AN INTER DISTRICT ANALYSIS OF GROWTH AND INSTABILITY OF THE YIELD OF FOOD GRAINS IN WEST BENGAL (1982-83 TO 2014-15).

Ashok Biswas
Assistant Professor in Economics, Departmant of Economics, Acharya Prafulla Chandra College, NewBarrackpore, North 24-Parganas, Kolkata-131, West Bengal, India.

Abstract : *This study has been undertaken to investigate the growth and instability in the yield of food grain of West Bengal by districts, over the 33 years, from 1982-83 to 2015-16. Here we use three types of Methodology for measuring growth performance of the yield of food grain, these are Year to Year growth rate, Linear trend growth rate and Exponential trend growth rate. The study derive the fact that Birbhum and Purulia are only two districts for which growth rate of yield of food grain exhibit satisfactory result. Here, I also examined degree of instability of the yield of food grain over the period for every district of West Bengal. To fulfill this purpose I calculated the index of degree of instability for each districts over the entire period of study and examined the relative position of every district in the context of instability of production. In this context it is found that the districts Birbhum, Bankura, 24-Parganas, Dinajpur and Cooch Behar are the good performer indicating that the extent of fluctuation was relatively less and the actual production remains above the trend value for the maximum period of our consideration.*

Key Terms: *yield of food grain, growth rate, instability of the yield of food grain.*

I. Introduction:

West Bengal is endowed with rich natural resources and climatic conditions favorable for agriculture. These include large areas of good alluvial soil, abundant surface water and ground water resources and good rainfall. The climate of the region (other than in the hill regions) is tropical, hot and humid. In spite of these favorable conditions, for many years the growth of agricultural production in the state was low as in other parts of eastern and north-eastern India, and lagged behind the national average. In a landmark study of agriculture performance in West Bengal, Boyce (1987) estimated that the growth rate of agricultural output between 1949 and 1980 was only 1.74 percent per annum. According to him the decade of the 1970's was marked by stagnation in agricultural production in West Bengal, a note worthy change occurred in the 1980's. Between 1981 and 1991 rate of growth of agricultural production in eastern state increased and among them West Bengal grew faster. The situation changed distinctly in the 1980's. Agricultural growth accelerated and West Bengal did better than other eastern states and the rate of growth of food grain production was the highest amount 17 major state in the Country. So in my paper I also examine the growth in the yield of food grain of West Bengal by districts, over the 33 years, from 1982-83 to 2015-16. This was the even full period in the history of agriculture in the state, has moved a high agricultural growth path.

Food production dominates cropping patterns in West Bengal. So the present paper is based on yield of food grain in rural West Bengal. Econometric studies of the growth, instability and determinants of food grain in West Bengal are mainly confined to analysing at aggregate all West Bengal level. These are the studies which analysed interstate disparities of the growth and fluctuation of food grain production in India. In this context one can mention the studies by Bhalla & Singh (1997). Rowal and Swaminathan (1998) among others. Now given the fact that there exist large scale inter district disparities, any single explanation for the growth and fluctuation of food grain may not be very meaningful. It is therefore necessary to examine whether the growth rate and instabilities of the production of food grain varies over different districts of West Bengal.

II. The objective of the study:

The objective of the present thesis is to provide a comprehensive study for the inter district variation in the growth, instability of yield of food grain in different 15 districts of West Bengal. For some recent years, the data for West Dinajpur and East Dinajpur were averaged to get the figure for Dinajpur (combined) and similarly the data for North 24-Parganas and South 24-Parganas were averaged to get figure for 24-Parganas (combined). Our period of consideration is 1982-83 to 2015-16. In doing so, we present a detailed picture about the rate of growth and the instability in the yield of food grain. In the third section we make an overview of the previous literature. In section four we make a comparative study of the inter district variations in the growth rate of food grains production. In the fifth

section, we examine the degree of instability of production of food grain. Section sixth provides a brief overall conclusion of our studies.

