

## 5.1 Introduction

Haryana's economic growth has been exemplary, except for some periods, since its inception as a separate state. Despite Haryana being a geographically small state, the State's contribution to the national GDP (India) was 3.6 percent as per the estimates of 2017-18 (IBEF, 2019). Haryana is one of the leading states in terms of agriculture and industry in India. Due to the excellent business environment and its favorable policies initiated by the government, it has been made possible. Hence, the State facilitates ease of doing business, fiscal incentives, and development of skills for Industrial sector promotion. The state government of Haryana is continuously working for the betterment of industries and agriculture in the State. The State is known for its strategic location, sufficient supply of raw material, availability of skilled labour and good infrastructure for textiles (Haryana Textile Policy, 2019). Cotton is the primary raw material for producing 'fibre' that is further used for making cloth/clothes in textile mills. There are nine central cotton-producing states in India with three zones as the Northern Zone (Haryana, Punjab, Rajasthan), Central Zone (Gujrat, Madhya Pradesh, Maharashtra,.) and Southern Zone (Telangana, Karnataka, Andhra Pradesh). Production and productivity of cotton are improved significantly throughout all the zones during the last decade (2008-09 to 2017-18). In contrast, Haryana secured the first position in India's north zone (MoT, 2018 Report from cotton advisory Board). Fatehabad, Sirsa, Hisar, Jind, Bhiwani were found in the significant cotton-producing districts of Haryana. Domestic consumption and export of Haryana's textile products are being increased today by innovative strategies and targeted interventions. The government's vision is to promote sustainable development that will increase the industrial output and boost the income of millions of people (PHD Chamber of Commerce and Industry, 2019). The textile sector of Haryana contributed to improving the living standard by employing approx 1 million people. In this direction, the textile policies 2018, 2019 provide fiscal incentives, infrastructure

augmentation provisions, establishment new textile parks, skill training, and promotion of Khadi and village industries and aims to create 50000 new jobs. The objectives of Textile Policies, 2018 and 2019, are to set up new textile units, growth of the already established textile units and ascertain the modernisation of the textile units in Haryana. Further, Textile Policy 2019 favours promoting export (by 20 percent CAGR) of all types of its products. The policy's particular thrust is technical textiles, made-ups and garments by providing a conducive ecosystem (Haryana Textile Policy 2019, Department of Industries and Commerce Chandigarh).

The present chapter analyses the textile industry's cotton production growth mechanism in Haryana from a 2008-09 to 2017-18. The secondary data has been used for the analysis of growth using variables that are cotton production, Handloom, and Handicraft export and area. The statistical techniques such as Regression, trend analysis and CAGR have been applied for the data analysis. Area and production are positively correlated (0.68). Hence, it is appropriate to use the simple linear regression using independent (Area) and dependent (Production) variables.

Further, year-wise, expected cotton production, and error term was calculated based on the actual production over the area by applying the regression equation. During the study period (except for 2015-16), it was observed that cotton production and productivity are showing an increasing trend with a 7% CAGR. In the year 2015-16, it was decreased by 37 % caused by the leaf curl virus and whitefly pest attack in Haryana (Business Standard published on 24 May/ 2016). Handloom and handicraft Export are depicting the positive linear trend.

The rest of the chapter segmented in three parts; section 5.2 presents the chapter-specific research methodology including data, variable selected and technique used, section 5.3 shows the empirical results and discussions, and section 5.4 concludes the chapter.

