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Comparative Economics of Bt-Cotton *vis* - A - *vis* NHH - 44

Pathrikar D.T.[1], Gourkhede P.H.[1] and Kharat S.S.[1]

ABSTRACT: *The improved situation regarding Bt Cotton made this investigation to undertake the present study "Comparative economics of Bt-cotton Vis-a Vis NHH-44 cotton", with major objectives as to study the socio-economic condition of cotton growers, to work out the cost and returns of cotton ,to analyze the input use efficiency and to find out the constraints faced by cotton growers . For this study four stage sampling technique was adopted .Parbhani and Nanded districts of Marathawada region were selected because of maximum area under cotton. From these districts two tahsils viz,pathri from Parbhani district and Naygaon from Nanded district were selected. Eight villages were selected and from these 180 farmers that is 90 each for cotton NHH-44 and Bt-cotton were randomly selected for the study .These farmers were grouped into three categories on the basis of their land holding analysis was carried out by adapting suitable analytical tools. Study revealed that among the selected sample, the farmers were from middle age group with primary education and agricultural as main source of occupation. The per hectare total cost of cultivation was worked out to be Rs.18196.86 and Rs.19327.03 in respect of cotton NHH-44 and Bt-cotton respectively. The seed cost of Bt-cotton was more however, the spraying amount required was low as compared with NHH-44. A typical trend was observed that farmers had given more irrigations to NHH-44 cotton than Bt-cotton. This may be due to the fact that farmers were not aware about the irrigations requirement to Bt-cotton .The other expenses on fertilizer, hired human ,bullock labor, manures and fertilizers were about the same. In general, the cost per hectare was more in Bt-cotton than Nhh-44 production.*

Keywords*: Input use efficiency Economics , cotton , returns ,cost benefit ratio etc.*

INTRODUCTION

The use of cotton as a source of textile extends far into the past, thousands of years before the birth of Christ. Documentation establishes that the cotton fibre was being produced in the Indus valley around 3000 Bc India later became the first important exporter of the finished products. Grithasamad, a Vedic rishi, survived some 20,000 years ago in a village called Kalambhi in the present Yavatmal district in Maharashtra State. This village has witnessed world's first successful researched cultivation of cotton by Grithasamad. Cotton crop with history and prosperity, have a profound influence on men and matter as The use of cotton as a source of textile extends far into the past, thousands an industrial commodity of worldwide importance. Cotton continues to remain the backbone of rural economy, particularly in dry land areas. Besides, being a money spinner, it is also an employment generator.

All this is because of Green Revolution, which had saved the world from food and fibre crisis, during the late 1960s and early 1970s. During that period the global population was about 3.7 billion. At present world population is around 7 billion and it is anticipated that it may reach 10 billion by the year 2050. The majority of these population will be in developing, resource poor countries. The increased demand for food and fibre will therefore come from these countries. While the demand for food and fibre increases, the potential for meeting that demand decreases. The adverse factors are ecological and socioeconomic. The per capita availability of land and water steadily going down. Whereas, demand for food and fibre goes on increasing, which serves as an index to measure the standard of living of a country.

[1] Department of Agril Economics Vasantrao Naik Marathawada Agricultural University, Parbhani -431402 (MH)
* *E mail : dheeraj.keynote@gmail.com*

So to over come such grim scenario of cotton, use of advanced technologies, such as biotechnology is applied to minimise the pesticide use and provide adequate crop protection for sustainable fibre production in the future.

With the development of transgenic plants one can tackle the problem at its source. Genetically engineered BT crops are spliced with the BT gene (cry 1 AC gene and npt II and aad marker gene) BT (*i.e. Bacillus thuringienisis*) is a natural occuring soil bacterium, used as a spray in organic farming as a natural pesticide which does not affect the beneficial insects. Mosanto has engineered BT into crops, making them pest resistant and minimise pesticide use.

This improved situation regarding BT cotton made this investigation to under take the present study, which will provide information about the comparative economics between BT cotton and existing stable NHH-44 variety of cotton.

