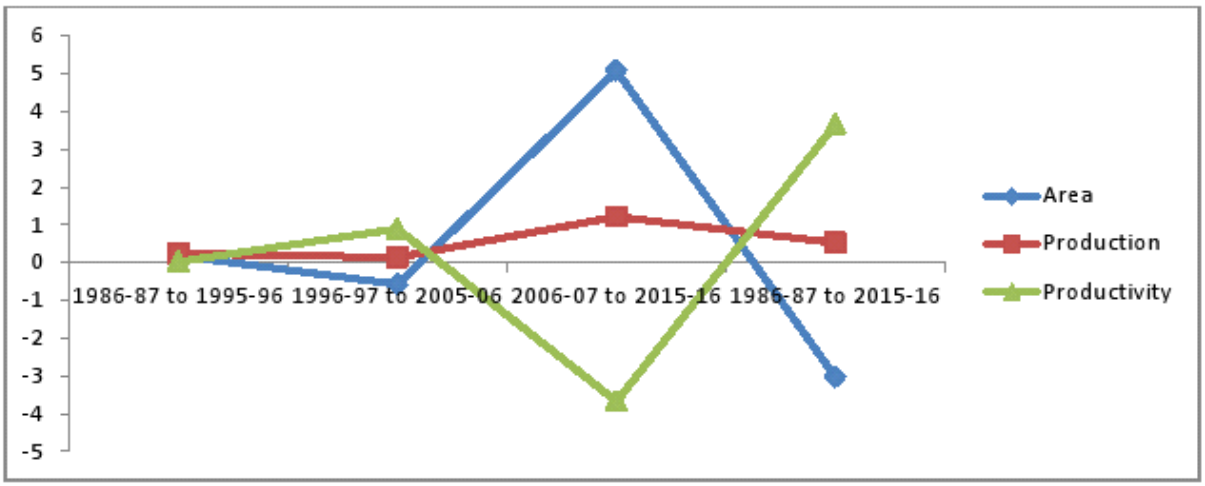


**Fig. 3.** CGR of area, production and productivity of cotton in Tamil Nadu

**Constraints faced by *Bt* cotton growers :** On the basis of the info information collected from the *Bt* cotton growers (Table 8), the main problems fac ed by them during the production were non-availability of adequate good quality seed (81.67 and 88.33 %), non-availability of labour (86.66 and 80 %), lack of technical knowledge (80 and 91.66 %), unfavourable climatic conditions (65.00 and 70 %), low oil content (25 and 30 %), poor quality insecticides/ pesticides (96.66 and 81.66 %), sub-optimal input use (45 and 58.33 %), poor quality land (23.33 and 21.66 %), poor quality weedicides (41.66 and 45 %) and maintenance of refuge plants (13.33 and 10 %) in Haryana and Tamil Nadu, respectively.

The constraints fac ed by the *Bt* cotton growers (Table 9) during marketing were low price of *Bt* cotton produce at market (91.66 and 96.66 %), non-availability of adequate processing units/mills (30 and 36.66 %), lack of extension and marketing fac ilities (75 and 86.66 %), high

**Table 7** Attainable yield gap in *Bt* cotton production in Haryana and Tamil Nadu (2015-2016) (q/ac)

| Sr. | | Haryana | | | Tamil Nadu | | |
|---|---|---|---|---|---|---|---|
| No | Particulars | Hisar | Sirsa | **Overall** | Dharmapuri | Salem | **Overall** |
| 1 | Potential yield | 14.00 | 15.00 | **14.50** | 13.00 | 14.00 | **13.50** |
| 2 | Actual average yield | 5.20 | 6.80 | **6.00** | 7.40 | 8.20 | **7.80** |
| 3 | Highest yield | 8.00 | 9.00 | **8.50** | 11.00 | 13.00 | **12.00** |
| 4 | Yield gap I | 8.80 | 8.20 | **8.50** | 5.60 | 5.80 | **5.70** |
| 5 | Yield gap II | 2.80 | 2.20 | **2.50** | 3.60 | 4.80 | **4.20** |
| 6 | Index of yield gap I | 0.63 | 0.55 | **0.59** | 0.43 | 0.41 | **0.42** |
| 7 | Index of yield gap II | 0.35 | 0.24 | **0.29** | 0.33 | 0.37 | **0.35** |

regulation by market intermediates (66.66 and 80 %), lack of infrastructure fac ilities (36.66 and 60 %) and high transportation costs (10 and 78.33 %) in Haryana and Tamil Nadu, respectively.