## **5.2 Research Methodology**

### **5.2.1 Data and variable selection**

This chapter analyses the growth of textile industry in Haryana. In the beginning, relevant literature has been reviewed on the growth of different industries including the textile sector. Based on the existing literature, important variables such as Cotton production, area, and export have been identified. Thereafter, annual data has been collected from 2008 to 2018 on selected variables from the Ministry of Textile, GoI (New Delhi), and Department of Industries and Commerce, Chandigarh (Haryana). Then data has been analysed by applying correlation, regression, CAGR, and trend analysis techniques in SPSS, R-studio, and Ms-Excel. A positive correlation (68 percent) between the area and the production of cotton has been observed. Hence, it is appropriate to use the simple linear regression by using both independent (Area) and dependent (Production) variables. Further, year-wise expected production and error term was calculated based on the actual production over the area by applying the regression equation. Also, it was observed that the CAGR of cotton production in Haryana is 7% over the last 10 years. Trend analysis has been applied to Handloom and Handicraft export data of that is depicts an increasing trend.

### **5.2.2 Technique used**

#### **5.2.2.1 Correlation**

The correlation table 5.1 of independent and dependent variables shows that all the correlation values are significant at a 5% level. There is a moderate degree of correlation between independent (area) and dependent variable (Cotton Production), which is 0.682\* significant at a 5% level appropriate to carry on with data analysis.

**Table 5.1:** Correlation between Area and Production

		Area	Production
Area	Pearson Correlation	1	.682*
	Sig. (2-tailed)		.030
	N	10	10
Production	Pearson Correlation	.682*	1
	Sig. (2-tailed)	.030	
	N	10	10

\*. Correlation is significant at the 0.05 level (2-tailed).

**Source:** Author's calculation

### 5.2.2.2 Regression Equation

Intercept and coefficient of regression equation calculated through "r studio" based on annual data of 10 years, regression equation will be:

$$y = -6.194 + 4.659 (x)$$

Where,

-6.194 = Intercept

4.659 = Coefficient of x

y = Expected Production

x = Area of Cotton production

Regression analysis showed that the production is based on the area, and there is no production without the area's existence or the area's value. Thus, production must be positive in proportion to the area because the production (Output) is in units that produce some value. Hence, the lesser the area shows lesser the production or maybe zero production (can be a possible situation).

### 5.2.2.3 Compound Annual Growth Rate

It measures the compounded growth of any finite data over many years (Here, ten years of Haryana's textile industry data is calculated).

The formula to calculate CAGR;  $((\text{End value}/\text{First value})^{(1/\text{Period of study})})-1$

### 5.2.2.4 Coefficient of Variation

It is the multiplication of 'Coefficient of S.D.' by 100 that provides the percentage of the coefficient of S.D. to depict the variation percentage. It is the best measure of dispersion for comparing the homogeneity and heterogeneity of two or more distributions.

The lesser the value of CV indicates a more homogenous distribution than others whereas the greater the value of CV shows a more heterogeneous distribution.

Formula to calculate CV is as follows:

$$\text{Coefficient of S. D.} = \frac{SD \text{ of } X}{\text{Mean of } X}$$
$$\text{Coefficient of Variation} = \frac{SD \text{ of } X}{\text{Mean of } X} * 100$$

Where,

$$SD = \sqrt{\frac{\sum(X-\text{mean})^2}{N}}$$

### 5.2.2.5 Range

The range is an absolute variation of a distribution, is calculated by subtracting the Minimum value of variable X from its Maximum value;

$$\text{Range} = X_{\text{Maximum}} - X_{\text{Minimum}}$$

## 5.3 Results and discussion

Table 5.2 depicts the year-wise cotton production (in lakh bales, 170 kg) and area (In lakh hectare) in Haryana. The CAGR of production is 7%, and the area is 4% across ten years of the study period (2008 to 2018). Production of cotton is continuously increasing (14 lakh bales to 25 lakh bales) in all the years except for the years 2013, 2014 and 2015.