METHODOLOGY

The study has been undertaken with the specific object to study the comparative economics of BT-Cotton vis-A-vis NHH-44 Cultivation in selected area of Parbhani and Nanded district.

Four stage sampling technique was adopted for selection of samples. At first stage the Nanded and Parbhani district was purposively selected because of higher area under cotton. At second stage one tahsil from each district was selected on basis of highest Area under cotton as compared to other talukas. At third stage from each tahsil a cluster of four villages were randomly selected:

Parbhani District :

1. Pathri taluka :

   Villages :

   (i) Babultar (iii) Renapur

   (iii) Babhulgaon (iv) Gunj

Nanded District :

2. Nayagaon taluka :

   Villages :

   (i) Narsi (ii) Ramtirat

   (iii) Kahala (iv) Khusnar

Selection of Cultivators

At fourth stage, a list of cultivators for each village was collected on the basis of the BT cotton and conventional cotton growers. Thus, twenty to twenty five cultivators were randomly selected from each village by random sampling method. The farmers were classified in three size groups (small, medium and large) on the basis of their land holding. For selection of farmers in groups, a list of cotton growers in all the selected villages was arranged in descending area of their total land holding, and from this list, 30 farmers each for small, medium and large groups were selected randomly (*i.e.* total of 180 farmers for both the varieties). Farmers upto 2 hectare were categories as small group, while from 2.01 to 4.00 ha. were medium group farmers and farmers above 4.00 ha. were grouped as large farmers. Thus the total effective sample size of cultivators was ninety for each of the variety (NHH-44 and BT-Cotton).

Collection of Data

The sample farmers were contacted personally and the objectives of the study were explained to them to ensure the co-operation. The information was collected from them in a specially designed schedule by survey method. The schedule covering details of size of holding, input utilization in physical terms, cost incurred on various items of expenditure and returns obtained from the crop was prepared. Data collected was pertained to the year 2002-2003. The data was analysed by employing simple statistical techniques, viz., means, frequency, ratio percentage, etc. and according to nature of the data functional analysis was done to arrive at meaningful conclusions.

Cost Concepts

The total input costs of BT cotton and NHH-44, production have been distributed under three heads using the accepted cost concepts 'A', 'B' and 'C'.

Cost 'A'

Cost 'A' includes actual expenditure incurred in cash and kind *i.e.* the cost on account of hired human labour, hired plus owned bullock labour, seed value manure and fertilizers, interest on working capital, depreciation and repair of implement and land revenue, etc.

Cost 'B'

Cost 'B comprised of Cost 'A' + imputed rental value of land and interest on fixed capital.

Cost 'C'

Comprised of Cost 'B' + imputed value of family human labour. Thus the Cost 'C' presents the total cost of cultivation.

Evaluation of Inputs

Inputs are the factors of production, they refer to those expenses of cultivation that are incurred in the form of cash and kind. The items considered are as :

Physical inputs :

Human labour, Bullock labour, Machine, Seed, Manures, Fertilizers, Plant protection, Depreciation on implement and machinery.

Monetary inputs

Land revenue, Interest on working capital, Interest on fixed capital, Rental value of the land.

RESULTS

The studies on cost of cultivation are essential for determining the comparative economic efficiency of well established cotton variety NHH-44 and newly evolved BT-cotton. It also enables a farm entrepreneur to select variety of cotton crop, which is more profitable and suited to agro-climatic conditions in the locality. Hence present investigation on "Comparative Economics of BT Cotton *vis* – A – *vis* NHH-44", was undertaken.

Socio-Economic Status of Cotton Growers

Frequency distribution and respective percentages of cotton growers in regard to socio economic status were calculated and are presented in Table 1. It was observe that most of the cotton grower (73.33 per cent) had been in middle age group. It is important to note that the highest number of cotton growers were educated only upto primary level (30.00 per cent) followed by high school level (26.67 per cent). It reveled that the majority of cotton growers had the agriculture as a main occupation (56.67 per cent) followed by businessmen and traders (36.67 per cent). The considerable family size was ranged from 5 to 8 members (60.00 per cent).

