Chapter – 6
DATA ANALYSIS

The present chapter deals with analysis of primary data collected from farmers and spinning mills for fulfilling objectives of the study. The chapter constitutes of analysis of farmers who are respondents for eliciting information on cotton adoption and various practices related to this. After analysis of responses from farmers through tabulation, cross tabulation and hypothesis testing present chapter deals with analysis of responses from spinning mills. How adoption of Bt cotton by farmers has impacted spinning mills which produce yarn for production of fabric, which in turn impacts production of textiles and their exports.

6.1 ADOPTION OF Bt COTTON BY FARMERS

The sample farmers have been selected from across various regions of Gujarat. The numbers of farmer respondents from Gujarat cultivating cotton are segregated from different regions names as Saurashtra 1, Saurashtra 2 and Gujarat Central and other regions. A snapshot of the regional distribution of farmers has been presented in table below.

Table 6.1: Regional Distribution of Farmers

Region		Total
Saurashtra 1	Amreli, Bhavnagar, Botad, Porbandar	115
Saurashtra 2	Junagadh, Surendranagar, Rajkot, Jamnagar	97
Central and Other	Dahod, Surat, Kheda, Vadodara, Gandhinagar	68
Total		280

Table 6.2: District wise Distribution of Farmers

District	Taluka	Frequency
Amreli	Amreli	18
	Babra	2
	Lathi	10
	Rajula	10
	Total	**40**

Bhavnagar	Bhavnagar	47
	Mahuva	4
	Palitana	3
	Talaja	5
	Total	**59**
Botad	Botad	**4**
Dahod	Dahod	**24**
Gandhinagar	Gandhinagar	**7**
Jamnagar	Jamnagar	**19**
Junagadh	Junagadh	10
	Keshod	11
	Total	**21**
Kheda	Kheda	**17**
Porbandar	Porbandar	**12**
Rajkot	Rajkot	**29**
Surat	Surat	**13**
Surendranagar	Surendranagar	**28**
Vadodara	Dabhoi	3
	Karjan	2
	Vadodara	2
	Total	**7**

Table 6.3: District wise Per cent Distribution of Respondents

	Frequency	**Per cent**	**Valid Per cent**	**Cumulative Per cent**
Amreli	40	14.3	14.3	14.3
Bhavnagar	59	21.1	21.1	35.4
Botad	4	1.4	1.4	36.8
Dahod	24	8.6	8.6	45.4
Gandhinagar	7	2.5	2.5	47.9
Jamnagar	19	6.8	6.8	54.6
Junagadh	21	7.5	7.5	62.1
Kheda	17	6.1	6.1	68.2
Porbandar	12	4.3	4.3	72.5
Rajkot	29	10.4	10.4	82.9
Surat	13	4.6	4.6	87.5
Surendranagar	28	10.0	10.0	97.5

Vadodara	7	2.5	2.5	100.0
Total	280	100.0	100.0	

Table 6.4: Taluka wise distribution of respondents

Taluka	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Amreli	18	6.4	6.4	6.4
Babra	2	0.7	0.7	7.1
Bhavnagar	47	16.8	16.8	23.9
Botad	4	1.4	1.4	25.4
Dabhoi	3	1.1	1.1	26.4
Dahod	24	8.6	8.6	35.0
Gandhinagar	7	2.5	2.5	37.5
Jamnagar	19	6.8	6.8	44.3
Junagadh	10	3.6	3.6	47.9
Karjan	2	.7	.7	48.6
Keshod	11	3.9	3.9	52.5
Kheda	17	6.1	6.1	58.6
Lathi	10	3.6	3.6	62.1
Mahuva	4	1.4	1.4	63.6
Palitana	3	1.1	1.1	64.6
Porbandar	12	4.3	4.3	68.9
Rajkot	29	10.4	10.4	79.3
Rajula	10	3.6	3.6	82.9
Surat	13	4.6	4.6	87.5
Surendranagar	28	10.0	10.0	97.5
Talaja	5	1.8	1.8	99.3
Vadodara	2	0.7	0.7	100.0
Total	280	100.0	100.0	

The farmers cultivating cotton were surveyed to collect required information in accordance with objectives of the study. The farmers cultivating cotton were the sample respondents for this study. In order to study acceptability and adoption of Bt cotton the sample farmers were purposefully chosen according to convenience. The sample respondents were chosen with the only condition that they were cultivating cotton in Gujarat, and as many as possible, a large number of talukas were chosen for eliciting responses of farmers producing cotton with

regard to their experience of Bt cotton cultivation. The study revealed how the farmers responded to adoption of Bt cotton, how it benefited the farmers and manufacturing of yarn by spinning mills.

The table below provides data on demographic profile of households of respondent farmers. A perusal of table reveals that highest per cent (more than 30 per cent) of farmers of cotton have 2 dependent members in the family. Second highest proportion of families (approx. 29 per cent) among sample respondent have 5 members in households, who are dependent, this is followed by 3 dependent member families with 18 per cent households as evident from the table. Three per cent households of farmers also have highest number of dependents with 8 dependent members of family.

Table 6.5: Dependent family members among Sample Households

Dependent Family members (in nos.)	Frequency	Per cent	Valid Per cent	Cumulative Per cent
2	85	30.4	30.4	30.4
3	51	18.2	18.2	48.6
4	36	12.9	12.9	61.4
5	67	23.9	23.9	85.4
6	17	6.1	6.1	91.4
7	16	5.7	5.7	97.1
8	8	2.9	2.9	100.0
Total	280	100.0	100.0	

The table below provides data on number of independent family members among sample households. A perusal of table reveals that among majority of households the number of persons independent is up to 3 persons, with only one person is independent, among 38 per cent households in the sample. Thus, less number of independent persons has to take care of more number of dependent members of the family, in general.

Table 6.5: Independent family members among Sample Households

Family members (in nos.)	Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	105	37.5	37.5	37.5
2	68	24.3	24.3	61.8
3	91	32.5	32.5	94.3
4	14	5.0	5.0	99.3
5	2	0.7	0.7	100.0
Total	280	100.0	100.0	

The table below provides data on education wise distribution of respondents. A per usal of table reveals that only 22 per cent of respondents are graduates, while around 27 per cent of respondents are 12^{th} pass, and 14 per cent of respondents are only primary pass. Among sample respondents, however, there are around 11 per cent respondents are illiterate as well. Thus it can be stated, based on the data in table that, general level of education among sample farmers producing cotton in Gujarat is poor with only 22 per cent graduates and more than 11 per cent respondents are illiterate.

Table 6.6: Education wise distribution of respondents

Education Level	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Graduation	62	22.1	22.1	89.6
12 pass	75	26.8	26.8	36.1
11 pass	16	5.7	5.7	9.3
10 pass	10	3.6	3.6	3.6
8 pass	25	8.9	8.9	67.5
7 pass	1	0.4	0.4	58.6
6 pass	24	8.6	8.6	58.2
5 pass	38	13.6	13.6	49.6
Illiterate	29	10.4	10.4	100.0
Total	280	100.0	100.0	

The table below provides data on use of fertilizers among sample farmers of cotton in Gujarat. Fertilizer use is an important part of the agricultural operations for cultivation of any crop. For cultivation of cotton as well liberal use of fertilizer is undertaken. A perusal of table

reveals that urea is used by around 72 per cent sample farmers, while DAP is used by more than 77 per cent of sample farmers while highest per cent of sample farmers were found to be using NKP. Thus, for cultivation of cotton practice of using multi nutrient fertilizer is quite prevalent among sample farmers.

Table 6.7: Usage of fertilizer among Sample Farmers

	Frequency	**Per cent**	**Respondents**
DAP	217	77.5	280
Urea	201	71.8	280
NKP	228	81.43	280

Capacity of any farmer to produce as well as use modern and scientific methods of cultivation is decided by the quantity of land owned. In case of cotton producing farmers the distribution of farmers according to landholding is provided in table below. A perusal of table reveals that among cotton producing farmers almost 13 per cent farmers are small farmers with landholding of up to 3 acres, while farmers with landholding of more than 3 acres and up to 10 acres constitute around 54 per cent of farmers. The farmers with more than 20 acres of land constitute only around 8 per cent of sample households producing cotton in Gujarat. Thus it can stated that a majority of farmers producing cotton (around 67 per cent) have less than 10 acres of land.

Table 6.8: Landholding pattern of respondents

Landholding	**Frequency**	**Per cent**	**Valid Per cent**	**Cumulative Per cent**
Up to 3 Acre	36	12.9	12.9	12.9
3 to 5 Acre	75	26.8	26.8	39.6
5 to 10 Acre	75	26.8	26.8	66.4
10 to 20 Acre	71	25.4	25.4	91.8
20 to 30 Acre	23	8.2	8.2	100.0
Total	280	100.0	100.0	

The table below reveals type of land used for cotton cultivation, whether the land is owned by farmer or it has been rented from someone else. The response from farmers is presented in table below. A perusal of table reveals that around 31 per cent of farmers cultivate cotton on rented land while around 69 per cent of farmers cultivate cotton on their own land among sample farmers. Thus it is noteworthy that farmers undertake cotton cultivation even on rented land among sample households in Gujarat.

Table 6.9: Land on which you are cultivating cotton is rented or owned

Land Type	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Rented	87	31.1	31.1	31.1
Owned	193	68.9	68.9	100.0
Total	280	100.0	100.0	

The farmers were probed regarding the period for which they are cultivating cotton. The response from farmers has been presented in the table below. A perusal of table below indicates that out of the sample farmers only 24 per cent have been cultivating cotton from more than 8 years. While a large proportion of farmers constituting of 47 per cent of sample farmers have been cultivating cotton since between 2 to 5 years ago. On the other hand there are around 14 per cent of farmers who adopted cotton cultivation only during less than last two years. Thus the sample constitutes new cotton cultivators as well as cotton cultivators who have been cultivating cotton for relatively quite a long period of time.

Table 6.10: Duration of Cotton Cultivation by Farmers

Duration	Frequency	Per cent	Valid Per cent	Cumulative Per cent
less than 2 years	38	13.6	13.6	13.6
2 to 5 years	129	46.1	46.1	59.6
5 to 8 years	48	17.1	17.1	76.8
More than 8 years	65	23.2	23.2	100.0
Total	280	100.0	100.0	

The farmers obviously cultivate a variety of crops during various seasons in a year. The sample farmers were probed about other crops grown by farmers other than cotton by them. The data related to same has been presented in table below. A perusal of table reveals that Bajara and Wheat is other principal crop grown by sample farmers (more than 75 per cent) for each of these crops. While Groundnut, Gram and Cumin seed is cultivated by around 22 per cent of farmers each among sample farmers in Gujarat. The data further reveals that around 5 per cent sample farmers also cultivate Seaseam, Guar and Paddy each. Thus besides cotton farmers cultivate other crops as well depending on their choice and needs based on considerations like other natural and economic factors weighing on their decision making.

Table 6.11: Other Principal Crops Grown besides Cotton by Farmers

Other Principal Crops Grown	**Frequency**	**Per cent**	**Total Respondents**
Bajara	216	77.1	280
Wheat	210	75.0	280
Maize	32	11.4	280
Fennel	15	5.4	280
Seaseam	15	5.4	280
Guar	15	5.4	280
Paddy	15	5.4	280
Ground nuts	60	21.4	280
Gram	60	21.4	280
Cumin Seed	60	21.4	280

The table below provides data on number of crops sown by sample farmers during a year as reported by sample farmers. A perusal of table reveals that only around 13 per cent of farmers take only one crop during a year. Around 58 per cent of sample farmers take two crops while 29 per cent of farmers take three crops as well during a year. Thus, irrigation facilities during non - monsoon season appears to be available to majority of sample farmers, which augurs well for their overall wellbeing.

Table 6.12: Crops Taken in a Year by Sample Farmers

No. Of Crops	**Frequency**	**Per cent**	**Valid Per cent**	**Cumulative Per cent**
One	36	12.9	12.9	12.9
Two	162	57.9	57.9	70.7
Three	82	29.3	29.3	100.0
Total	280	100.0	100.0	

The table below provides data on the reason stated by sample farmers to cultivate cotton in Gujarat. The sample farmers were given a choice from amongst reasons like monetary reason, no other crop can be grown, soil only good for cultivating cotton, easy to sell and good yield. Out of the sample farmers a good proportion of farmers (around44 per cent) cited monetary reasons and yield has been good as the single most important reasons for cotton cultivation. A good yield allows farmer to earn good money value, hence both can be considered equivalent to monetary returns and increased income for farmers. A good 28 per

cent of sample farmers stated that soil has been suitable for cotton cultivation only as single most important reason for cotton cultivation. Around 20 per cent of farmers were of the view that the reason for them to cultivate cotton is ease of selling, that there is a good market for cotton which exist. Thus there are good reasons for farmers in the form of good demand as well as a decent monetary return for them to cultivate cotton. Hence the sample farmers cited various reasons for cultivating cash crop like cotton amounting to good combination of overall conditions of market as well as natural factors.