**Table 5.2:** Descriptive Statistics and growth of area and production of Cotton

<b>Year-wise Cotton Production, Area and Yield in Haryana</b>				
<b>(Area in Lakh Hectare, Production in Lakh bales 170 Kgs)</b>				
<b>Year</b>	<b>Area</b>	<b>Annual Growth (%) in Area</b>	<b>Production</b>	<b>Annual Growth (%) in Production</b>
2008-09	4.56		14	
2009-10	5.07	11%	15.25	9%
2010-11	4.92	-3%	17	11%
2011-12	6.41	30%	26	53%
2012-13	6.14	-4%	26	0%
2013-14	5.36	-13%	24	-8%
2014-15	6.48	21%	23	-4%
2015-16	6.15	-5%	14.5	-37%
2016-17	5.7	-7%	20.5	41%
2017-18	6.56	15%	25	22%
<b>Mean</b>	<b>5.735</b>	<b>5%</b>	<b>20.525</b>	<b>10%</b>
<b>Maximum</b>	<b>6.56</b>	<b>30%</b>	<b>26</b>	<b>53%</b>
<b>Minimum</b>	<b>4.56</b>	<b>-13%</b>	<b>14</b>	<b>-37%</b>
<b>Range</b>	<b>2</b>	<b>43%</b>	<b>12</b>	<b>90%</b>
<b>SD</b>	<b>0.72</b>	<b>15%</b>	<b>4.91</b>	<b>27%</b>
<b>C AGR</b>	<b>4%</b>		<b>7%</b>	
<b>Coefficient of Variation</b>	<b>12.55%</b>		<b>23.92%</b>	

**Source:** 1. Ministry of Textile, Government of India, Cotton Advisory board as per CAB meeting dated 12-12-2017.

2. Descriptive statistics calculated by the author.

Various fluctuations were observed in terms of the area covered by cotton production. In the year 2010-11 area is decreased by 2.95 percent, but the production has increased by 11.47 percent that shows a remarkable performance whereas in the year 2012-13 area has again reduced by 4 percent, but production was same as the previous year but the highest (26 lakh bales) across ten years of data. In the year 2013-14, area and production have decreased by 13 percent and 8 percent. In the year 2014-15, despite an increment in the area by 21 percent, production has reduced by 4 percent, it was the most malicious condition ever observed throughout the data of 10 years. The mean value of the area and production of 10 years is 5.735 lakh hectares and 20.525 lakh bale, respectively. The absolute dispersion or range of

production is 12 lakh bales {Max (26) – Min (14)} that is six times the range of area is that is 2 lakh hectares {Max (6.56) – Min (4.56)}. The coefficient of variation of production is found at 23.92 percent, and the area's coefficient is found at 12.55 percent. It is observed from the results that production is more heterogeneous than the area. Hence, the area is more reliable or homogeneous than the production over it. Table 5.3 shows the actual and expected cotton production (Through regression equation) with error terms across all ten years of the study period. If the error term is +ve, then it can be explained that actual production is losing based on the expected value. It means actual production is less than the expected cotton production over the occupied area. On the other hand, if the error term is –ve, it means that the production volume is higher over the allocated area, which is a favorable situation.

**Table 5.3:** Based on the regression equation, estimation of the production for each year is shown in the table below:

<b>Year-wise Cotton Production, Area and Yield in Haryana</b>				
<b>(Area in Lakh Hectare, Production in Lakh bales 170 Kgs)</b>				
<b>Year</b>	<b>Area (x)</b>	<b>Actual Production (y)</b>	<b><math>y = -6.194 + 4.659 (x)</math> / predicted production</b>	<b>Error (In Lakh bales)</b>
2008-09	4.56	14	15.05104	1.05104
2009-10	5.07	15.25	17.42713	2.17713
2010-11	4.92	17	16.72828	-0.27172
2011-12	6.41	26	23.67019	-2.32981
2012-13	6.14	26	22.41226	-3.58774
2013-14	5.36	24	18.77824	-5.22176
2014-15	6.48	23	23.99632	0.99632
2015-16	6.15	14.5	22.45885	7.95885
2016-17	5.7	20.5	20.3623	-0.1377
2017-18	6.56	25	24.36904	-0.63096

Source: Author's calculation

As per the observation mentioned above, it is found that the actual production is increasing almost every year except 2013-14, 2014-15, 2015-16 but the Predicted production deviates positively and negatively almost every year. The actual production is lesser by 1.05 and 2.17 lakh bales (error term) in the initial two years (2008-09 and 2009-10) as compared to the predicted production. Thus it can be considered as an unfavorable condition. In the next four years (2010-11 to 2013-14), where actual cotton production is higher than the expected production each year with the increasing ratio is a favorable condition.