## CONCLUSIONS

The comparative analysis of *Bt* cotton calculated for the crop year 2015 showed that / ac cost of cultivation varied between ₹ 35890 and ₹ 31736 in Haryana and Tamil Nadu, respectively. But due to yield variation among the two states, the significant difference in / unit cost of production was observed. It varied between ₹ 5836 and ₹ 4492 in Haryana and Tamil Nadu, respectively. Net return / ac of *Bt* cotton is ₹ - 8000 and ₹ 1376 in Haryana and Tamil Nadu, respectively. The yield gap analysis revealed that the economic losses were found relatively higher in case of Haryana when compared to Tamil Nadu due to wide gap existed between potential yield, highest yield attained on farm and the average ac tual yield. Hence, the efforts should be made to bridge the gap. The efforts in cotton research will be more beneficial if farmers are educated and if cotton research is tailored towards the needs of specific locations. To overcome the constraints in production of *Bt* cotton, it is necessary to develop suitable *Bt* cotton varieties which can withstand unfavourable climatic conditions, insect pest attack (particularly whitefly) and lodging at harvesting stage.

**Table 8.** Constraints faced by farmers in *Bt* cotton production in Haryana and Tamil Nadu

| S. No. | Constraints | Haryana | | Tamil Nadu | |
|---|---|---|---|---|---|
| | | Number of farmers (N=60) | Respondent's response (%) | Number of farmers (N=60) | Respondent's response (%) |
| 1 | Non availability of adequateinputs | 49 | 81.67 | 53 | 88.33 |
| 2 | Non availability of labour | 52 | 86.66 | 48 | 80.00 |
| 3 | Unfavourable climatic condition | 39 | 65.00 | 42 | 70.00 |
| 4 | Lack of technical knowledge | 48 | 80.00 | 55 | 91.66 |
| 5 | Poor quality of insecticides/pesticides | 58 | 96.66 | 49 | 81.66 |
| 6 | Sub optimal input use | 27 | 45.00 | 35 | 58.33 |
| 7 | Low oil content | 15 | 25.00 | 18 | 30.00 |
| 8 | Poor quality land | 14 | 23.33 | 13 | 21.66 |
| 9 | Poor quality weedicides | 25 | 41.66 | 27 | 45.00 |
| 10 | Maintenance of refuge plants | 8 | 13.33 | 6 | 10.00 |

**Table 9.** Constraints faced by farmers in *Bt* cotton marketing in Haryana and Tamil Nadu

| S. No. | Constraints | Haryana | | Tamil Nadu | |
|---|---|---|---|---|---|
| | | Number of farmers (N=60) | Respondent's response (%) | Number of farmers (N=60) | Respondent's response (%) |
| 1 | Low price of *Bt* cotton produce atmarket | 55 | 91.66 | 58 | 96.66 |
| 2 | Lack of extension and marketing services | 45 | 75.00 | 52 | 86.66 |
| 3 | Non availability of adequate processing units/mi11s | 18 | 30.00 | 22 | 36.66 |
| 4 | High regulation by market inter mediates | 40 | 66.66 | 48 | 80.00 |
| 5 | Lack of infrastructure facility | 22 | 36.66 | 36 | 60.00 |
| 6 | Distance from market | 30 | 50.00 | 36 | 60.00 |
| 7 | High transportation cost | 6 | 10.00 | 47 | 78.33 |

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