Table 6.13: Reasons for Cultivation of Cotton by Sample Farmers

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Monetary reason	99	35.4	35.4	35.4
No other crop can be grown	28	10.0	10.0	45.4
Soil only good for cotton	78	27.9	27.9	73.2
Easy to sell	54	19.3	19.3	92.5
Yield has been good	21	7.5	7.5	100.0
Total	280	100.0	100.0	

The table below provides data on number of persons dependent on the field operated by sample farmers. A perusal of table reveals that a majority (more than 50 per cent) of farmers have up to 4 persons dependent on them. Another substantial numbers of farmers (more than 40 per cent) reported that they had 5 to 6 persons dependent. Only around 8 per cent of the farmers reported that they have 7 to 8 persons in the family who are dependent.

Table 6.14: Number of People Dependent on the Field

	Frequency	Percent	Valid Percent	Cumulative Percent
2 to 4 people	141	50.4	50.4	50.4
5 to 6 people	116	41.4	41.4	91.8
7 to 8 people	23	8.2	8.2	100.0
Total	280	100.0	100.0	

The sample households were probed on their other sources of income. The relevant data is presented in table below. A perusal of table reveals that around 75 per cent farmers are having sources other than agriculture also. Other sources of income include income from livestock and income from other petty jobs. Only around 24 per cent households were

primarily dependent on the sole source of income from agriculture from among sample households. Thus, it can be inferred that majority of farmers have alternate source of income as well, besides agriculture.

Table 6.15: Other Source of Income

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
No	68	24.3	24.3	24.3
Yes	212	75.7	75.7	100.0
Total	280	100.0	100.0	

The sample farmers were asked regarding season generally opt for selling of cotton produced by them, whether they sell during off season or they sell cotton produced during the producing season itself. The data from sample farmers were collected and are presented in table below. A perusal of table reveals that around half (48 per cent approx.) of farmers preferred to sell during January to March, while around 27 per cent were found to be selling cotton during October to December season. However, during April to June only around 20 per cent of farmers preferred to sell. Only around 6 per cent were selling during July to September. Various reasons can be attributed for these selling patterns of farmers of Gujarat including cropping season, lack of storage facilities and others.

Table 6.16: Sell in season or in off season

Season	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Mostly from Oct to Dec.	74	26.4	26.4	26.4
Mostly from Jan to March	133	47.5	47.5	73.9
Mostly from April to June	55	19.6	19.6	93.6
Mostly from July to Sept.	18	6.4	6.4	100.0
Total	280	100.0	100.0	

The table below provides data on the brand of seed of cotton used by them to grow cotton. It is clear from the information received during study that a large variety of cotton seeds are available in the market under different names, which are used by farmers for cotton cultivation by sample farmers. Rasi(13.2 per cent), Ajeet (7.1 per cent), Amar (7.9 per cent), Gurbani (6.1 per cent) and Aditya (5.4 per cent) are the cotton seeds which are used by relatively higher proportion of sample farmers to produce cotton in Gujarat. Many other brands are also used by farmers which are available in the market or are provided by the

government directly or through its agencies or departments.

Table 6.17: Brand of Seeds Used by Sample Farmers

Brand of Seed	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Active	5	1.8	1.8	1.8
Aditya	15	5.4	5.4	7.1
Ajeet	20	7.1	7.1	14.3
Ajit 115	5	1.8	1.8	16.1
Ajit 55	5	1.8	1.8	17.9
Amar	22	7.9	7.9	25.7
Ankur	4	1.4	1.4	27.1
Arjun	5	1.8	1.8	28.9
Badsah 222	5	1.8	1.8	30.7
Bansi	5	1.8	1.8	32.5
Bolly Guard	5	1.8	1.8	34.3
Bolly Guard Pratik	5	1.8	1.8	36.1
Crozin	5	1.8	1.8	37.9
Double BT	5	1.8	1.8	39.6
Ganga Kaveri	5	1.8	1.8	41.4
Gurabini	1	0.4	0.4	41.8
Gurabini,Amar seeds	1	0.4	0.4	42.1
Gurbani	17	6.1	6.1	48.2
Hybrid Cotton	5	1.8	1.8	50.0
Kaveri 11	5	1.8	1.8	51.8
Lakshmi	9	3.2	3.2	55.0
Mallika Gold	5	1.8	1.8	56.8
Monopoto	5	1.8	1.8	58.6
Nuziveedu Seeds	1	0.4	0.4	58.9
OxiGold	5	1.8	1.8	60.7
Rashi 2	5	1.8	1.8	62.5
Rasi	37	13.2	13.2	75.7
Sankar 6	5	1.8	1.8	77.5
Sardar Daj	5	1.8	1.8	79.3
Shri Govardhan	1	0.4	0.4	79.6

Sine 56	5	1.8	1.8	81.4
Surya 56	5	1.8	1.8	83.2
Surya Moti	5	1.8	1.8	85.0
Tilak	5	1.8	1.8	86.8
Triple BT	5	1.8	1.8	88.6
Varsha	5	1.8	1.8	90.4
Vikram	22	7.9	7.9	98.2
Vikram 5	5	1.8	1.8	100.0
Total	280	100.0	100.0	

The farmers of cotton were also asked about the source of cotton seed purchased by them that is from where they purchased cotton seeds for sowing. The response from sample farmers was tabulated and is presented in table below. A perusal of table reveals that highest proportion of seeds has been purchased by sample farmers from local sellers (41 per cent approx.), wholesalers were the source of seed purchase by sample farmers to the extent of 31 per cent approximately, while government agencies contributed to only 25 per cent of seed purchase by sample farmers in Gujarat. Thus, retailers are the principal source of seed buying for farmers of cotton while government agencies are not a major supplier of seed for farmers.

Table 6.18: Source of Seed Purchased by Farmers

Sources	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Wholesalers	88	31.4	31.4	31.4
Government organization	70	25.0	25.0	56.4
Local sellers	122	43.6	43.6	100.0
Total	280	100.0	100.0	

The farmers of cotton were asked about the variety of cotton purchased by them for sowing. The responses of farmers are presented in table below. It can be seen from table that the most purchased variety of seed of cotton by sample farmers are Anand Desi Cotton-1, G Cotton 18, G Cotton 10, GW-120, V-797, GW-1139, Vishnu G Cotton 100. These are among the most popularly varieties of cotton which are purchased by sample farmers in Gujarat.

Table 6.19: Variety of Seed Purchased by Farmers

Variety	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Active	5	1.8	1.8	1.8
Ajit 115	5	1.8	1.8	3.6
Ajit 55	5	1.8	1.8	5.4
Anand Desi Cotton-1, G Cotton 18	42	15.0	15.0	20.4
Arjun	5	1.8	1.8	22.1
Badsah 222	5	1.8	1.8	23.9
Bansi	5	1.8	1.8	25.7
Bolly Guard	5	1.8	1.8	27.5
Bolly Guard Pratik	5	1.8	1.8	29.3
Crozin	5	1.8	1.8	31.1
Double BT	5	1.8	1.8	32.9
G Cotton 10, GW-120	25	8.9	8.9	41.8
V-797, GW-1139	19	6.8	6.8	48.6
G cotton 18, GW-120	43	15.4	15.4	63.9
Ganga Kaveri	5	1.8	1.8	65.7
Hybrid Cotton	5	1.8	1.8	67.5
Kaveri 11	5	1.8	1.8	69.3
Mallika Gold	5	1.8	1.8	71.1
Monopoto	5	1.8	1.8	72.9
OxiGold	5	1.8	1.8	74.6
Rashi 2	5	1.8	1.8	76.4
Sankar 6	5	1.8	1.8	78.2
Sardar Daj	5	1.8	1.8	80.0
Sine 56	5	1.8	1.8	81.8
Surya 56	5	1.8	1.8	83.6
Surya Moti	5	1.8	1.8	85.4
Tilak	5	1.8	1.8	87.1
Triple BT	5	1.8	1.8	88.9
Varsha	5	1.8	1.8	90.7
Vikram 5	5	1.8	1.8	92.5
Vishnu (G Cotton 100),	21	7.5	7.5	100.0
Total	280	100.0	100.0	

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The sample farmers were asked about the purchase of only Bt cotton seeds, the response of farmers has been presented in table below. A perusal of table reveals that almost 90 per cent of sample farmers responded in affirmative. While remaining opined that they were buying Bt cotton seed as well as other cotton seeds also. Thus a majority of farmers are buying Bt cotton seeds only for cultivation of cotton. Thus it can be concluded that Bt cotton has become the preferred variety among cotton producing farmers in Gujarat.

Table 6.20: Purchase of Bt Cotton Seed Only

Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	247	88.2	88.2	88.2
No	33	11.8	11.8	100.0
Total	280	100.0	100.0	

The sample farmers were asked about the top most advantage received by them due to use of Bt cotton compared to the normal cotton. The responses have been presented in table below. A perusal of table reveals that according to response from sample farmers reduction in cost and reduction in expenses are the most important benefit which they receive by using Bt cotton. It is well known that Bt cotton is a disease resistant variety of cotton which reduces use of insecticides and pesticides considerably, hence save on the cost of production owing less need of insecticides and pesticides as well as labour cost is saved thereby. The other advantages received by sample farmers are increased yield as well as more cotton price received due to better quality of cotton.

Table 6.21: Advantages Received After Using Bt Cotton Seed

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Increase in yield per hectare of cotton	69	24.6	24.6	56.8
Reduction in expenses (cost) per hectare of cotton grown	180	64.2	32.1	88.9
More price of cotton (kapas) due to better quality	31	11.1	11.1	100.0
Total	280	100.0	100.0	

The sample farmers were also asked regarding where they sell cotton normally. The related data has been presented in the table below. It can be seen from the table that almost 62 per cent of the farmers sold their produce of cotton to local ginners. On the other hand 24 per cent of farmers approximately sold to Cotton Corporation while remaining around 14 per cent

farmers sold their cotton to Gujarat cotton federation.

Table 6.22: Preference to Sell Cotton

Preference	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Gujarat cotton federation	38	13.6	13.6	13.6
C C I	68	24.3	24.3	37.9
Local Ginners	174	62.1	62.1	100.0
Total	280	100.0	100.0	

The farmers are normally provided various types of assistance by government. A variety of such assistance is also received by cotton farmers as well. The information related to such assistance received by farmers from government has been briefly provided in table below. A perusal of table reveals that around more than 30 per cent sample respondents accepted receiving subsidy on seed, while 23 per cent sample farmers each, accepted receiving insurance on crop, subsidy on electricity and getting water from canal as their most important benefit received from the government in the form of assistance to farmers. Thus various cotton producing farmers have benefited from encouragement provided from the government.

Table 6.23: Assistance Received From the Government by Farmers for Cotton Cultivation

Benefits	Frequency	Per cent	Valid Per cent	Cumulative Per cent
insurance on crop	65	23.2	23.2	23.2
subsidy on electricity	65	23.2	23.2	46.4
subsidy on seed	85	30.4	30.4	76.8
getting water from canal	65	23.2	23.2	100.0
Total	280	100.0	100.0	

The farmers were receiving benefits at present from various government programmes and promotional efforts; however farmers were expecting further benefits from the government. A brief of the responses in this regard are presented in following table. A perusal of table reveals that most of the farmers (43 per cent) wanted to regulate quality of seeds from government. A sizable number of farmers (24 per cent) wanted compulsory buying of cotton by the government while 18 per cent of sample farmers wanted an increase in minimum support price of cotton. On the other hand other sample farmers also desired an increase in supply and availability of Bt cotton seed and lower price of Bt cotton seed. Around 6 per cent sample farmers also wanted government to completely leave it to market forces to decide

prices of cotton. According to cotton farmers these measures will augur well for healthy growth of Bt cotton producing farmers in Gujarat and hence will also be a boost for textile sector.

Table 6.24: Expectations from Government of Farmers Producing Cotton

Expectations from Government	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Compulsory buying of cotton by govt. bodies	67	23.9	23.9	23.9
Increase in minimum support price per year	49	17.5	17.5	41.4
Regulate the quality of seed	119	42.5	42.5	83.9
Increase supply of BT seed	19	6.8	6.8	90.7
Lower the price of B T seed	10	3.6	3.6	94.3
Leave it to market forces to decide the price of cotton	16	5.7	5.7	100.0
Total	280	100.0	100.0	

The farmers have been using all their efforts as well as benefits made available to them by the government to cultivate cotton. The yield of cotton achieved by sample farmers is given in following table. A perusal of table indicates that the yield per hectare of cotton varies from 900 kgs to 1900 kgs per hectare of production. It is clear from table that around 32.5 per cent of farmers reported a yield between 1100 kgs. to 1300 kgs., while only 6 per cent reported yield in the highest range of 1700 to 1900 kgs. Thus there is a considerable variation in yield of cotton realised by sample farmers per hectare of production.