Further, a positive error term has been observed in the years 2014-15 and 2015-16 by 0.99 lakh bale and 7.96 lakh bales respectively, where 2015-16 is the most unfavorable year ever. In the later two years '2016-17 and 2017-18,' the negative error term has been observed by producing (actual production) more 0.14 and 0.63 lakh bale cotton than the predicted production is a favorable condition. The major reason for the downfall of cotton production in 2015-16 was the leaf curl virus and whitefly pest attack in Haryana (Business Standard published on 24 May 2016). The same situation happened with Punjab and Rajasthan (The rest part of Northern India), but the downfall ratio of Haryana was more in this year (Table 5.4).

Table 5.4 depicts the year-wise comparison between cotton production in northern India\* and cotton production in Haryana. Lakh bale cotton production over per lakh hectare area in Haryana/ is greater than north India each year except 2015-16 and 2017-18, a slight decrease of 0.19 and 0.01 lakh bale respectively have been observed in these years. CAGR of cotton production in Haryana is 7 percent, whereas CAGR of northern India is 5 percent for ten years from 2008-09 to 2017-18.



**Table 5.4: Year-wise Comparison of production in Haryana in lakh bales (170 kgs) over area per lakh hectare to Northern India**

<b>Year</b>	<b>Area in Lakh Hectare (Haryana)</b>	<b>Production in Lakh bales (170 kg) (Haryana)</b>	<b>Area in Lakh Hectare (North India)</b>	<b>Production in Lakh bales (North India )</b>	<b>Lakh bale Production over per lakh hectare area (Haryana) – Productivity</b>	<b>Lakh bale Production over per lakh hectare area (North India) – Productivity</b>
2008-09	4.56	14	12.85	39	3.07	3.04
2009-10	5.07	15.25	14.62	40.25	3.01	2.75
2010-11	4.92	17	13.57	45.6	3.46	3.36
2011-12	6.41	26	16.71	64	4.06	3.83
2012-13	6.14	26	15.44	64	4.23	4.15
2013-14	5.36	24	13.75	59	4.48	4.29
2014-15	6.48	23	15.55	53	3.55	3.41
2015-16	6.15	14.5	14.02	35.75	2.36	2.55
2016-17	5.7	20.5	13.26	46	3.6	3.47
2017-18	6.56	25	15.44	59	3.81	3.82
<b>Mean</b>	<b>5.735</b>	<b>20.525</b>	<b>14.521</b>	<b>50.56</b>	<b>3.563</b>	<b>3.467</b>
<b>Min</b>	<b>4.56</b>	<b>14</b>	<b>12.85</b>	<b>35.75</b>	<b>2.36</b>	<b>2.55</b>
<b>Max</b>	<b>6.56</b>	<b>26</b>	<b>16.71</b>	<b>64</b>	<b>4.48</b>	<b>4.29</b>
<b>SD</b>	<b>0.68</b>	<b>4.66</b>	<b>1.17</b>	<b>10.07</b>	<b>0.6</b>	<b>0.54</b>
<b>CV</b>	<b>12%</b>	<b>23%</b>	<b>8%</b>	<b>20%</b>	<b>17%</b>	<b>16%</b>
<b>CAGR</b>	<b>4%</b>	<b>7%</b>	<b>2%</b>	<b>5%</b>	<b>2%</b>	<b>3%</b>
<b>North India* = Rajasthan + Haryana + Punjab</b>						

**Source:** 1. Data collected from Ministry of textile, 2. Descriptive statistics and CAGR has been calculated by the author.