Study revealed that, the majority of the farmers were from middle age group with maximum percentage of growers with only primary educational level. Out of the total growers, 56.67 per cent were directly dependent on agriculture sector.

Table 1
Socio-economic status of cotton growers.

Sr. No.	*Particulars*	*Frequency (N = 90)*	*Percentage*
1.	*Age in years*		
	1. upto 25	06	6.67
	2. 26 to 50	66	73.33
	3. 50 and above	18	20.00
2.	*Educational level*		
	1. Primary	27	30.00
	2. Middle school	12	13.33
	3. High school	24	26.67
	4. Higher secondary	12	13.33
	5. Graduate	09	10.00
	6. Post graduate	06	6.67
3.	*Occupational level*		
	1. Agriculture	51	56.67
	2. Business and trade	33	36.67
	3. Official	06	6.66
4.	*Family size in number*		
	1. 1 to 4	18	20.00
	2. 5 to 8	54	60.00
	3. 9 to 12	18	20.00

Land Utilization Pattern

Land utilization pattern of the selected cultivators in the study area is presented in Table 2 as below.

Table 2
Land Utilization Pattern

Sr. No.	*Particulars*	*Small*	*Medium*	*Large*	*Avg.*
1.	Size of Holding	1.46 (100.00)	2.86 (100.00)	4.6 (100.00)	2.97 (100.00)
2.	Fallow Land	0.07 (4.80)	0.18 (6.30)	0.43 (9.34)	0.22 (7.40)
3.	Net Culti vated area	1.39 (95.20)	2.68 (93.71)	4.17 (90.66)	2.75 (92.60)
4.	Irrigated area	0.56 (38.35)	1.29 (45.10)	2.88 (62.62)	1.58 (53.19)
5.	Rainfed area	0.83 (56.85)	1.39 (48.60)	1.29 (28.04)	1.17 (39.39)

Figures in arenthesis indicate percentage to the size of land holding.

Data presented in Table 2 revealed that on an average the size of holding for the sample as a whole was 2.97 hectares, while in respect to small, medium and large farmers, the size of holding was 1.46, 2.86, and 4.60 ha., respectively. The average net cultivated land was 2.75 ha. while for small farmers, it was 1.39 ha. for medium farmers, it was 2.68 ha. and for large farmers it was about 4.17 ha. On an average fallow land was 0.22 ha. while with small, medium and large farmers it was 0.07, 0.18 and 0.43 ha. respectively. From this data it can be noted clearly that, farmers now a days are utilizing maximum area there by leaving very few fallow land. As cotton is cash crop and now a days grown commercially for earning more profit. Farmers in the study area on

an average are growing cotton under higher irrigated area 1.58 ha.(53.19 per cent), while in rainfed area cotton was grown on 1.17 ha. (39.39 per cent). It was observed that among the small, medium and large farmers, the rainfed cotton was comparatively more with small and medium farmers, while irrigated cotton was more with large farmers (62.62 per cent). The land utilization pattern for small, medium and large farmers clearly indicated that most of the land was under cultivation, leaving very few land as fallow land. This is because of the size of holding per person is decreasing and problem of unemployment caused the youths to return back to agriculture.

Cropping Pattern

Cropping pattern of selected cultivators under study is presented in Table 3.

It is observed from Table 3 that, cotton was main kharif crop of the selected cultivators, whereas other kharif crops grown were soybean, mung, tur, udid, hybrid jowar, turmeric and vegetable.