Table 6.25: Yield of Production of Cotton by Sample Farmers during Last Few Years

Yield/acre	Frequency	Per cent	Valid Per cent	Cumulative Per cent
900 kgs to 1100 kgs	60	21.4	21.4	21.4
1100 kgs to 1300 kgs	91	32.5	32.5	53.9
1300 kgs to 1500 kgs	68	24.3	24.3	78.2
1500 kgs to 1700 kgs	43	15.4	15.4	93.6
1700 kgs to 1900 kgs	18	6.4	6.4	100.0
Total	280	100.0	100.0	

The storage capacity of cotton by sample farmers has been presented in the following table. A perusal of table reveals that there is a huge variation in storage capacity of cotton among

farmers as reported by them. The minimum storage capacity of cotton is reported 200 kgs. While maximum storage capacity of cotton reported by sample farmers is 5000 kgs. The further details are given in the table below. The highest per cent of farmers reported a storage capacity of 500 kgs. is approximately by 13 per cent farmers.

Table 6.26: Storage Capacity of Cotton Among Sample Farmers

Kgs.	Frequency	Per cent	Valid Per cent	Cumulative Per cent
200	1	.4	.4	.4
300	3	1.1	1.1	1.4
400	6	2.1	2.1	3.6
500	37	13.2	13.2	16.8
560	1	.4	.4	17.1
600	6	2.1	2.1	19.3
650	1	.4	.4	19.6
700	4	1.4	1.4	21.1
750	1	.4	.4	21.4
800	13	4.6	4.6	26.1
850	1	.4	.4	26.4
900	7	2.5	2.5	28.9
950	7	2.5	2.5	31.4
1000	28	10.0	10.0	41.4
1050	5	1.8	1.8	43.2
1100	10	3.6	3.6	46.8
1200	6	2.1	2.1	48.9
1300	2	.7	.7	49.6
1400	2	.7	.7	50.4
1500	33	11.8	11.8	62.1
1600	1	.4	.4	62.5
1700	2	.7	.7	63.2
1800	4	1.4	1.4	64.6
1900	17	6.1	6.1	70.7
1950	1	.4	.4	71.1
2000	32	11.4	11.4	82.5
2200	6	2.1	2.1	84.6
2500	24	8.6	8.6	93.2
3000	11	3.9	3.9	97.1
5000	8	2.9	2.9	100.0
Total	280	100.0	100.0	

The sample farmers revealed on probing by researcher the place of storage of cotton. The data related to their responses is presented in the table below. A huge per cent of farmers (45 per cent) revealed that they store their cotton in godowns of ginners, while around 34 per cent of sample farmers stored their produce of cotton in open. However, remaining 21 per cent reportedly kept their cotton in special godowns made for the purpose of storage of cotton only. Thus around 80 per cent farmers store cotton such that it is disadvantageous for them to receive the best price on offer during the year.

Table 6.27: Place of Storage of Cotton

Place	Frequency	Per cent	Valid Per cent	Cumulative Per cent
In open	95	33.9	33.9	33.9
In the ginners godown	126	45.0	45.0	78.9
In special storage facility	59	21.1	21.1	100.0
Total	280	100.0	100.0	

6.2 HYPOTHESIS TESTING

6.2.1: Regional Differences among Cotton Producers in Gujarat

The data collected from farmers were cross tabulated according different geographical regions. The cotton farmers were segregated according to three regions in Gujarat, namely, Saurashtra 1 (Amreli, Bhavnagar, Botad, Porbandar districts), Saurashtra 2 (Junagadh, Surendranagar, Rajkot, Jamnagar districts), and Central Gujarat and other region (Dahod, Surat, Kheda, Vadodara, Gandhinagar districts). This analysis indicates interregional variations in adoption, cultivation and practices undertaken by cotton producing farmers in Gujarat.

In order to understand regional variations cross tabulations were undertaken for various variables and three principal geographical regions where cotton production is done in Gujarat.

The table below provides data on landholding among cotton farmers according to three regions in Gujarat. It is clear from table that in central Gujarat region cotton is cultivated by farmers having large landholding. In Saurashtra 2 region highest proportion of cotton farmers have landholding between 10 to 20 acres.

1) H0: There is no relationship between landholding of cotton producer according to region.

Table 6.28: Landholding among Cotton Farmers according to Regions

Region	Land holding					Total
	1 to 3 Acre	3 to 5 Acre	5 to 10 Acre	10 to 20 Acre	20 to 30 Acre	
Saurashtra 1	19	37	35	16	8	115
Saurashtra 2	14	25	14	40	4	97
Central Gujarat and Other	3	13	26	15	11	68
Total	36	75	75	71	23	280

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	40.686[a]	8	.000
Likelihood Ratio	41.601	8	.000
Linear-by-Linear Association	13.174	1	.000
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.59.			

The analysis further reveals that as chi-square value is less than 0.5, the null hypothesis is rejected and therefore it can be concluded that land holding and regions have significant association among them. Hence, region of location of cotton farmer affects their landholding.

The land allocated by farmers to cultivate cotton is their own or they may cultivate on rented land. In order to find its association with region in Gujarat data was collected and is presented in table below. The data in table below indicates that highest proportion of farmers cultivating cotton on own land are in Central Gujarat and other region, followed by Saurashtra 1 region, while only around 60 per cent farmers in Saurashtra 2 region cultivate cotton on self owned land. Thus, highest per cent of sample farmers are cultivating cotton on rented land in Saurashtra 2 region.

2) H0: There is no relationship between cultivation of cotton on rented land according to region.

Table 6.29: Cultivation on Self Owned or Rented Land according to Regions

Region	Cultivating cotton		Total
	Rented	Owned	
Saurastra 1	31	84	115
Saurastra 2	38	59	97
Central and Other	18	50	68
Total	87	193	280

Further analysis reveals that according to chi square value that there is an association between region of cultivation and rented land being used for cotton cultivation. Thus, null hypothesis is rejected and alternate hypothesis is accepted.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.556[a]	2	.103
Likelihood Ratio	4.480	2	.106
Linear-by-Linear Association	.068	1	.794
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 21.13.			

The table below provides data on number of years for which cotton is cultivated by farmers according to different regions in Gujarat. The data in table clearly shows that in Saurashtra 2 region highest proportion of sample farmers are cultivating cotton for longer years, followed by Saurashtra 1 region, while highest proportion of sample households in Central and other region are the new adopters to cotton cultivation. Thus, data reveals that adoption of cotton in new regions which are non- traditional regions of growing cotton is marginally more than the other traditional regions of Saurashtra 1 and 2 during recent years.

3) H0: There is no relationship between years of cotton cultivation according to region.

Table 6.30: Years of Cultivation according to Regions

	How long you have been cultivating the cotton				Total
Region	Less than 2 years	3 to 5 years	6 to 8 Years	More than 8 years	
Saurastra 1	16	55	23	21	115
Saurastra 2	11	42	15	29	97
Central and Other	11	32	10	15	68
Total	38	129	48	65	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	5.022[a]	6	.541
Likelihood Ratio	4.956	6	.549
Linear-by-Linear Association	.071	1	.790
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.23.			

A further analysis based on chi- square test reveals that null hypothesis is accepted as its value is more than 0.5. Hence it can be accepted that there is no relationship between years of cotton cultivation according to region. Hence one can state that in all regions more adoption of cotton cultivation is undertaken by more and more farmers.

The data related to number of crops taken by cotton farmers in a year according to different regions is presented in the table below. A perusal of table reveals that highest number of farmers in all the regions undertake two crops in a year, but quite a few farmers have reported taking three crops as well.

4) H0: There is no relationship between number of crops taken according to region.

Table 6.31: Number of Crop in a Year according to Region

Region	**Number of crop taken in a year**			**Total**
	1	**2**	**3**	
Saurastra 1	16	69	30	115
Saurastra 2	7	48	42	97
Central and Other	13	45	10	68
Total	36	162	82	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	18.495[a]	4	.001
Likelihood Ratio	18.988	4	.001
Linear-by-Linear Association	1.242	1	.265
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.74.			

A chi-square analysis of data reveals that the null hypothesis is rejected. This means that there does not exist any relationship between the number of crops undertaken in a year and

various regioins in Gujarat.

The following table shows data on regional differences in reason for cultivating cotton by farmers. In Saurashtra 1 region farmers cultivated cotton for monetary reasons, which was cited as most preferred reason by maximum number of farmers. In saurashtra 2 region monetary benefit and appropriate soil are most preferred reasons cited for cultivating cotton. In Central Gujarat ease of selling is cited by almost 33 per cent of farmers as the reason for cultivating cotton.

5) H0: There is no relationship between reason for cotton cultivation and region of residence.

Table 6.32: Reasons For Cultivation of Cotton according to Region

	12.Why do you cultivate the cotton on very regular basis					
Region	**Monetary reason**	**No other crop can be grown**	**Soil only good for cotton**	**Easy to sell**	**Yield has been good**	**Total**
Saurastra 1	50	9	23	24	9	115
Saurastra 2	37	15	36	8	1	97
Central and Other	12	4	19	22	11	68
Total	99	28	78	54	21	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	43.068[a]	8	.000
Likelihood Ratio	46.229	8	.000
Linear-by-Linear Association	11.888	1	.001
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.10.			

The chi square test allows to reject the null hypothsis and reveals that the choice of cultivation of cotton is for different reasons in different regions of Gujarat. Thus, alternate hypothesis is accepted.

The data on number of persons dependent on agriculture in family according to different regions is given in table below. In Saurashtra 1 and 2 regions highest number of farmers reported to have 2 to 4 number of dependent members. However, in case of Central Gujarat region highest number of sample farmers reported to have 5 to 6 persons dependent in the family.

6) H0: There is no relationship between numbers of dependent person on Agriculture in the family according to region.

Table 6.33: Number of Dependent Persons on Agriculture according to Region

Region	Persons dependent on agriculture			Total
	2 to 4 People	5 to 6 people	7 to 8 people	
Saurastra 1	59	49	7	115
Saurastra 2	52	30	15	97
Central and Other	30	37	1	68
Total	141	116	23	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.742[a]	4	.002
Likelihood Ratio	17.498	4	.002
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.59.			

The chi square value is less than 0.5 which means that null hypothesis is rejected and alternate hypothesis is accepted. Thus it can be concluded that number of persons dependent on agriculture has a relationship according to region.

The table below presents data on other source of income and regional variations. A perusal of table reveals that a large majority of sample farmers do not have any other source of income, other than agriculture, in all the cotton growing regions in Gujarat.

7) H0: There is no relationship between other sources of Income according to region.

Table 6.34: Source of Income other than Agriculture According to Region

Region	Any other source of income you have		Total
	Yes	No	
Saurastra 1	31	84	115
Saurastra 2	20	77	97
Central and Other	17	51	68
Total	68	212	280

Chi-Square Tests			
	Value	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	**1.174**[a]	**2**	**.556**
Likelihood Ratio	**1.190**	**2**	**.551**
Linear-by-Linear Association	**.207**	**1**	**.649**
N of Valid Cases	**280**		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.51.			

The chi square analysis reveals that null hypothesis is accepted and indicates that there is no relationship between other sources of income, other than agriculture, and different regions. Thus irrespective of different regions majority of respondent farmers do not have income sources other than agriculture.

The table below provides data on period of selling of cotton by sample farmers according to different regions. In all the regions highest number and proportion of farmers sell their cotton during months of January to march, while lowest number of sample farmers sold cotton during July to September. In July to September selling of cotton was reported in Saurashtra region only.

8) H0: There is no relationship between seasons of selling of cotton according to region.

Table 6.35: Season of Selling Cotton According to Regions

Region	**Do you sell in season or in off season?**				**Total**
	Mostly from Oct to Dec.	**Mostly from Jan to March**	**Mostly from April to June**	**Mostly from July to Sept.**	
Saurastra 1	40	54	21	0	115
Saurastra 2	20	40	19	18	97
Central and Other	14	39	15	0	68
Total	74	133	55	18	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	41.624[a]	6	.000
Likelihood Ratio	45.671	6	.000
Linear-by-Linear Association	4.161	1	.041
N of Valid Cases	280		
a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 4.37.			

The chi square test reveals that there is an association between season of sell of cotton and region. Thus the null hypothesis is rejected and alternate hypothesis is accepted. Thus the seasonal differences are observed in selling of cotton according to regions of location of a farmer.

The table below clearly shows that regional differences exist in sources of buying cotton seed. In Saurashtra 1 as well as Central and other region local sellers were preferred for buying seeds while in case of Saurashtra 2 wholesellers were preferred source of buying seeds.

9) H0: There is no relationship between sources of buying of seed according to region.

