

## PRACTICAL – 11

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**AIM:** To calculate trend using spencer's 21-point formula.

### **EXPERIMENT:**

Following data gives India Wheat Production in metric ton from 1987 to 2019. Using Spencer's 21 point formula compute trend value. Also plot the trend line.

55134	55690	57210	59840	65470	62097	69350	71288	76369	69681	72766
68637	69355	75807	78570	80679	80804	86874	94882	83506	95850	86530
65761	72156	87000	98380	87750	52097	69350	81288	76369	99681	82766

### **THEORY:**

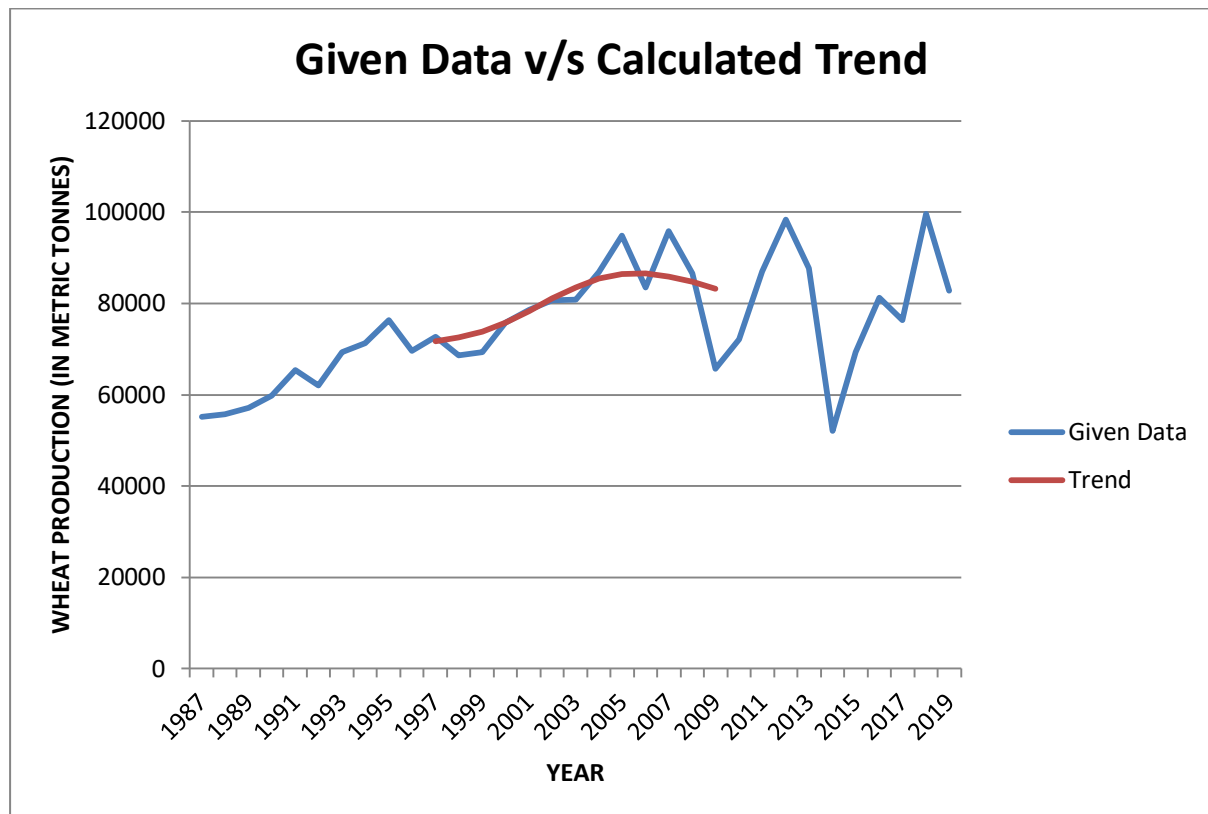
1. Spencer's 21-point formula requires 21 points to calculate one single trend value.
2. Formula:  $y_o = 1/350 * [5]^2[7][-1,0,1,2,1,0,-1]y_o$
3. The above formula is correct up to 3<sup>rd</sup> differences.

**CALCULATIONS:** (an excel sheet has also been attached for reference to detailed calculations)

Table-11.1

Year	yt	[5]yt	[5] <sup>2</sup> yt	[5] <sup>2</sup> [7]yt	[5] <sup>2</sup> [7][-1,0,1,2,1,0,-1]yt	Trend
1987	55134					
1988	55690					
1989	57210	293344				
1990	59840	300307				
1991	65470	313967	1580237			
1992	62097	328045	1635678			
1993	69350	344574	1694825			
1994	71288	348785	1739599	11995119		
1995	76369	359454	1768362	12224860		
1996	69681	358741	1780034	12425634		
1997	72766	356808	1796384	12613187	25117315	71763.76
1998	68637	356246	1809978	12821529	25388538	72538.68
1999	69355	365135	1836452	13062718	25822206	73777.73
2000	75807	373048	1882378	13361103	26506891	75733.97
2001	78570	385215	1947941	13705565	27395712	78273.46
2002	80679	402734	2009551	14060228	28371337	81060.96
2003	80804	421809	2078419	14370411	29243838	83553.82
2004	86874	426745	2140846	14615220	29895396	85415.42
2005	94882	441916	2164641	14762377	30249523	86427.21
2006	83506	447642	2146635	14811329	30298281	86566.52
2007	95850	426529	2127187	14762267	30071494	85918.55
2008	86530	403803	2095098	14641552	29671626	84776.07
2009	65761	407297	2058503	14478610	29144729	83270.65
2010	72156	409827	2029357	14290701		
2011	87000	411047	2020131	14089978		
2012	98380	397383	2001699	13933415		
2013	87750	394577	1958726			
2014	52097	388865	1926464			
2015	69350	366854	1938535			
2016	81288	378785				
2017	76369	409454				
2018	99681					
2019	82766					

Graph-11.1



### **RESULT:**

1. Trend values have been calculated using spencer's 21 point formula, and are shown in Table 11.1.
2. Graph 11.1 shows the line graph plotted for the given data and the calculated trend.

### **CONCLUSION:**

1. The production of wheat from 1987-2019 follows increasing trends in the beginning, but the last 3 trend values are observed to be decreasing.
2. This shows us that there have been some fluctuations in production of wheat.