Cropping pattern indicated that, on an average basis in kharif season cotton NHH-44 was grown as an major crop (27.66 per cent), followed by hybrid jowar (20.56 per cent) and soybean (6.91 per cent). On small farmers field, area under cotton was more (32.68 per cent), followed by tur (2.94 per cent), udid (2.28 per cent). On medium farms contribution of cotton was more (26.26 per cent) than other followed by turmeric (6.55 per cent) and soybean (5.50 per cent), while with large farmers also area under cotton was more (26.33 per cent), followed by soybean (9.89 per cent) and turmeric (4.70 per cent) area. In rabi season on an average basis, jowar, wheat, gram and safflower were the major crops grown by the farmers. On small farms area under jowar (29.41 per cent), followed by wheat (2.94 per cent) and gram (4.90 per cent) area. On medium farms contribution of jowar was more (21.69 per cent) followed by wheat (5.29 per cent) and gram (3.17 per cent). Similar trend was observed on large farms also. In summer season maize and groundnut were the only crops taken by farmers. This may be because of scarcity of water. On small farms maize was occupied on 10.78 per cent area. The second crop followed was groundnut (5.22 per cent). A similar trend was observed on medium and large farms.

On an average basis, annual sugarcane, banana and fruit crops were grown by the selected farmers.

Table 3
Average cropping pattern of selected holdings.

Sr. No.	*Crops*	*Small (%)*	*Medium (%)*	*Large (%)*	*Average (%)*
A.	*Kharif*				
1.	Cotton	0.54 (17.65)	0.72 (15.25)	1.52 (18.33)	0.93 (17.38)
2.	BT-Cotton	0.46 (15.03)	0.52 (11.01)	0.68 (8.20)	0.55 (10.28)
3.	Soybean	0.03 (0.98)	0.26 (5.50)	0.82 (9.89)	0.37 (6.91)
4.	Mung	0.04 (1.30)	0.17 (3.60)	0.27 (3.25)	0.16 (3.00)
5.	Tur	0.09 (2.94)	0.06 (1.27)	0.10 (1.20)	0.08 (1.50)
6.	Udid	0.07 (2.28)	0.03 (0.63)	0.05 (0.60)	0.05 (0.93)
7.	Hy-Jowar	0.04 (1.30)	0.09 (1.90)	0.17 (2.04)	1.10 (20.56)
8.	Turmeric	0.01 (0.32)	0.31 (6.55)	0.39 (4.70)	0.24 (4.48)
9.	Vegetables	0.01 (0.32)	0.10 (2.11)	0.30 (3.61)	0.14 (2.61)
	Total	1.29 (42.16)	2.26 (47.88)	4.30 (51.87)	2.62 (48.97)
B.	*Rabi*				
1	Wheat	0.09 (2.94)	0.25 (5.29)	0.28 (3.37)	0.20 (3.73)
2	Gram	0.15 (4.90)	0.15 (3.17)	0.23 (2.77)	0.18 (3.36)
3	Safflower	0.04 (1.30)	0.10 (2.12)	0.08 (0.96)	0.07 (1.30)
4	Jowar	0.90 (29.41)	1.02 (21.61)	1.78 (21.47)	1.23 (22.99)
	Total	1.18 (38.56)	1.52 (32.20)	2.39 (28.82)	1.69 (31.58)
C.	*Summer*				
1.	Maize	0.33 (10.78)	0.31 (6.56)	0.48 (5.80)	0.37 (6.91)
2.	Ground nut	0.16 (5.22)	0.21 (4.44)	0.35 (4.24)	0.23 (4.29)
	Total	0.49 (16.01)	0.52 (11.02)	0.83 (10.01)	0.61 (11.40)
D.	*Annual*				
1.	Sugarcane	0.04 (1.30)	(4.44) 0.21 (5.06)	0.42 (4.11)	0.22
2.	Banana	0.04 (1.30)	0.14 (2.96)	0.21 (2.53)	0.13 (2.42)
3.	Fruit crops	0.02 (0.65)	0.07 (1.48)	0.14 (1.68)	0.08 (1.49)
	Total	0.10 (3.26)	0.42 (8.88)	0.77 (9.28)	0.43 (9.28)
	Gross cropped Area	3.06	4.72	8.29	5.35
	Cropping intensity (%)	220	176.12	198.98	194

* *Figures in parenthesis indicate percentage to the gross cropped area.*

Table 4
Average position of livestock on the selected holdings.