Table 6.36: Source of Buying Seed according to Region

	From were does you buy seed			Total
Region	**Wholesalers**	**Government organization**	**Local sellers**	
Saurastra 1	31	27	57	115
Saurastra 2	39	29	29	97
Central and Other	18	14	36	68
Total	88	70	122	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	11.689[a]	4	.020
Likelihood Ratio	11.934	4	.018
Linear-by-Linear Association	.041	1	.840
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 17.00.			

The chi-square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted. Thus data and analysis reveal that region does affect decision of farmers regarding source of buying seed.

The table below presents data on experience of sample farmers with buying of Bt cotton according to region. Reduction of cost of cultivation and lower cost of seed are the prime advantages as reported by sample farmers as experience of using Bt cotton. Increase in yield is the second most exciting experience besides reduction of cost for farmers to cultivate Bt cotton.

10) H0: There is no relationship between preference for using Bt cotton seed and region.

Table 6.37: Experience of Farmers of Using Bt Seed according to Region

Region	Experience after using Bt Cotton				Total
	Lower cost of seed	Increase in yield per hectare of cotton	Reduction in expenses per hectare of cotton grown	More price of cotton (kapas) due to better quality	
Saurastra 1	38	31	39	7	115
Saurastra 2	29	22	27	19	97
Central and Other	23	16	24	5	68
Total	90	69	90	31	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.343[a]	6	.078
Likelihood Ratio	10.789	6	.095
Linear-by-Linear Association	.225	1	.635
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.53.			

The chi value indicates that the null hypothesis is rejected and hence it can be further stated that alternate hypothesis is accepted that there is a relationship between reasons of cultivating cotton and different region in the state of Gujarat.

The table below indicates relationship between agencies of selling Bt cotton by sample farmers and between different regions. A perusal of table reveals that highest number of sample farmers sold cotton to local ginners, which was followed by selling to CCI.

11) H0: There is no relationship between cotton selling market and region.

Table 6.38: Selling of Cotton According to Region in Gujarat

Region	Where do you sell your cotton (Kapas)?			Total
	Gujarat cotton federation	C C I	Local Ginners	
Saurastra 1	16	32	67	115
Saurastra 2	10	16	71	97
Central and Other	12	20	36	68
Total	38	68	174	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	8.469[a]	4	.076
Likelihood Ratio	8.654	4	.070
Linear-by-Linear Association	.190	1	.663
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.23.			

The chi square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted which means that there is a relationship between place of selling cotton by farmers and region.

The table below presents data on expectations of cotton market by sample farmers according to region. A perusal of table reveals that there is varying expectations of farmers according to region.

12) H0: There is no relationship between perception of cotton market according to region.

Table 6.39: Expectations about Market of Cotton according to Region

Region	**How do you look to the future market in the next season for cotton?**			**Total**
	very good	**same as last season**	**very bad**	
Saurastra 1	52	54	9	115
Saurastra 2	29	59	9	97
Central and Other	35	33	0	68
Total	116	146	18	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	13.279[a]	4	.010
Likelihood Ratio	17.638	4	.001
Linear-by-Linear Association	1.141	1	.285
N of Valid Cases	280		
a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 4.37.			

The chi square value reveals that null hypothesis is rejected and alternate hypothesis is accepted. Thus, it can be inferred that relationship between region and expectations on

prospects on cotton does exists among sample farmers.

The table below presents data on perception on prices of cotton by sample farmers according to different regions. It clearly reveals that except for a few farmers most of the farmers expected prices of cotton to be same as this season or better than this season during coming season. Thus, a large majority of sample farmers were expecting prices to be better in future in comparison to present.

13) H0: There is no relationship between perception on cotton prices and region.

Table 6.40: Expectation on Price of Cotton Fibres According to Region

Region	Expectation of price of cotton in the next season			Total
	Better than this season	Same as this season	Lower than this season	
Saurastra 1	52	54	9	115
Saurastra 2	29	59	9	97
Central and Other	35	33	0	68
Total	116	146	18	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.279[a]	4	.010
Likelihood Ratio	17.638	4	.001
Linear-by-Linear Association	1.141	1	.285
N of Valid Cases	280		
a. 1 cells (11.1%) have expected count less than 5. The minimum expected count is 4.37.			

The chi square test leads to rejection of null hypothesis and acceptance of alternate hypothesis. Thus it can be stated that expectations on prices of cotton has a relationship with region.

The table below provides data on what is expectations of sample farmers from government for benefiting them from cotton cultivation according to region. A perusal of table reveals that most the farmers expect government to regulate and ensure that good quality of seed are available and that seed is available to them at lower price. The sample farmers also desired other measures to be adopted by government for betterment of cotton producing sample farmers.

14) H0: There is no relationship between expectations from Government and region.

Table 6.41: Expectations from Government according to Region

Region	How the Government Can Help to Increase Earnings in Cotton Cultivation						Total
	Compulsory buying of cotton by govt. bodies	Increase in minimum support price per year	Regulate the quality of seed	Increase supply of BT seed	Lower the price of B T seed	Leave it to market sources to decide the price of cotton	
Saurastra 1	33	19	45	8	2	8	115
Saurastra 2	27	20	45	3	2	0	97
Central and Other	7	10	29	8	6	8	68
Total	67	49	119	19	10	16	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.153[a]	10	.001
Likelihood Ratio	34.861	10	.000
Linear-by-Linear Association	9.149	1	.002
N of Valid Cases	280		
a. 5 cells (27.8%) have expected count less than 5. The minimum expected count is 2.43.			

A perusal of chi square test results show that the null hypothesis is rejected and alternate hypothesis is accepted. Thus the data establishes that there is an association between expectations from government and region for cotton producing farmers in Gujarat.

The table below provides data on experience of sample farmers after using Bt cotton according to region. It is clear from data that the sample farmers felt that more water is required and more manure is required after use of Bt cotton seed. Some variations according to regions are clearly discernable from the data.

15) H0: There is no relationship between experience of using Bt cotton seeds and region.

Table 6.42: Experience After use of Bt seeds for cotton Production According to Region

Region	Experience After use of Bt seeds for cotton Production						Total
	The yield of the soil has gone down	More quantity of manure are required	More water required	More danger of diseases	The soil is losing its fertility	Quality of cotton is reducing	
Saurastra 1	3	35	36	23	17	1	115
Saurastra 2	1	27	31	17	11	10	97
Central and Other	4	27	31	6	0	0	68
Total	8	89	98	46	28	11	280

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.528[a]	10	.000
Likelihood Ratio	43.839	10	.000
Linear-by-Linear Association	7.847	1	.005
N of Valid Cases	280		
a. 6 cells (33.3%) have expected count less than 5. The minimum expected count is 1.94.			

The chi square test reveals that null hypothesis is rejected and alternate hypothesis is accepted. Thus it can be stated that experience of sample farmers after using Bt cotton seed is dependent on region.

The table provide data on production of cotton by sample farmers during last five years according to region. The table reveals that in Saurashtra 2 region higher average production is reported by sample farmers compared to other two regions. While Saurashtra 1 region, relatively more sample farmers reported less average production.

16) H0: There is no relationship between cotton production and region.

Table 6.43: Production Of Cotton by Sample Farmers During Last Five Year (Kgs Per Acres) According To Region

Region	production of cotton from your field in the last five year approx in kgs per Acres					Total
	900 kgs to 1100 kgs	1100 kgs to 1300 kgs	1300 kgs to 1500 kgs	1500 kgs to 1700 kgs	1700 kgs to 1900 kgs	
Saurastra 1	33	44	19	11	8	115
Saurastra 2	17	24	32	20	4	97
Central and Other	14	23	13	12	6	68
Total	64	91	64	43	18	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.825[a]	8	.016
Likelihood Ratio	18.882	8	.016
Linear-by-Linear Association	4.293	1	.038
N of Valid Cases	280		
a. 1 cells (6.7%) have expected count less than 5. The minimum expected count is 4.37.			

The chi square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted. Therefore it can be said that there is an association between average production of cotton and region and that average production is influenced by region as well besides other factors influencing cotton production

The table below presents data on storage of cotton practices according to region among sample farmers. It is clear from the table that special storage facilities for cotton are either lacking or are not used by sample farmers in different regions. In Saurashtra 1 and 2 region godown of ginners is the most favoured place of storage of cotton while in Central region cotton is stored in open by most of the sample farmers.

17) H0: There is no relationship between storage practices of cotton and region.

Table 6.44: Practice of Cotton Storage According to Region

Region	Storage of the cotton			Total
	In open end	In the ginners godown	In special storage facility	
Saurastra 1	40	55	20	115
Saurastra 2	19	53	25	97
Central and Other	36	18	14	68
Total	95	126	59	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.309[a]	4	.000
Likelihood Ratio	23.062	4	.000
Linear-by-Linear Association	.690	1	.406
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.33.			

The chi square test reveals that null hypothesis is rejected and alternate hypothesis is accepted. Thus it can be stated that the storage practices have an association with region and it varies from region to region.

6.2.2 DIFFERENCES AMONG COTTON PRODUCERS IN GUJARAT ACCORDING TO LAND HOLDING

The sample farmers were classified according to land holding and data is tabulated and analysed to study differences in various practices related to cotton production undertaken by them. An attempt has been made to identify various differences prevalent among sample farmers producing cotton with regard to various attributed related to production of cotton by use of Bt cotton seeds. The data collected through questionnaire were tabulated and results are presented in following paragraphs.

The table below provides data on ownership of land according to land holdings of sample farmers producing cotton. It clear from table that in all categories of land holdings, farmers own land for cultivation. However, in case of small farmers around 50 per cent of farmers were cultivating cotton on rented land. Similar was the case with farmers in 10 to 20 acre

category.

1) H0: There is no association between landholding and Ownership of land

Table 6.45: Ownership of Land according to Land holding

	Land on which you are cultivating cotton		Total
Land holding	**Rented**	**Owned**	
Up to 3 Acre	15	21	36
3 to 5 Acre	26	49	75
5 to 10 Acre	12	63	75
10 to 20 Acre	34	37	71
More than 20 Acres	0	23	23
Total	87	193	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	30.036[a]	4	.000
Likelihood Ratio	37.059	4	.000
Linear-by-Linear Association	1.974	1	.160
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.15.			

The result of chi square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted. This means that there is an association between land holding and ownership of land among cotton producing sample farmers.

The data in table below indicates the pattern in years of cotton cultivation by sample farmers according to land holding. A perusal of table reveals that in almost all categories of land holding majority of sample farmers have been cultivating cotton from more than 3 years however, very less per cent of sample farmers are cultivating for more than 8 years barring a few exceptions. However, more 8 years of cultivation of cotton is found among farmers with more than 5 acres to 20 acre land holding.

2) H0: There is no association between landholding and Years of Cotton Cultivation

Table 6.46: Years of Cotton Cultivation and Landholding

	How long you have been cultivating the cotton	Total

Land holding	Less than 2 years	3 to 5 years	6 to 8 Years	More than 8 years	
Up to 3 Acre	8	23	4	1	36
3 to 5 Acre	10	42	15	8	75
5 to 10 Acre	13	35	9	18	75
10 to 20 Acre	6	24	12	29	71
More than 20 Acres	1	5	8	9	23
Total	38	129	48	65	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	45.006[a]	12	.000
Likelihood Ratio	48.289	12	.000
Linear-by-Linear Association	33.476	1	.000
N of Valid Cases	280		
a. 3 cells (15.0%) have expected count less than 5. The minimum expected count is 3.12.			

The chi square test reveals that null hypothesis cannot be accepted and hence rejected while alternate hypothesis is accepted. This means that there is statistical relationship found to exist between and holding and years of cotton cultivation by sample farmers in Gujarat.

The data in table below indicates number of crops undertaken by farmers according to different land holdings by sample farmers. A perusal of table reveals that highest proportion of sample farmers are undertaking two crops while quite a large proportion also take 3 crops during the year. It means prevalence of adequate irrigation facilities for sample farmers.

3) H0: There is no association between landholding and number of crops taken in a year

Table 6.47: Crops Undertaken by Farmers According to Different Land Holdings

	Number of crop taken in a year			Total
Land holding	1	2	3	
Up to 3 Acre	9	12	15	36
3 to 5 Acre	1	52	22	75
5 to 10 Acre	22	42	11	75
10 to 20 Acre	0	46	25	71
More than 20 Acres	4	10	9	23
Total	36	162	82	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	53.083[a]	8	.000
Likelihood Ratio	63.552	8	.000
Linear-by-Linear Association	.320	1	.572
N of Valid Cases	280		
a. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 2.96.			

The chi square test reveals that null hypothesis is rejected and alternate hypothesis is accepted. This means that there is an association between land holding and number of crops taken in a year by sample farmers.

The table below indicates reasons for undertaking cotton cultivation by sample farmers according to land holding among sample farmers. The data clearly shows that sample farmers holding land between 5 to 10 acres clearly preferred ease in selling as the most important reason in determining cultivation of crop of cotton. Farmers with 3 to 5 acres of land stated appropriateness soil as the prime reason for cotton cultivation. However, overall, across size of land holding monetary reason was the single most important reason for cotton cultivation as indicated by sample farmers..