**Table 5.5: Export of Handloom and Handicraft**

<b>Year</b>	<b>Handloom (In Lakhs)</b>	<b>Growth</b>	<b>Handicrafts (In Lakhs)</b>	<b>Growth</b>
2002-03	13110		92734.11	
2003-04	14240	8.62%	72834.89	-21%
2004-05	19100	34.13%	93616.43	29%
2005-06	20930	9.58%	102584.57	10%
2006-07	21723.9	3.79%	141841.21	38%
2007-08	27956	28.69%	155621.69	10%
2008-09	30430	8.85%	200930.25	29%
2009-10	32749	7.62%	229591.97	14%
2010-11	27256.2	-16.77%	285802.19	24%
2011-12	23600	-13.41%	360499	26%
2012-13	30560	29.49%	331708.29	-8%
2013-14	41015.9	34.21%	299421.68	-10%
2014-15	49810	21.44%	352333.37	18%
2015-16	47720	-4.20%	600634	70%
<b>Mean</b>	<b>28585.786</b>	<b>11.70%</b>	<b>253179.8687</b>	<b>15%</b>
<b>Maximum</b>	<b>49810</b>	<b>34%</b>	<b>600634</b>	<b>70%</b>
<b>Minimum</b>	<b>13110</b>	<b>-17%</b>	<b>72834.89</b>	<b>-21%</b>
<b>SD</b>	<b>10901.26</b>	<b>16%</b>	<b>149083.5892</b>	<b>24%</b>
<b>CAGR</b>	<b>10%</b>		<b>15%</b>	
<b>Co-efficient of Variation</b>	<b>38%</b>		<b>59%</b>	

**Source;** 1.Data is collected from the website of the Department of Industries and Commerce Haryana (Chandigarh)

2. Descriptive statistics have been calculated by the author

\*Northern India - Only 3 states; Rajasthan, Haryana, and Punjab have been considered in northern India because these are the major cotton-producing states of North India according to the report of MoT.

\*Productivity = Lakh bale production (170 kg) of cotton/Lakh hectare area.

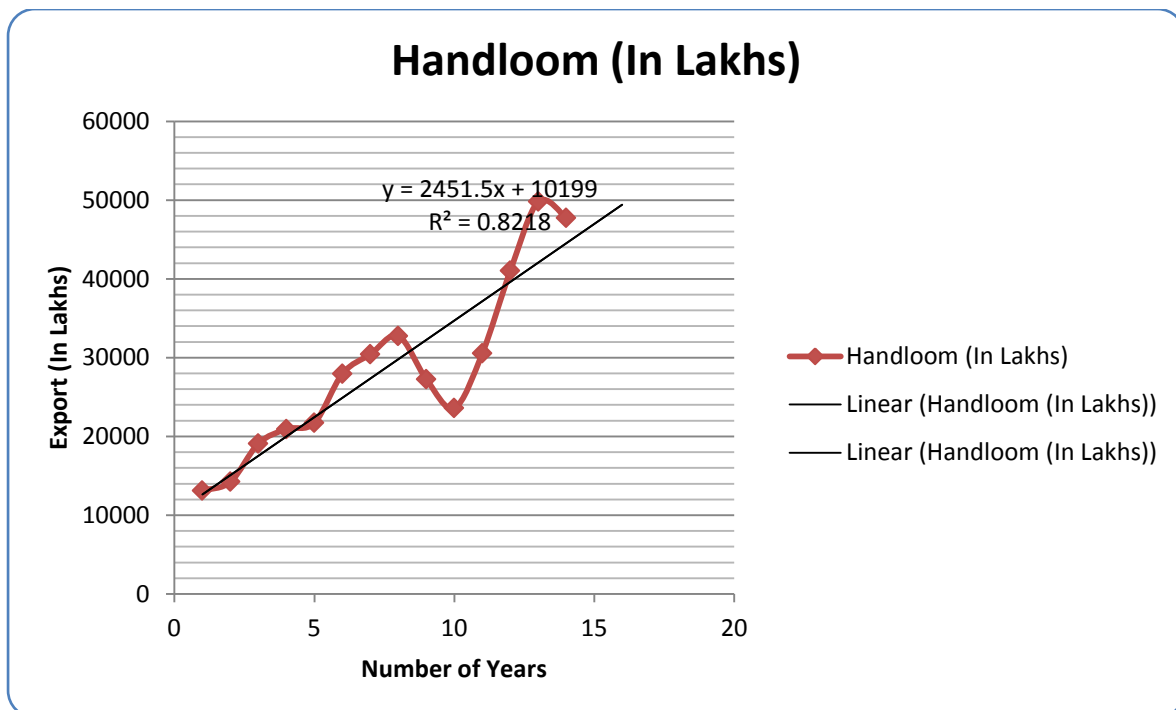
\*Good ft - hensquare is more than 0.80 (80 percent).