Sr. No.	*Particulars*	*Small*	*Medium*	*Large*
1	Bullock pairs	0.30	0.83	1.66
		(9.23)	(23.31)	(30.85)
2	Cows(cross	0.20	1.67	1.56
	breed)	(6.15)	(46.91)	(28.99)
3	Cows (local)	1.33	0.13	1.10
		(40.92)	(3.65)	(20.45)
4	Buffaloes	0.96	0.83	1.06
		(29.53)	(23.31)	(19.71)
5	Goats	0.46(14.15)	0.10(2.81)	–
	Total	3.25	3.56	5.38
		(100)	(100)	(100)

* (Figures in parenthesis indicate percentage to the total)

Area covered by sugarcane was more (4.11 per cent), followed by banana (2.42 per cent) and fruit crops (1.49 per cent) area. Similar type of trend was observed for the small, medium and large farmers. An examination of cropping pattern revealed the dominance of kharif crops over rabi and summer crops due to dependency on monsoon rains. So 48.97 per cent average land holding was being utilized in kharif season followed by rabi (31.58 per cent) and summer (11.40 per cent).

Livestock Position

Data presented in Table 4 revealed the livestock position for selected cultivators. It was observed that bullock pair maintained by selected cultivators for small, medium and large farmers were 9.23, 23.31, 30.85 per cent, respectively. The other livestock maintained by the cultivators were cross bred cows, local cows, buffaloes and goats for their family need and commercial purpose. The crossbred cows with small, medium and larger farmers were 6.15, 46.91 and 28.99 per cent, respectively. Local cows maintained were 40.92, 3.65 and 20.45 per cent, respectively, while buffaloes recorded were 29.53, 23.31 and 19.71 per cent, respectively. Goats maintained were 14.15 and 2.81 per cent, respectively with small and medium farms. Goats were not reared by the large farmers.

Implements and Machinery

Information pertained to implements and machinery is presented in Table 5.

It was noticed from Table 5 that the implement were generally of traditional type i.e. iron and wooden plough, harrow, hoe and bullock cart. A shift towards modern technology also was observed among large farmers such as use of tractor, electric motor, thresher, etc.

Table 5
Average position of the farm implements and machinery on the selected holdings.

Sr.No.	*Particulars*	*Unit(s)*	*Small*	*Medium*	*Large*	*Average*
1.	Tractors	No.	–	–	0.26	0.09
2.	Bullock cart	No.	0.10	0.66	0.83	0.53
3.	Harrow	No.	0.40	1.10	1.33	0.94
4.	Sprayer	No.	–	0.16	0.60	0.25
5.	Seed drill	No.	–	0.27	1.06	0.44
6.	Iron plough	No.	–	–	0.80	0.26
7.	Wood plough	No.	0.66	0.93	1.66	1.08
8.	Pipe lines	Meters	266.66	533.33	866.66	555.55
9.	Thresher	No.	–	–	0.16	0.05
10.	Electric motor	No.	0.36	0.83	1.40	0.86

Input Utilization

Utilization of inputs for cotton (NHH-44) and BT-Cotton is presented in Table 6.

Labour Utilization

Per hectare human, bullock, machine labour utilized on the selected holdings in respect to cotton (NHH-44) and BT-Cotton were worked out and same is presented in Table 6.

Human labour

In cotton and even in BT-Cotton, labour requirement was mostly female labour who plays a very important role in cotton production. For cotton (NHH-44) the

Table 6
Average per hectare utilization of inputs for cotton NHH-44 and Bt-cotton