4) H0: There is no association between landholding and reason of cotton cultivation

Table 6.48: Reasons for Cultivation of Cotton Regularly According to Land Holding

	Why do you cultivate the cotton on very regular basis					**Total**
Land holding	**Monetary reason**	**No other crop can be grown**	**Soil only good for cotton**	**Easy to sell**	**Yield has been good**	
Up to 3 Acre	24	1	11	0	0	36
3 to 5 Acre	28	6	34	7	0	75
5 to 10 Acre	23	3	8	38	3	75
10 to 20 Acre	15	18	24	4	10	71
More than 20 Acres	9	0	1	5	8	23
Total	99	28	78	54	21	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	152.844[a]	16	.000
Likelihood Ratio	149.408	16	.000
Linear-by-Linear Association	21.523	1	.000
N of Valid Cases	280		
a. 5 cells (20.0%) have expected count less than 5. The minimum expected count is 1.73.			

As per chi square test the null hypothesis is rejected and alternate hypothesis is accepted. Thus, there is a clear statistical association between land holding and reason for cotton cultivation by sample farmers as evident from data and analysis.

The table below presents data on number of persons dependent on agriculture according to land holding of sample farmers. A perusal of table reveals that the number of persons dependent on agriculture are relatively less for sample farmers with small land holding among sample farmers.

5) H0: There is no association between landholding and number of persons dependent on agriculture.

Table 6.49: Number of Persons Dependent on Agriculture According to Land holding

	No. of Persons Dependent			
Land holding	**2 to 4 people**	**5 to 6 people**	**7 to 8 people**	**Total**
Up to 3 Acre	18	15	3	36
3 to 5 Acre	52	20	3	75
5 to 10 Acre	39	31	5	75
10 to 20 Acre	21	38	12	71
More than 20 Acres	11	12	0	23
Total	141	116	23	280

Chi-Square Tests			
	Value	**Df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	28.867[a]	8	.000
Likelihood Ratio	30.425	8	.000
N of Valid Cases	280		
a. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 1.89.			

The chi square test reveals that the null hypothesis is rejected and alternate hypothesis is

accepted. This means that there is an association between size of land holding and number of persons dependent on agriculture among sample farmers.

The table below shows other sources income according to landholding of sample respondents. The table clearly shows that quite a substantial number of respondents do not have other source of income, other than agriculture.

6) H0: There is no association between landholding and other sources of Income

Table 6.50: Other source of income according to Land Holding

	source of income		Total
Land holding	**Yes**	**No**	
Up to 3 Acre	8	28	36
3 to 5 Acre	30	45	75
5 to 10 Acre	9	66	75
10 to 20 Acre	14	57	71
More than 20 Acres	7	16	23
Total	68	212	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	**17.590[a]**	**4**	**.001**
Likelihood Ratio	**17.541**	**4**	**.002**
Linear-by-Linear Association	**1.642**	**1**	**.200**
N of Valid Cases	**280**		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.59.			

The chi square analysis indicates that null hypothesis is rejected and alternate hypothesis is accepted. This means that statistical relationship between landholding and other sources of income exist among sample farmers.

The table below provides data on time of selling cotton during the year and land holding of farmers. A perusal of table reveals that January to March is the most preferred season for selling cotton irrespective of land holding by sample farmers. Medium Land holding farmers preferred all months equally except for April to June.

7) H0: There is no association between landholding and season of selling of Cotton

Table 6.51: Time of Selling Cotton according to Land Holding

	Sell in season or in off season				
Land holding	**Mostly from Oct to Dec.**	**Mostly from Jan to March**	**Mostly from April to June**	**Mostly from July to Sept.**	**Total**
Up to 3 Acre	10	23	3	0	36
3 to 5 Acre	15	53	7	0	75
5 to 10 Acre	24	26	25	0	75
10 to 20 Acre	25	22	6	18	71
More than 20 Acres	0	9	14	0	23
Total	74	133	55	18	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	118.729[a]	12	.000
Likelihood Ratio	115.065	12	.000
Linear-by-Linear Association	17.446	1	.000
N of Valid Cases	280		
a. 6 cells (30.0%) have expected count less than 5. The minimum expected count is 1.48.			

The chi-square analysis indicates that null hypothesis is rejected and alternate hypothesis is accepted. It indicates that there is a statistical relationship between land holding and season during which cotton is sold by sample farmers.

The table below indicates that majority of sample households from various land holding categories buy seed from local sellers except for those who have land holding of less than 3 acres.

8) H0: There is no association between landholding and source of buying seed

Table 6.52: Source of Buying Seed according to Land holding

	Source of buying seed			
Land holding	**Wholesalers**	**Government organization**	**Local sellers**	**Total**
Up to 3 Acre	15	15	6	36
3 to 5 Acre	22	31	22	75
5 to 10 Acre	18	14	43	75
10 to 20 Acre	24	9	38	71
More than 20 Acres	9	1	13	23
Total	88	70	122	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	39.856[a]	8	.000
Likelihood Ratio	42.813	8	.000
Linear-by-Linear Association	6.815	1	.009
N of Valid Cases	280		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.75.			

The result of chi square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted. Thus, it clearly shows land holding does impact decision to source buying of seed by sample farmers cultivating on different size of land holdings.

The table below shows data related to land holding and purchase of Bt cotton seed by sample farmers according to land holding. The table clearly shows that all the category of land holding farmers buy Bt cotton seed, however, one third of 3 to 5 acres land holding category farmers do not buy but get it from other sources like government and other agencies.

9) H0: There is no association between landholding and buying of Bt cotton

Table 6.53: Buying Bt Cotton Seed according to Land holding

	Do you buy BT seed for cotton?		**Total**
Land holding	**Yes**	**No**	
Up to 3 Acre	36	0	36
3 to 5 Acre	49	26	75
5 to 10 Acre	70	5	75
10 to 20 Acre	70	1	71
More than 20 Acres	22	1	23
Total	247	33	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	53.045[a]	4	.000
Likelihood Ratio	50.793	4	.000
Linear-by-Linear Association	9.586	1	.002
N of Valid Cases	280		
a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 2.71.			

The chi square analysis indicates that null hypothesis is rejected and alternate hypothesis is

accepted. It is clear therefore that land holding does have a relationship with buying of Bt cotton to an extent.

The table below provides data on experience of farmers after using Bt cotton seeds according to land holding. A perusal of table reveals that highest number of respondent farmers derived benefits in terms of lower cost seed and reduction in overall expenses per hectare of cotton grown. Farmers with relatively large land holding reported lower cost of seed while farmers with less land holding reported reduction in expenses.

10) H0: There is no association between landholding and experience of using Bt cotton among sample farmers

Table 6.54: Experience of Using Bt Cotton Seeds according to Land holding

	What is your experience after using BT seeds				
Land holding	**Lower cost of seed**	**Increase in yield per hectare of cotton**	**Reduction in expenses per hectare of cotton grown**	**More price of cotton (kapas) due to better quality**	**Total**
Up to 3 Acre	7	11	14	4	36
3 to 5 Acre	12	20	34	9	75
5 to 10 Acre	24	25	24	2	75
10 to 20 Acre	29	13	13	16	71
More than 20 Acres	18	0	5	0	23
Total	90	69	90	31	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	59.925[a]	12	.000
Likelihood Ratio	65.694	12	.000
Linear-by-Linear Association	13.655	1	.000
N of Valid Cases	280		
a. 2 cells (10.0%) have expected count less than 5. The minimum expected count is 2.55.			

The chi square test reveals that null hypothesis is rejected and alternate hypothesis is accepted. This means that there is an association between land holding by sample farmers and their experience after using Bt cotton seed.

The table below shows that the relationship between mode of selling cotton and land holding by sample farmers. A perusal of table clearly shows that local ginners are the preferred choice

most of the farmers from different land holding category. However, medium land holding farmers also sell to CCI and GCF directly.

11) H0: There is no association between landholding and mode of selling Cotton

Table 6.55: Mode of Selling Cotton according to Land holding

	Selling cotton			Total
Land holding	**Gujarat cotton Federation**	**C C I**	**Local Ginners**	
Up to 3 Acre	7	3	26	36
3 to 5 Acre	16	17	42	75
5 to 10 Acre	13	28	34	75
10 to 20 Acre	0	12	59	71
More than 20 Acres	2	8	13	23
Total	38	68	174	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	36.402[a]	8	.000
Likelihood Ratio	45.904	8	.000
Linear-by-Linear Association	5.031	1	.025
N of Valid Cases	280		
a. 2 cells (13.3%) have expected count less than 5. The minimum expected count is 3.12.			

The chi square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted. This indicates that relationship between land holding of farmers does impact where the cotton is sold.

The table below shows data on future market expectations on cotton by sample farmers according to their land holding pattern. It clearly shows that only a small proportion of sample farmers expected very bad market irrespective of land holding of farmers, hence a majority of farmers considered future for cotton same or very good.

12) H0: There is no association between landholding and expectation from market in future

Table 6.56: Future market expectation of Cotton and Land Holding

	Future market Expectations in the next season for cotton			Total
Land holding	**very good**	**same as last season**	**very bad**	
Up to 3 Acre	14	19	3	36
3 to 5 Acre	27	41	7	75
5 to 10 Acre	36	35	4	75
10 to 20 Acre	26	41	4	71
More than 20 Acres	13	10	0	23
Total	116	146	18	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	7.193[a]	8	.516
Likelihood Ratio	8.437	8	.392
Linear-by-Linear Association	2.011	1	.156
N of Valid Cases	280		
a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.48.			

The chi square test reveals that null hypothesis is accepted and alternate hypothesis is rejected. This means that difference in land holding pattern does not have any significant relationship with future expectation on cotton market by sample farmers.

The table below presents data on expectations regarding prices of cotton fiber according to land holding. It is clear from the table that only a small per cent of sample farmers have expectations of prices being lower and most of them have better expectations irrespective of size of land holding.

13) H0: There is no association between landholding and expectation on future Price of cotton

Table 6.57: Expectations on price of cotton fibres and Land holding

Land holding	How do you see the price of cotton fibres in the next season			Total
	Better than this season	Same as this season	Lower than this season	
Up to 3 Acre	14	19	3	36
3 to 5 Acre	27	41	7	75
5 to 10 Acre	36	35	4	75
10 to 20 Acre	26	41	4	71
More than 20 Acres	13	10	0	23
Total	116	146	18	280

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.193[a]	8	.516
Likelihood Ratio	8.437	8	.392
Linear-by-Linear Association	2.011	1	.156
N of Valid Cases	280		
a. 5 cells (33.3%) have expected count less than 5. The minimum expected count is 1.48.			

The chi square test indicates that null hypothesis is accepted. Thus, land holding size does not matter with regard to expectations regarding price of cotton fiber. Hence alternate hypothesis is rejected.

The table below presents data on expectations of sample farmers from government to increase earnings from cotton cultivation according to land holding. The table clearly indicates that generally relatively small size farmers want government to regulate quality of seed and control its price, however, large size farmers want government to remain away from interfering in the market, barring a few exceptions.

14) H0: There is no association between landholding and Expectations from Government

Table 6.58: Expectations from Government for Better Earning in cotton cultivation according to Land Holding

	Expectations From Government to increase earning in cotton cultivation						
Land holding	**Compulsory buying of cotton by govt. bodies**	**Increase in minimum support price per year**	**Regulate the quality of seed**	**Increase supply of BT seed**	**Lower the price of B T seed**	**Leave it to market sources to decide the price of cotton**	**Total**
Up to 3 Acre	9	10	17	0	0	0	36
3 to 5 Acre	13	11	50	1	0	0	75
5 to 10 Acre	27	7	16	14	10	1	75
10 to 20 Acre	17	13	26	0	0	15	71
More than 20 Acres	1	8	10	4	0	0	23
Total	67	49	119	19	10	16	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	134.930[a]	20	.000
Likelihood Ratio	134.323	20	.000
Linear-by-Linear Association	6.934	1	.008
N of Valid Cases	280		
a. 14 cells (46.7%) have expected count less than 5. The minimum expected count is .82.			

The chi square analysis shows that the null hypothesis needs to be rejected and alternate hypothesis is accepted. Thus there is an association between land holding of sample farmers and expectations from the government.

The table below presents data on average production of cotton during last few years according to land holding of sample farmers. It clearly shows that average production of medium land holding sample farmers is higher than the small as well as large land holding farmers barring a few exceptions.