Hence, it is observed that Haryana is performing 2 percent more than northern India based on compounding growth. Results of the study indicate that productivity\* of cotton (lakh bale cotton production over per lakh hectare area) in Haryana is also higher than northern India

each year, but CAGR of productivity (Lakh bale Production over per lakh hectare area) in Haryana (2 percent) is lower by 1 percent than North India (3 percent).

Table 5.5 shows the year-wise handloom and handicraft export of Haryana for 14 years from 2002-03 to 2015-16. CAGR of handloom is 10%, and the absolute growth of its export is 264% across the 14 years (2002-03 to 2015-16) of the study period. The coefficient of variation of handloom has been observed at 38%, which shows homogeneity percentage; here, so we can observe this 38 percent as the outstanding growth of handloom export.

**Figure 5.1:** Trend of Handloom export for 14 years from 2002-03 to 2015-16

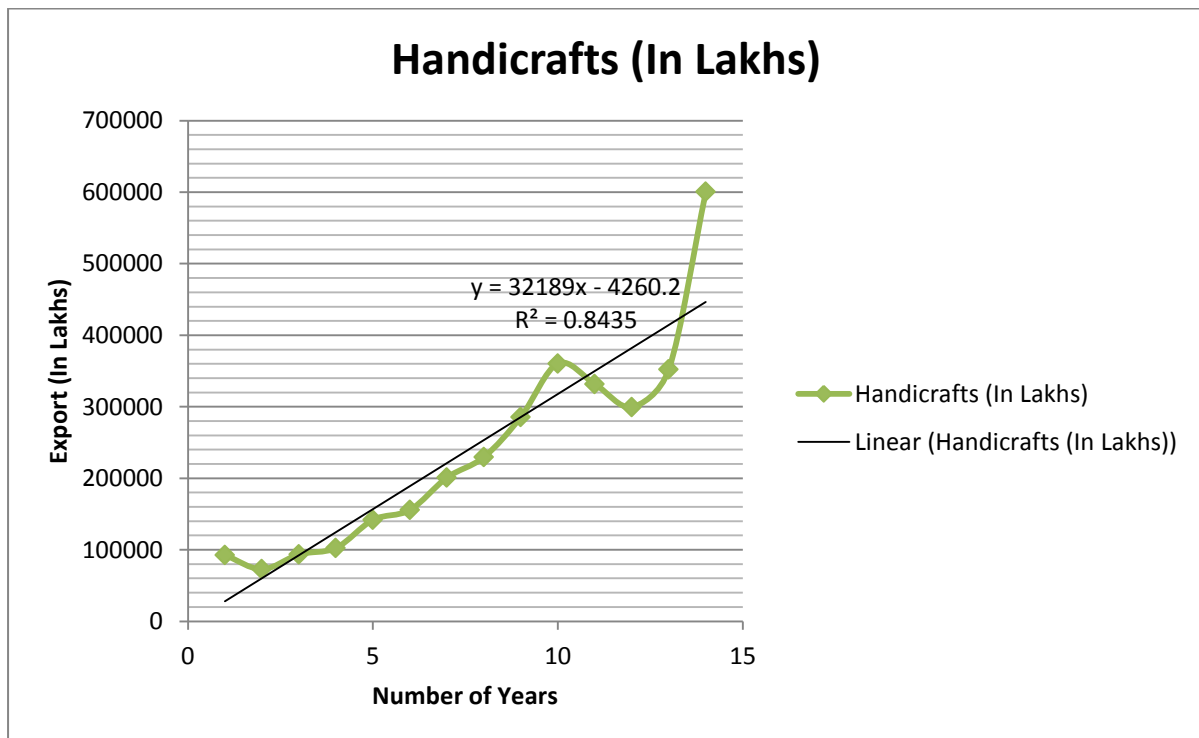


**Source;** Author’s Compilation based on the data collected from the Department of Industries and Commerce’s website of Haryana (Chandigarh)

Further, data of Handloom export has been plotted on the scatter graph (Figure 5.1) to see the trend, and it seems positive linear trend as per the data line over the year. Therefore, the linear trend-line function applied on the 14 years data shows a good fit equals 0.821. Hence, a trend-line that has been drawn in figure 5.1 shows the predicted possible values of handloom export. On the other hand, the CAGR of the Handicraft export is 15%, and its absolute

growth is 415% across the 14 years (2002-03 to 2015-16) of the study period is remarkable. The coefficient of variation was observed at 59%, showing year-wise outstanding growth of the Handicraft sector in Haryana. Further, Handicraft export data are plotted on the scatter plot that depicts a positive linear trend (Figure 5.2) equal to '0.868' is a good fit\*, homogeneous or sound data.

**Figure 5.2:** Scatter plot and trend-line of Handicraft Export from Haryana



**Source;** Author's Compilation based on the data collected from the Department of Industries and Commerce's website of Haryana (Chandigarh)

Therefore, forward prediction can be made based on the trend-line. Thus, a trend line has been drawn, which shows the possible predicted handicraft export values in figure 5.2.