Sr.No.	*Items*	*Unit*	*Cotton*	*BT-Cotton*
1.	Human labour			
	(i) Hired labour			
	Male	Mandays	15.97	8.37
	Female	Mandays	98.68	101.14
	Total	Mandays	114.65	209.51
	(ii) Family labour			
	(a) Male	Mandays	27.85	25.72
	(b) Female	Mandays	36.55	36.47
	Total	Mandays	64.40	62.19
2.	Bullock labour	Pairdays	2.88	2.46
3.	Machine labour	Hours	7.50	6.67
4.	Seed	(Kg)	1.87	1.10
5.	F.Y.M.	Tones	8.42	8.07
6.	Fertilizers			
	Nitrogen(N)	Kg.	62.30	59.51
	Phosphorus(P)	Kg.	30.98	27.83
	Potassium(K)	Kg.	14.20	13.25
7.	Plant protection	Lit.	7.20	2.04
8.	Irrigation	Numbers	3.27	3.25

average per hectare hired male and female labour required were 15.97 and 98.68 mandays, respectively, whereas, use of family human labour i.e. male and female were 27.85 and 36.55 man days, respectively.

In case of cotton production total hired and family labour used were 179.05 mandays. In this, the contribution of hired human was more (114.65 man days) than family labour (64.40 mandays) per hectare. Similar trend was noticed in respect of BT-Cotton production also. It was interesting to note that per hectare total human labour use was more *i.e.* 271.70 mandays in respect to BT–Cotton production.

Bullock labour

Average per hectare bullock labour (pair days) used was worked out to be 2.88 days in case of cotton (NHH–44) and 2.46 days in case of BT – Cotton. From this observation, it is seen that bullock labour required in NHH–44 was more than BT – Cotton.

Machine labour

Average per hectare machine labour (hours) used was worked out to be 7.50 hours in case of NHH-44 and 6.67 hours in case of BT-Cotton. More machine labour use in cotton production may be due to the facts that modern implements and machineries, might have replaced tradition implements in order to speed up the work. Per hectare requirement of other inputs such as seed, FYM, fertilizer and irrigation in the cultivation of cotton (NHH-44) as well as BT-Cotton was same. Per hectare use of seed was 1.87 kg in case of NHH-44 while 1.10 kg in BT-Cotton production. Farm Yard Manure (FYM) applied by the cultivators was somewhat similar for NHH-44 and BT-Cotton i.e. 8.42 and 8.07 tonnes, respectively. Fertilizer use per hectare was also found similar for both NHH-44 and BT-Cotton. The N, P, K applied for NHH-44 was 62.3, 30.98 and 14.20 kg/ ha. while for BT-Cotton it was 59.51, 27.83 and 13.25 kgs/ ha. The irrigation which was given as protective irrigation in kharif season in assured rainfall area of Nanded and Parbhani district was also similar in respect of NHH-44 and BT-Cotton i.e. number of irrigations given were 3.27 and 3.25, respectively.

Plant Protection

This is an important input which was being used in this study. As BT-Cotton has a gene, which is resistance for the Lepidoterous pests, hence the plant protection requirement was less than cotton NHH-4. It was observed that per hectare plant protection applied was 7.20 lit. to cotton NHH-44, while it was only 2.04 lit. for only sucking pest of BT-Cotton.

The recommended dose of fertilizer in case of both BT-Cotton and NHH-44 is 100 kg nitrogen, 50 kg phosphorous and 50 kg potassium per hectare, but from the data in Table, it was seen that the dose applied by the cultivator was 62.30 kg of nitrogen, 30.98 kg of phosphorous and 14.20 kg of potassium for NHH-44 while 59.51 kg of nitrogen 27.83 kg of phosphorous and 13.25 kg of potassium for BT-Cotton. It revealed that use of fertilizers on an average was low by 50 per cent than recommended one. Comparatively fertilizer used was less in BT-Cotton production.

Per Hectare Cost of Cultivation of BT-Cotton and NHH-44

Cost of cultivation of cotton (NHH-44) and BT-Cotton production was worked out by considering accepted cost concepts *i.e.* Cost – 'A', Cost – 'B' and Cost – 'C' and results are given in Table 7.