15) H0: There is no association between landholding and average production of cotton by sample farmers

Table 6.59: Average production of cotton (five years) and Land holding

	What was your production of cotton (kapas) from your field in the last five year approx in kgs per Acres?					
Land holding	**900 kgs to 1100 kgs**	**1100 kgs to 1300 kgs**	**1300 kgs to 1500 kgs**	**1500 kgs to 1700 kgs**	**1700 kgs to 1900 kgs**	**Total**
Up to 3 Acre	16	8	9	2	1	36
3 to 5 Acre	4	36	25	6	4	75
5 to 10 Acre	25	27	13	4	6	75
10 to 20 Acre	9	15	17	23	7	71
More than 20 Acres	10	5	0	8	0	23
Total	64	91	64	43	18	280

Chi-Square Tests			
	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	81.953[a]	16	.000
Likelihood Ratio	88.690	16	.000
Linear-by-Linear Association	6.105	1	.013
N of Valid Cases	280		
a. 6 cells (24.0%) have expected count less than 5. The minimum expected count is 1.48.			

The chi square test results indicate that null hypothesis is rejected and alternate hypothesis is accepted. Thus, size of land holding does have an association with average production by sample farmers of cotton.

The table below presents data place of storage of cotton according to land holding. It clearly shows that land land holding farmers store cotton in open themselves while relatively small land holding farmers store with ginners. The medium size land holding farmer have a tendency to store cotton in special storage facility to a greater extent.

16) H0: There is no association between landholding and storage of cotton by sample farmers

Table 6.60: Storage of cotton according to land holding

Land holding	Storage of cotton			Total
	In open end	In the ginners godown	In special storage facility	
Up to 3 Acre	**11**	**18**	**7**	**36**
3 to 5 Acre	**7**	**49**	**19**	**75**
5 to 10 Acre	**42**	**30**	**3**	**75**
10 to 20 Acre	**13**	**28**	**30**	**71**
More than 20 Acres	**22**	**1**	**0**	**23**
Total	**95**	**126**	**59**	**280**

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	102.664[a]	8	.000
Likelihood Ratio	110.137	8	.000
Linear-by-Linear Association	5.991	1	.014
N of Valid Cases	280		
a. 1 cells (6.7%) have expected count less than 5. The minimum expected count is 4.85.			

The chi square test reveals that the null hypothesis is rejected and alternate hypothesis is accepted. Thus, the land holding does have an association with storage facility used by cotton producing farmers. Hence, it can be stated that sample farmers with different land holding do adopt varying storage practice for storing cotton.

6.3 ANALYSIS OF SPINNING MILLS, YARN PRODUCTION AND IMPACT OF BT COTTON

The present section of the study deals with impact of Bt cotton adoption on spinning mills. It attempts to study how spinning mills are affected by good quality of Bt cotton available to them from markets due to increasing production of Bt cotton by India farmers in Gujarat and also other states. The spinning mills undertake a critical part of the process of production of fabric from raw cotton.

The raw cotton as produced by farmers through their sheer hard work by sweating in fields, is transported to ginning mills for initiation of the manufacturing process of transformation to a variety of textile products. It begins with the process of ginning, which involves separation of cotton seeds and cleaning of visible impurities in the cotton bales sourced from farmers, at ginning mills. The ginned cotton forms raw input for spinning mills. The process of spinning is a complex process involving processing of cotton of different lengths of staple. The raw cotton received from a ginning mill by a spinning mill is put to a few processes involving grading, spinning, dyeing, coating and others processes, leading to strengthening of the cotton yarn produced as a final product from spinning mill. Thus, spinning mills produce fabric as final product which is further used by fabricating to manufacture various textile products.

Selected spinning mills from Maharashtra, Gujarat, Rajasthan, Punjab and Andhra Pradesh were purposefully contacted to receive information. In all 20 spinning were chosen for this study. The spinning mills in these states receive cotton produced in Gujarat. The spinning mills for data collection were chosen according to convenience and due to personal connection and contact with senior management of researcher himself in each of the spinning mills in four states. This also ensured reliability and authenticity of data collection and information received from these mills on various aspects of research. In general the information was sought on the raw cotton received from ginning mills, extent of Bt cotton used by them and the advantages and benefits derived by them over earlier prevalent practice of using normal cotton, before adoption of Bt cotton. The information in the form of data received from spinning mills are presented in tabular form below. The data has been presented and discussed along with interpretation relevant for present study in this part.

The table below gives distribution of selected spinning mills according to different states. It can be seen from table that six spinning mills are from Gujarat, followed by four spinning

mills Punjab have been chosen for eliciting relevant information regarding effect of use of Bt cotton on spinning of cotton to manufacturing of yarn. Two spinning mills were chosen from states of Andhra Pradesh, Maharashtra, New Delhi and Madhya Pradesh, each. One spinning mill was chosen for this purpose each from states of Rajasthan and Uttar Pradesh. The selectioin of these spinning mills was purposefully done for convenience and ensuring reliability and authenticity of data, opinion and information being collected from respondents representing these spinning mills.

Table 6.61: State wise Distribution of Spinning Mills

States	Frequency	Per cent
Gujarat	06	30.0
Rajasthan	01	05.0
Punjab	04	20.0
Andhra Pradesh	02	10.0
Maharashtra	02	10.0
New Delhi	02	10.0
Uttar Pradesh	01	5.0
Madhya Pradesh	02	10.0
Total	20	100.0

The table below provides data on when and in which year the production in selected spinning mills started. It can be seen from this table that the selected mills constitute spinning mills which are more than 20 years old as well as some of the mills which started production only during a period of last five years. This has allowed to gain an insight on their experience of using Bt cotton and capture their views on the same. In Gujarat, during recent years new spinning mills have been established. It may be due to increase in production of cotton due to adoption of Bt cotton to a considerable extent in Gujarat resulting in net addition of cropped area under cotton, being one of the cash crops.

Table 6.62: Year of Commencement of Commercial Production by Spinning Mills

Year		Frequency	Per cent	Valid Per cent	Cumulative Per cent
During 1980s	1982	1	5.0	5.0	5.0
	1982	1	5.0	5.0	10.0
	1986	1	5.0	5.0	15.0
	1987	1	5.0	5.0	20.0
During 1990s	1991	2	10.0	10.0	30.0
	1992	1	5.0	5.0	35.0
	1995	1	5.0	5.0	40.0
	1996	2	10.0	10.0	50.0
	1998	2	10.0	10.0	60.0
During 2000s	2002	2	10.0	10.0	70.0
	2004	1	5.0	5.0	75.0
	2006	2	10.0	10.0	85.0
During 2010s	2011	1	5.0	5.0	90.0
	2012	1	5.0	5.0	95.0
	2014	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

The following table provides data on number of spindles in each of the spinning mills selected for this study. It is clear that the size of the capacity of spinning mills varies considerably and the number of spindle vary from just more than one thousand to one lakh twenty five thousand approximately. Thus, a large variation exists in the number of spindles used for spinning the fibre in spinning mills indicating capacity of different spinning mills.

Table 6.63: Total no. of Spindles in Spinning Mills

No. of Spindles	Frequency	Per cent	Valid Per cent	Cumulative Per cent
1280	1	5.0	5.0	5.0
5000	1	5.0	5.0	10.0
8000	1	5.0	5.0	15.0
10000	1	5.0	5.0	20.0
12000	1	5.0	5.0	25.0
18000	2	10.0	10.0	35.0
28000	1	5.0	5.0	40.0

32000	1	5.0	5.0	45.0
35000	1	5.0	5.0	50.0
38000	1	5.0	5.0	55.0
39312	1	5.0	5.0	60.0
42000	2	10.0	10.0	70.0
58400	1	5.0	5.0	75.0
63000	1	5.0	5.0	80.0
64000	1	5.0	5.0	85.0
80000	1	5.0	5.0	90.0
82000	1	5.0	5.0	95.0
250000	1	5.0	5.0	100.0
Total	20	100.0	100.0	

The table provides data on the extent of cotton – a natural fibre, used for spinning to prepare fibre which can be fabricated to fabric. It is clear from table that all 20 spinning mills were using natural raw cotton for manufacturing of fibre. However, many of them also use other natural products- other than cotton, in the spinning mill for manufacturing fibre.

Table 6.64: Cotton based Spinning Mills

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	20	5.0	100.0	100.0
No	00	0.0	0.0	100.0
Total	20	100.0	100.0	

It is further clear from perusal of data in table below that only 17mills out of 20 are using only cotton for spinning to manufacture fibre. However, there are three mills which use other sources of fibre. The table further reveals that out of three mills which use other source of fibre, one of them use 40 per cent, another uses 20 per cent and the third mill uses approximately 10 per cent of other source, other than cotton, for production of fibre. Thus, amongst selected spinning mills a majority of mills use only cotton as an input for manufacturing of fibre.

Table 6.65: Per cent of Cotton Usage by Spinning Mills

Per cent	Frequency	Per cent	Valid Per cent	Cumulative Per cent
60	1	5.0	5.0	5.0
80	1	5.0	5.0	10.0
90	1	5.0	5.0	15.0
100	17	85.0	85.0	100.0
Total	20	100.0	100.0	

The table below presents details regarding different varieties of cotton used by spinning mills as source of fibre or yarn production. It can be seen from table that 12 units or 60 per cent of spinning mills are using Shanku – 6 variety of cotton, followed by MECH variety and J-34 variety of cotton used by 8 spinning mills each constituting of 40 per cent of selected units of spinning mills. The other varieties of cotton like H-4, V-797 and Banny Bahma were also used as indicated in table are also used by spinning mills. It is further revealed that multiple varieties of cotton are used by spinning mills for yarn manufacturing.

Table 6.66: Variety of Cotton Used by Spinning Mills

	Frequency	Per cent	Respondents
J-34	8	40.0	20
Shanku -6	12	60.0	20
MECH	8	40.0	20
H-4	3	15.0	20
V-797	1	5.0	20
Banny Bahma	1	5.0	20

It has been found that all spinning mills which were selected for sourcing data and relevant information for present study are using Bt cotton for producing yarn which in turn is used for manufacturing of fabric. However, the proportionate use of Bt cotton is different by different spinning mills as revealed by data presented in table below.

Table 6.67: Using Bt Cotton per year

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	20	100.0	100.0	100.0

Table 6.68: Bt Cotton Usage In Terms of Per cent per year

Bt cotton Use (%)	Frequency	Percent	Valid Percent	Cumulative Percent
80	1	5.0	5.0	5.0
95	1	5.0	5.0	10.0
100	18	90.0	90.0	100.0
Total	20	100.0	100.0	

The table below provides data on Bt cotton usage in terms of quantity in tons of cotton by spinning mills. It is clear from the table that 4 spinning mills constituting 20 per cent use cotton up to less than 5000 tons while due to small capacity in terms of spindles. At the same time 4 spinning mills use cotton which is more than 5000 tons but less than 10000 tons. There are 6 spinning mills using cotton quantity more than ten thousand tons but less than 20 thousand tons from amongst spinning mills chosen for study purpose. The remaining 6 spinning mills were using more than 20 thousand tons of raw cotton for manufacturing fibre.

Thus, table clearly reveals that the selected spinning mills are of different capacity and have been using inputs in varying quantities.

Table 6.69: Bt Cotton Usage In Terms of Tons per year

Tons	Tons	Frequency	Percent	Valid Percent	Cumulative Percent
Upto 5000	2200	1	5.0	6.7	6.7
	4500	2	10.0	6.7	13.3
	4900	1	5.0	6.7	20.0
Upto 10000	8400	2	10.0	6.7	26.7
	8800	1	5.0	6.7	33.3
	9000	1	5.0	6.7	40.0
Upto 20000	11000	1	5.0	6.7	46.7
	11500	2	10.0	6.7	53.3
	12000	1	5.0	6.7	60.0
	12500	1	5.0	6.7	66.7
	22500	1	5.0	6.7	73.3
More than 20000	28800	2	10.0	6.7	80.0
	38400	2	10.0	6.7	86.7
	54000	1	5.0	6.7	93.3
	68500	1	5.0	6.7	100.0
	Total	20	100.0	100.0	

The table below provides data on strength of cotton used by spinning mills. A perusal of table reveals that Bt cotton provides higher strength to the fibre produced by spinning mills as reported by all the spinning mills. It is clearly indicated by data that the fibre produced from Bt cotton results in greater strength for fibre. The further reveals that almost 75 per cent, that is 15 spinning mills have reported that they derive greater strength in fibre produced by use of Bt cotton in comparison with normal cotton used by them. Hence, Bt cotton leads to greater strength for fibre produced compared to use of normal cotton.