#### 5.4 Conclusion

This chapter aims to study the textile industry's growth pattern in Haryana for a decade by considering the production of cotton and handloom & handicraft export. A comparison of the production and productivity of cotton between Haryana and northern India is also conducted

where Haryana was found as the best performer state out of the whole north zone (Haryana + Punjab + Rajasthan). The trend of cotton production (over the area) in Haryana is showing increasing across the study period as per the data collected from the website of the Ministry of Textile, GoI. A downfall in cotton production has been found in 2015-16 and 2016-17 because of the leaf curl virus and whitefly pest attack in Haryana and north India. CAGR of cotton production in Haryana was observed at 7 percent, whereas CAGR of northern India is 5 percent for ten years. The findings of the study indicate that the productivity (Lakh bale cotton production over per lakh hectare area) of cotton in Haryana is higher each year than in Northern India, but CAGR of productivity (Lakh bale Production over per lakh hectare area) in Haryana (2 Percent) is lowered by 1 percent than the CAGR of Productivity in North India (3 percent). Export performance is selected as another variable to measure the growth of the textile sector in Haryana. The handloom and handicraft export trend of Haryana for 14 years from 2002-03 to 2015-16 was analysed. It was found that CAGR of handloom is at 10% and absolute growth of export is 264% across these 14 years of the study period. The CAGR of handicraft export is 15 percent with an absolute growth of 415 percent is remarkable. Whereas raw cotton export data is available only for eight years from 2010-11 to 2017-18 with an absolute growth of export is 4842% that is the highest ever among all segments of the textile sector in Haryana across these eight years. CAGR of the raw cotton export is 75% (Calculated with eight years of data). It is observed from the results that Haryana is growing well in the textile sector. Production of cotton is increasing every year and export performance as well. There is a huge employment scope in the near future as textile policy 2019 targeted to create more than 50000 jobs in Haryana shortly.