Table 7
Per ha cost of cultivation of NHH-44 and BT-Cotton

Sr. No.	*Particulars*	*NHH – 44*		*Bt-cotton*	
		Cost (Rs)	*(%)*	*Cost (Rs)*	*(%)*
1.	Hired human labour				
	Male	887.93	5.02	465.37	2.40
	Female	2020.00	11.42	2275.65	11.77
	Total	2907.93	16.44	2741..02	14.17
2.	Bullock labour	433.00	2.44	369.28	1.91
3.	Machine labour	937.50	5.30	833.33	4.31
4.	Manures	2105.00	11.90	2017.50	10.44
5.	Fertilizers				
	Nitrogen (N)	747.60	4.22	714.12	3.69
	Phosphorous (P)	402.78	2.27	361.79	1.87
	Potassium (K)	213.00	1.20	198.75	1.03
6.	Seed	948.00	5.36	4000.00	20.69
7.	Irrigation	997.35	2.72	442.77	2.29
8.	Plant protection	1296.00	7.33	367.30	1.89
9.	Interest on Working Capital	1361.24	7.73	1565.95	8.18
10.	Land revenue	170.00	0.96	170.00	0.87
11.	Depreciation on imple -ments and machinery	397.00	2.25	399.39	2.06
	Cost 'A'	12916.70	70.13	14181.10	73.40
12.	Rental value of land	2200.00	12.44	2186.00	11.31
13.	Interest on fixed capital	709.33	3.99	709.33	3.67
	Cost 'B'	15826.03	86.56	17076.43	88.29
14.	Family labour				
	Male	1548.46	8.76	1430.03	7.39
	Female	822.37	4.65	820.57	4.24
	Total	2370.83	13.41	2250.60	11.63
	Cost 'C'	18196.86	100.00	19327.03	100.00

Data on cost of cultivation per hectare in respect to cotton NHH–44 and BT–Cotton are presented in Table 7.

The per hectare cost of cultivation of cotton (NHH-44) was worked out to Rs. 18196.86 (Cost-C) with the cost structure for inputs, labours, etc. prevalent during this period. The cost of labour and input accounted for near about 2/3rd, while the remaining cost was due to interest on working capital, investment and management. Similar conclusion were reported by Mudholkar (1992) with his study on "Cost of cultivation of hybrid cotton under rainfed condition in Central India".

The per hectare cost of cultivation comparison between BT-Cotton and NHH-44 was carried out where it was observed that the Cost-A for NHH-44 was Rs. 12916.70 and for BT-Cotton it was Rs. 14181.10 while profit per hectare was Rs.7453.09 and Rs. 2496.72 for NHH-44 and BT-Cotton respectively. Thus, it was found that farmers have to invest more amount i.e. Rs.1264.40 which was due to seed cost but this was even more after substracting the amount of insecticide required for bollworm control. This clearly indicated that the profit per hectare was more than double in the production of BT-Cotton. These results were in confirmaty with the results recorded by Sumon Sahai (2002) in his study on "Economics of BT-Cotton in Vidharbha region." Benson et al. (1999) also recorded similar conclusion in Southern USA with their study on "The economics of a conventional cotton programme with a BT-Cotton programme".

CONCLUSIONS

The following conclusions have been drawn from the findings,

1. Majority of cotton growers were educated only up to primary level and had agriculture as their main occupation.
2. The irrigated area was more with large size farmer than the small and medium size farmers. Exactly opposite situation was observed in case of follow land, *i.e.* it was less with the small farmers compared to medium and large farmers.
3. Cropping pattern study of small, medium, large farmers as well on overall basis clearly indicated the dominance of cotton cultivation over all other crops.
4. The cost per hectare calculated was more in BT-Cotton as compared to NHH-44 production.
5. Fertilizer use for BT-cotton and NHH-44 was less by 37.7, 19.02 and 35.80 NPK Kgs/ha then its recommended dose (100:50:50 NPK kg/ha.).
6. The manure use was comparatively low by 3.52 tonnes per hectare than recommended one (12 tonnes per hectare).
7. Seed cost per hectare was more in case of BT-Cotton, while plant protection cost was comparatively lower than NHH-44.

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