Table 6.70: Comparison of Normal and Bt Cotton STRENGTH Grams/tex

Normal			Bt Cotton		
Unit is grams/ tex	**Frequency**	**Per cent**	**Unit is Grams/tex**	**Frequency**	**Per cent**
18.0	1	5.0	21.0	1	5.0
19.0	1	5.0	27.0	1	5.0
24.0	1	5.0	28.0	1	5.0
25.5	1	5.0	28.5	2	10.0
26.0	3	15.0	29.0	3	15.0
27.0	2	10.0	29.5	2	10.0
27.5	1	5.0	31.0	7	35.0
28.0	4	20.0	32.0	2	10.0
28.5	1	5.0	32.5	1	5.0
29.0	5	25.0	Total	20	100.0
Total	20	100.0			

*Where tex is the measurement unit for yarn

The table below provides data on comparison between normal and Bt cotton regarding coarseness of the fibre produced by spinning mills. The coarseness also depicts the thickness of fibre. Less coarseness indicates that the fibre is less thick, that is, more fine. Thus, compared to use of normal cotton when spinning mills are using Bt cotton, the fibre produced is more coarse, as indicated by spinning mills. Thus, overall, use of Bt cotton leads to increase in coarseness and thickness of fibre produced by spinning mills. The table further reveals that 6 spinning mills constituting of almost 30 per cent of selected mills reported higher coarseness in the fibre produced by them while using Bt cotton rather than using normal cotton.

Table 6.71: Comparison of Normal and Bt Cotton Coarseness in Micronaaire

Normal			Bt Cotton		
Micronaaire	**Frequency**	**Per cent**	**Micronaaire**	**Frequency**	**Per cent**
3.3000	2	10.0	3.4000	1	5.0
3.4000	1	5.0	3.6000	3	15.0
3.5000	1	5.0	3.9000	2	10.0
3.6000	1	5.0	4.1000	1	5.0
3.8000	1	5.0	4.3000	5	25.0
4.0000	3	15.0	4.4000	2	10.0
4.1000	2	10.0	4.5000	4	20.0
4.2000	3	15.0	4.6000	1	5.0
4.3000	1	5.0	4.7000	1	5.0
4.4000	3	15.0	Total	20	100.0
4.5000	2	10.0			
Total	20	100.0			

* Micronaaire is the thickness or coarseness of fibre, it is an index so no unit. Fine fibres have low micronaaire value like say shanker -6 cotton has 3.5 to 4.2 micronaaire value and coarse cotton like j-34 for Punjab has 4.5 to 4.8 micronaaire value.

The table below provides data on short fibre content in normal and Bt cotton as observed by various selected spinning mills for this study. A perusal of data in table below indicates that there is not much difference in content of short fibre in normal and Bt cotton as found by spinning mills. The data indicate more or less similar short fibre content in normal as well as Bt cotton, received from farmers and market which is used by spinning mills for production of fibre. Thus, there is not much difference found in content of short fibre in normal and Bt cotton by spinning mills. Thus, in relation to short fibre content, normal and Bt cotton does not show any difference as reported by spinning mills and both are found to have almost same per cent of quality concern.

Table 6.72: Comparison of Normal and Bt Cotton in terms of Short Fibre Content

Normal			Bt Cotton		
Per cent	**Frequency**	**Per cent**	**Per cent**	**Frequency**	**Per cent**
20	3	15.0	20	3	15.0
21	4	20.0	21	3	15.0
22	3	15.0	22	4	20.0
23	5	25.0	23	4	20.0
24	5	25.0	24	6	30.0
Total	20	100.0	100	20	100

*Short fibre content in percentage

The table below indicates convolutions in the fibre produced by spinning mills using Bt cotton. These are a measure of and indicate how much is the density of fibre produced by mills from cotton used as inputs. All of spinning mills reported convolutions of 22 except for one which reported convolutions of 18. Thus, the convolutions as reported by spinning mills is well within the standard norms and hence there is no inverse impact due to Bt cotton on the process of spinning of yarn.

Table 6.73: Convolutions

Bt cotton				
Nos.	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
22	19	95.0	95.0	95.0
18	1	5.0	5.0	100.0
Total	20	100.0	100.0	

The table below presents data on length of staple of cotton in case of normal and Bt cotton. A perusal of table reveals that in case Bt cotton the length of staple has been longer compared to the length found in case of normal cotton. Thus, overall the spinning mills found that the length of staple in case of Bt cotton is longer than as compared to the length found in case of normal cotton, while they receive cotton for spinning purpose for manufacturing of fibre in the process of raw cotton.

Table 6.74: Comparison of Staple Length in Normal and Bt Cotton

Normal			Bt Cotton		
Mm	**Frequency**	**Per cent**	**Mm**	**Frequency**	**Per cent**
18.70	1	5.0	22.0	1	5.0
21.00	1	5.0	24.0	1	5.0
26.50	3	15.0	28.0	1	5.0
27.50	1	5.0	28.5	3	15.0
28.00	5	25.0	29.0	5	25.0
28.20	1	5.0	29.3	1	5.0
28.50	4	20.0	29.5	2	10.0
29.00	2	10.0	29.8	1	5.0
29.50	1	5.0	30.5	2	10.0
31.00	1	5.0	31.0	2	10.0
Total	20	100.0	31.5	1	5.0
			Total	20	100.0

The data related to presence of trash in raw cotton received by spinning mills was reported by spinning mills. The same has been presented in table below. The data presented provide information of trash content in normal cotton and Bt cotton as reported by spinning mills. A perusal of this table indicate that the trash content in cotton received is marginally higher in case of normal cotton while it is relatively lower in case of Bt cotton. Less content of trash is likely to make the operation of spinning mills more efficient and productive when they use Bt cotton in comparison to normal cotton used in the process of spinning cotton to manufacture fibre.

Table 6.75: Comparison of Trash in Normal and Bt Cotton

Normal			Bt Cotton		
Per cent	**Frequency**	**Per cent**	**Per cent**	**Frequency**	**Percent**
2.2000	1	5.0	1.9800	1	5.0
2.3000	1	5.0	2.3000	2	10.0
2.4000	1	5.0	2.4000	3	15.0
2.7000	2	10.0	2.5000	1	5.0
2.8000	2	10.0	2.8000	2	10.0
3.2000	5	25.0	3.2000	3	15.0
3.5000	1	5.0	4.0000	3	15.0
4.0000	4	20.0	4.2000	1	5.0
4.5000	2	10.0	4.5000	4	20.0
4.6000	1	5.0	Total	20	100.0
Total	20	100.0			

*Trash means waste in cotton consisting of leaves and other particles unit is percentage

The data on moisture content in cotton, normal cotton and Bt cotton are given in table below as experienced and reported by selected spinning mills. A perusal of table below indicates that there is not a significant difference among normal cotton and Bt cotton with regard to moisture content as reported by selected spinning mills. However, overall a marginally less per cent of moisture content has been reported by spinning mills while using Bt cotton in comparison to while using normal cotton. Thus, it appears to be more beneficial for spinning mills to use Bt cotton rather than normal cotton for spinning of fibre due to presence of less moisture content.

Table 6.76: Comparison of Moisture Content in Normal and Bt Cotton

Normal			Bt Cotton		
Per cent	**Frequency**	**Per cent**	**Per cent**	**Frequency**	**Per cent**
2.5	3	15.0	2.50	3	15.0
4.5	1	5.0	5.50	2	10.0
5.5	1	5.0	5.60	1	5.0
5.6	1	5.0	6.50	3	15.0
6.5	2	10.0	7.00	2	10.0
7.0	3	15.0	7.50	2	10.0
7.5	3	15.0	8.00	4	20.0
8.0	5	25.0	8.06	1	5.0
8.5	1	5.0	8.50	2	10.0
Total	20	100.0	Total	20	100.0

*Moisture in per cent

The table below provides data on elongation of staple of cotton in normal and Bt cotton in accordance with responses of selected spinning mills. A perusal of table reveals that highest elongation in case of normal cotton is up to five per cent while that of Bt cotton is 5.5 per cent, further the minimum elongation reported for normal cotton is 3.8 per cent while that in case of Bt cotton is 4.4 per cent. It is also seen that more number of spinning mills reported less elongation in case of normal cotton in comparison of Bt cotton using spinning mills. Thus clearly spinning mills are deriving better quality advantages while using Bt cotton compared to use of normal cotton in manufacturing of fibre.

Table 6.77: Comparison of Elongation in Staple of Cotton in Normal and Bt Cotton

Normal			Bt Cotton		
Per cent	**Frequency**	**Per cent**	**Per cent**	**Frequency**	**Per cent**
3.8000	6	5.0	4.4000	1	5.0
4.2000	6	5.0	4.9000	1	5.0
4.5000	5	5.0	5.2000	8	40.0
4.8000	1	5.0	5.3000	6	30.0
4.9000	1	5.0	5.5000	4	20.0
5.0000	1	5.0	Total	20	100.0
Total	20	100.0			

Another attribute of cotton produced by farmers is its colour. The colour is an attribute which is directly visible to observer with necked eye. The cotton, normal as well as Bt cotton, have a variety of shades ranging from grey, white, red, etc. depending on many factors these colours are manifested in strains of cotton, including weather conditions and other natural factors as well.

Table 6.78: Comparison of Colour of Cotton in Normal and Bt Cotton

Normal			Bt Cotton		
	Frequency	**Per cent**		**Frequency**	**Per cent**
0	7	35.0	0	6	30.0
Grey	5	25.0	Grey	5	25.0
RD-75	1	5.0	RD 73.7+b 8.5	1	5.0
White	7	35.0	RD 75	1	5.0
Total	20	100.0	White	7	35.0
			Total	20	100.0

Table 6.79: Comparison of Body of Cotton in Normal and Bt Cotton

Normal			Bt Cotton		
Unit	**Frequency**	**Per cent**	**Unit**	**Frequency**	**Per cent**
0	20	100.0	0	19	95.0
			1	1	5.0
			Total	20	100.0

*It is descriptive so no unit

Table 6.80: Comparison of Spinnability of Cotton in Normal and Bt Cotton

Normal			Bt Cotton		
Unit	**Frequency**	**Per cent**	**Unit**	**Frequency**	**Per cent**
0	1	5.0	.0000	1	5.0
12	1	5.0	10.2000	2	10.0
16	1	5.0	16.0000	2	10.0
20	1	5.0	20.0000	1	5.0
30	6	30.0	30.0000	4	20.0
40	5	25.0	40.0000	7	35.0
100	1	5.0	102.0000	3	15.0
101	4	20.0	Total	20	100.0
Total	20	100.0			

*What is the yarn count we can spin from a particular fibre is know as spinnability

Table 6.81: Comparison of Maturity of Cotton in Normal and Bt Cotton

Normal			Bt Cotton		
Per cent	Frequency	Percent	Per cent	**Frequency**	**Percent**
.9	1	5.0	.9400	1	5.0
7.8	1	5.0	8.2000	1	5.0
25.8	1	5.0	80.0000	1	5.0
28.8	1	5.0	82.0000	2	10.0
75.0	1	5.0	83.0000	1	5.0
78.0	2	10.0	84.0000	6	30.0
79.0	1	5.0	85.0000	4	20.0
80.0	7	35.0	92.0000	3	15.0
81.0	1	5.0	96.0000	1	5.0
82.0	1	5.0	Total	20	100.0
85.0	2	10.0			
88.0	1	5.0			
Total	20	100.0			

The table below provide information from spinning mills regarding trend in usage of Bt cotton by spinning mills. A perusal of data in table shows that 19 spinning mills constituting of 95 per cent mills of selected mills have experienced increasing use of Bt cotton. This indicates that spinning mills are using proportionately more Bt cotton rather than normal cotton. Hence it is clear that acceptance of Bt cotton in spinning mills has been increasing over a period of time.

Table 6.82: Trend in Usage Of Bt Cotton in Spinning Mills

Trend in Use of Bt Cotton	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Increasing	19	95.0	95.0	95.0
Not increasing	1	5.0	5.0	100.0
Total	20	100.0	100.0	

The spinning mills which indicated an increasing trend in usage of Bt cotton were asked to reveal the per cent by which Bt cotton use is increasing in their mills. The data for the same is presented in following table. It is clear from perusal of the table that the increasing trend in use of Bt cotton by spinning mills is different in different spinning mills. A perusal of table

shows that a large majority of spinning mills have reported an increase in use of Bt cotton by more than 100 per cent, while one spinning each reported an increase of Bt cotton use of 20 per cent and 25 per cent. While one spinning mills had reported a decline in use of Bt cotton during last years.

Table 6.83: Extent of Increase in Bt Cotton Usage by Spinning Mills

Per cent Increase	Frequency	Per cent	Valid Per cent	Cumulative Per cent
20	1	5.0	5.3	5.3
25	1	5.0	5.3	10.5
100	17	85.0	89.5	100.0
Total	19	95.0	100.0	
Decrease	1	5.0		
Total	20	100.0		

The spinning mill which decrease in use of Bt cotton reported was probed further regarding the extent of decrease in use of Bt cotton. The data for the same has been presented in table below. A perusal of table shows that the use of Bt cotton decreased in one spinning mill during last years. The spinning that reported that its use of Bt cotton as raw material has shown a decline of 30 per cent.

Table 6.84: Extent of Decrease in Use of Bt Cotton by Spinning mill

Per cent Decrease	Frequency	Percent	Valid Percent	Cumulative Percent
0	19	95.0	95.0	95.0
30	1	5.0	5.0	100.0
Total	20	100.0	100.0	

The owners or senior managers from spinning mills were probed on impact of Bt cotton use on quality of fibre and yarn produced by spinning mills. The response from spinning mills has been presented in the following table. A perusal of table below reveals that except for one spinning mill, all other representative of spinning mills were of the view that due to use of Bt cotton the quality of yarn production has improved considerably. However, one did not felt improvement in quality of yarn due to use of Bt cotton. In fact 14 respondents constituting of 70 per cent spinning mills found that the the quality of yarn has improved considerably due to use of Bt cotton by them instead of normal cotton. Thus it can be inferred that the quality of yarn produced improves considerably due to use of Bt cotton by spinning mills.

Table 6.85: Improvement of Yarn Quality Owing to Use of Bt Cotton

Responses	Frequency	Per cent	Valid Per cent	Cumulative Per cent
No Improvement	1	5.0	5.0	5.0
Improved	5	25.0	25.0	30.0
Improved To A Great Extent	14	70.0	70.0	100.0
Total	20	100.0	100.0	

Table 6.86: COUNT

	Frequency	Percent	Valid Percent	Cumulative Percent
10	3	15.0	15.0	15.0
16	1	5.0	5.0	20.0
20	2	10.0	10.0	30.0
24	1	5.0	5.0	35.0
30	7	35.0	35.0	70.0
40	5	25.0	25.0	95.0
125	1	5.0	5.0	100.0
Total	20	100.0	100.0	

* Count is the unit of measurement of yarn .

Count= hank (length in yards)/ weight in lbs where one hank is 120 yrds

Table 6.87: STRENGTH

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
17.5	1	5.0	5.0	5.0
24.5	1	5.0	5.0	10.0
25.0	1	5.0	5.0	15.0
29.0	1	5.0	5.0	20.0
58.0	1	5.0	5.0	25.0
61.5	1	5.0	5.0	30.0
62.5	1	5.0	5.0	35.0
75.0	1	5.0	5.0	40.0
80.0	2	10.0	10.0	50.0
88.0	1	5.0	5.0	55.0
95.0	1	5.0	5.0	60.0

97.0	1	5.0	5.0	65.0
130.0	2	10.0	10.0	75.0
172.0	1	5.0	5.0	80.0
175.0	1	5.0	5.0	85.0
188.0	1	5.0	5.0	90.0
190.0	1	5.0	5.0	95.0
280.0	1	5.0	5.0	100.0
Total	20	100.0	100.0	

Table 6.88: THIN

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
0	16	80.0	80.0	80.0
1	2	10.0	10.0	90.0
6	1	5.0	5.0	95.0
46	1	5.0	5.0	100.0
Total	20	100.0	100.0	

Table 6.89: THICK

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
8.00	1	5.0	5.0	5.0
10.00	1	5.0	5.0	10.0
11.98	1	5.0	5.0	15.0
15.00	1	5.0	5.0	20.0
20.00	1	5.0	5.0	25.0
24.00	1	5.0	5.0	30.0
25.00	3	15.0	15.0	45.0
28.20	1	5.0	5.0	50.0
30.00	5	25.0	25.0	75.0
39.00	1	5.0	5.0	80.0
40.00	1	5.0	5.0	85.0
42.00	1	5.0	5.0	90.0
60.00	1	5.0	5.0	95.0
288.00	1	5.0	5.0	100.0
Total	20	100.0	100.0	

Table 6.90: NEPS

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
5.9000	1	5.0	5.0	5.0
10.0000	1	5.0	5.0	10.0
12.0000	1	5.0	5.0	15.0
20.0000	1	5.0	5.0	20.0
25.0000	1	5.0	5.0	25.0
30.0000	1	5.0	5.0	30.0
34.3000	1	5.0	5.0	35.0
35.0000	2	10.0	10.0	45.0
36.0000	1	5.0	5.0	50.0
38.0000	1	5.0	5.0	55.0
40.0000	3	15.0	15.0	70.0
42.0000	1	5.0	5.0	75.0
45.0000	1	5.0	5.0	80.0
49.0000	1	5.0	5.0	85.0
50.0000	1	5.0	5.0	90.0
65.0000	1	5.0	5.0	95.0
80.0000	1	5.0	5.0	100.0
Total	20	100.0	100.0	

* Sort of small entanglement of fibres

Table 6.91: TOTAL

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
20.0	2	10.0	10.0	10.0
30.0	2	10.0	10.0	20.0
40.0	1	5.0	5.0	25.0
55.0	1	5.0	5.0	30.0
63.0	1	5.0	5.0	35.0
63.1	1	5.0	5.0	40.0
64.0	1	5.0	5.0	45.0
65.0	1	5.0	5.0	50.0
66.0	1	5.0	5.0	55.0
70.0	1	5.0	5.0	60.0
72.0	1	5.0	5.0	65.0
87.0	1	5.0	5.0	70.0
90.0	1	5.0	5.0	75.0
92.0	1	5.0	5.0	80.0

95.0	1	5.0	5.0	85.0
140.0	1	5.0	5.0	90.0
350.0	1	5.0	5.0	95.0
650.0	1	5.0	5.0	100.0
Total	20	100.0	100.0	

Table 6.92: U%

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
5.0000	1	5.0	5.0	5.0
8.9000	2	10.0	10.0	15.0
9.2000	3	15.0	15.0	30.0
9.4000	4	20.0	20.0	50.0
9.6000	1	5.0	5.0	55.0
9.6500	1	5.0	5.0	60.0
9.7000	1	5.0	5.0	65.0
9.8000	2	10.0	10.0	75.0
10.2000	2	10.0	10.0	85.0
10.3000	1	5.0	5.0	90.0
11.9000	2	10.0	10.0	100.0
Total	20	100.0	100.0	

Table 6.93: HARINESS

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
3.80	2	10.0	10.0	10.0
4.20	1	5.0	5.0	15.0
5.20	1	5.0	5.0	20.0
5.40	1	5.0	5.0	25.0
5.70	1	5.0	5.0	30.0
5.80	4	20.0	20.0	50.0
5.90	4	20.0	20.0	70.0
6.10	1	5.0	5.0	75.0
6.20	2	10.0	10.0	85.0
6.40	1	5.0	5.0	90.0
6.90	1	5.0	5.0	95.0
7.05	1	5.0	5.0	100.0
Total	20	100.0	100.0	

* Protruding hairs from the surface of yarn

Table 6.94: CLASSIMATE

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
5.9	1	5.0	5.0	5.0
11.8	1	5.0	5.0	10.0
40.0	1	5.0	5.0	15.0
55.0	1	5.0	5.0	20.0
70.0	2	10.0	10.0	30.0
80.0	3	15.0	15.0	45.0
82.0	1	5.0	5.0	50.0
90.0	3	15.0	15.0	65.0
110.0	2	10.0	10.0	75.0
119.0	1	5.0	5.0	80.0
120.0	2	10.0	10.0	90.0
180.0	1	5.0	5.0	95.0
190.0	1	5.0	5.0	100.0
Total	20	100.0	100.0	

* Type of faults in yarns which are classified as per diameter of fault and length of fault

Table 6.95: OBJECTABLE FAULTS

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
0	11	55.0	55.0	55.0
0-2	1	5.0	5.0	60.0
1	1	5.0	5.0	65.0
2	5	25.0	25.0	90.0
3	1	5.0	5.0	95.0
4	1	5.0	5.0	100.0
Total	20	100.0	100.0	

* Faults in yarns which are not acceptable by a weaver or knitter, in numbers.

Table 6.96: ELONGATION

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
2.0000	1	5.0	5.0	5.0
3.5000	1	5.0	5.0	10.0
4.5000	3	15.0	15.0	25.0
4.6000	1	5.0	5.0	30.0
4.7000	1	5.0	5.0	35.0
4.8000	7	35.0	35.0	70.0
4.9000	2	10.0	10.0	80.0

5.1000	1	5.0	5.0	85.0
5.2000	3	15.0	15.0	100.0
Total	20	100.0	100.0	

Table 6.97: HARINESS

	Frequency	Per cent	Valid Per cent	Cumulative Per cent
.0	15	75.0	75.0	75.0
3.0	1	5.0	5.0	80.0
5.8	2	10.0	10.0	90.0
5.9	1	5.0	5.0	95.0
16.0	1	5.0	5.0	100.0
Total	20	100.0	100.0	

The table below provides data on machines changed or new machines installed by spinning mills during recent past, that is during last few years. A perusal of table reveals that a majority of spinning mills have reportedly installed a variety of machines during various years since last few years. The table indicates that blow room has been set up by almost 90 per cent of the selected spinning mills during last two years. While 30 per cent or 6 spinning mills have purchased carding machines during last year, while the number of spinning mills installing this machine is 17 constituting of 85 per cent of spinning mills during last 5 years. The draw frame as well as comber was changed by 9 spinning mills i.e. 45 per cent during last year while 90 per cent (18 numbers) spinning did so in last 5 years. The ring frame has been changed by 60 per cent spinning mills (12 numbers) while 55 per cent spinning mills (11 numbers) changed simplex during last year itself. However, autoconors were changed by majority of spinning mills during last 5 years including 25 per cent or 5 spinning mills during last year itself. Thus it can be inferred from table that most of the spinning mills have changed various machines during last few years. These changes indicate either expansion of capacity or modernisation for consolidating in a growing market owing to globalisation of economy.

Table 6.98: Machines Changed During Recent Past by Spinning Mills

Machines		Less than one Year	One to 2 years	2 to 5 Years	5 to 8 years	8 to years	Total
Blow Room	Frequency	13	5	1	0	1	20
	Per cent	65	25	5	0	5	100
Carding Machine	Frequency	6	3	8	2	1	20
	Per cent	30	15	40	10	5	100
Draw Frame	Frequency	9	1	8	2	0	20
	Per cent	45	5	40	10	0	100
Comber	Frequency	9	1	8	2	0	20
	Per cent	45	5	40	10	0	100
Simplex	Frequency	11	0	4	4	1	20
	Per cent	55	0	20	20	5	100
Ring Frame	Frequency	12	1	5	2	0	20
	Per cent	60	5	25	10	0	100
Autoconers	Frequency	5	4	8	2	1	20
	Per cent	25	20	40	10	5	100

The table below provides data on possible factors leading to improvement in quality of yarn as experienced by spinning mills. The responses from spinning mills regarding whether change in machinery or introduction of Bt cotton has led to improvement in quality of yarn manufacturing by them were collected and are presented in table below. A perusal of table reveals that 75 per cent i.e. 15 spinning mills are of opinion that quality of yarn has improved due to both machinery change as well as due to adoption of Bt cotton. Three spinning mills were of the view that introduction of machinery has been a cause of improvement of quality of yarn only by 50 per cent. While only 2 spinning mills were of the view that Bt cotton has been responsible for improvement of quality of yarn to an extent of only 50 per cent. Thus varying reasons are attributed for improvement in quality of yarn by spinning mills. They also differ in their view as to how much per cent in improvement in quality which can be attributed to machinery change or introduction of Bt cotton.

Table 6.99: Causes for Improvement in Yarn Quality

Machinery Change			Bt Cotton		
Quality improvement (Per cent)	Frequency	Per cent	Quality improvement (Per cent	Frequency	Per cent
0	1	5.0	0	2	10.0
50	3	15.0	40	1	5.0
60	1	5.0	50	2	10.0
100	15	75.0	50	15	75.0
Total	20	100.0	100	20	100.0

The respondents from spinning mills were probed further as to precisely how much per cent improvement in quality of yarn was contributed by change in machinery and how much was contributed by adoption of Bt cotton. The responses from spinning mills have been presented in table below. It is clear from perusal of table that ten per cent spinning mills were of the view that it is the change in machinery that has contributed to 10 per cent improvement in quality of yarn and Bt cotton has not contributed at all. However, 45 per cent (9) respondent spinning mills were of the view that improvement in quality of yarn is due 40 per cent due to machinery and 60 per cent due to Bt cotton. At the same time an equal per cent i.e. 45 per cent spinning mills viewed that quality improvement of yarn is owing to 60 per cent due to Bt cotton and 40 per cent due to machinery. Hence one can infer that both introduction of Bt cotton as well as change in machinery contributed to improvement in quality of yarn produced by spinning mills.

Table 6.100: Relative Contribution to Quality of Yarn – Machinery Vs Bt Cotton

Contribution to Yarn Quality	Frequency	Per cent	Valid Per cent	Cumulative Per cent
40% Machinery And 60% Bt Cotton Usage	9	45.0	45.0	45.0
60% Machinery And 40% Bt Cotton Usage	9	45.0	45.0	90.0
100% Machinery And 0% Bt Cotton Usage	2	10.0	10.0	100.0
Total	20	100.0	100.0	

Conclusion