III. An overview of the previous Literature:

A vast country of Sub continental size like India with marked regional diversities in agro-climatic environment, resource endowment, and population density is likely to be characterised by uneven economic and agricultural development among various regions or states. Hence during the early phase of the green revolution from 1962-65 to 1970-73 the new HYV technology which led to appreciable increases in the yield of wheat and rice was more or less confined only to Punjab, Hariyana and Western Uttar Pradesh in the North India. However, except for these states, the other regions were hardly able to derive any benefits. During the 1970s, the green revolution spread to new areas like coastal Andhra Pradesh and Tamil Nadu, eastern Uttarpradesh and parts of Rajasthan. A major development during the 1980s was the spread of new technology to the eastern Indian states of Bihar, West Bengal, Orissa and Assam. This has, for the first time, increase the productivity and output levels in the densely populated eastern states of India. Specially, creditable was the performance West Bengal where the growth rate increased to an unprecedented level of 5.39 percent per annum, a growth rate that was the highest among all the states in India. Bihar also recorded significant acceleration in growth rate from 0.41 percent during 1970-70 to 1980-83 to 2.08 percent during 1980-88 to 1992-95. However, there was a deceleration in growth rate in Assam and Orissa. The acceleration of the growth in the highly populated but agriculturally stagnant state, West Bengal of eastern India was a development of major significance. The Reserve Bank of India and National Bank for Agriculture and Rural Development (NABARD) appointed a Committee in 1983 to enquire into the factors constraining agricultural growth in West Bengal. The Committee concluded that the major constraint on the use of new inputs was the lack of adequate and controlled supply of water. Inadequacies in the supply of fertilizers and modern varieties of seeds, electricity and credit facilities and instructor for markets were also identified as constraints to production (RBI, 1984). In his detailed study of agricultural growth in West Bengal and Bangladesh from 1949 to 1980, Bayce (1987) argues that the leading constraint was the limited development of irrigation and water control. Bayce further argue that it was the nature of the agrarian structure and "The inequalities of Wealth and power in rural Bengal" that had resulted in institutional implements to technological change in the crucial area water control (Boyce, 1987). In 1978-79 only about 40 percent of the net area in eastern India received irrigation as against 80 percent in Punjab. Another feature of agrarian structure in West Bengal is that the majority of cultivators are small and marginal farmers who operates fragmented land holding. These were the main reasons for agricultural stagnation in rural West Bengal in 1970's (Rawal and Swaminathan, 1998). A. Saha (1996) argue that after a long period of agrarian stagnation, high growth of agricultural production in West Bengal was started during the eighties and among the three major states in eastern India West Bengal with a growth rate of 6.5 percent ranked at the top followed by Orissa (4.1 percent) and Bihar (3.8 percent) in food grain production during 1980-81 to 1991-92. The success story of West Bengal is interesting also due to the fact that this new growth regime was preceded by a series of institutional reform undertaken by the Government of West Bengal. The government has introduced two important Socio-political changes in the rural landscape of West Bengal. These were the implementation of land reforms and the re-organisation and re-vitalisation of democratic institutions of local governance at the village, block and district level. Limited redistribution of surplus land to the poor and small farmers, strengthening of the rights of the tenants and successful implementation of the panchayat system at the grass root level, are some of the changes that marked a clear shift in the agrarian policy in West Bengal during the last seventies and early eighties.

The Government of West Bengal implemented "Operation Barga", a program of tenancy reform with the support of organisations of rural worker and plasants. Under 'Operation Barga' by 1990, the name of 1.4 million share croppers were registered in the land record (Lieten, 1992). As much as 12,62,000 acres of land were acquired by the state under the West Bengal land reform act of 1955 (amended in 1977). By 1991, about 9,13,000 acres has been distributed to around 2 million households (Ramachandran, 1997). In this context Ray Chaudhuri and Sen (1997) has present an Econometric studies on "Operation Barga" in West Bengal agriculture. They suggested that operation Barga is undoubtedly the most important agricultural reform in West Bengal. It is also tried to ensure a just distribution of product between the land lords and share croppers. The operation Barga was followed by a spectacular success in the growth of agricultural production in West Bengal. In 1980's West Bengal also recorded a high rate of growth in the use of modern inputs in general and use of fertilisers, in particular. The Consumption of fertiliser recorded a phenomenal growth rate. For example in West Bengal per hectors consumption of fertiliser, increased from 48 kg during 1982-83 to 139 kg in 1992-95 (Bhalla & Singh, 1997). On the other hand area under irrigation shows a big change over the period. The total increase in net irrigated area in West Bengal during this period was of the order of 74 percent as compared to about 20 percent in India. In particular, there has been a big expansion of the tube well irrigation, area irrigated by tube

well increased by as much as 575 percent in West Bengal as compared to about 60 percent in India. There was also significant increase in area irrigated by Government Canals and other sources such as jor-bendhs, river-lift-irrigation etc. (Rawal and Swaminathan, 1998). Sengupta (1995) and Sen & Sengupta (1995) have analysed that growth in extent of adoption of high yielding - varieties seeds (area sour with HYV as a proportion of total area croped with food grain) was lower in the 1980's than in the 1970's. Saha (1996) examined the patern of adoption of HYV in West Bengal and found that the speed of adoption of high-yielding varieties (HYV) of rice between 1980 and 1989 was not significantly different from the speed of adoption in the period 1966 to 1980. Saha (1996) further argue that the speed of adoption of HYV seed in rice cultivation in the West Bengal has been quite low as compared to the other major rice producing states. Contrary to our expectation, even in the last decade of high agricultural growth the speed of adoption of HYV has not shown any improvement in the state.

The Data

In our study we mainly concentrate on yield of food grain for different district which is mainly based on Secondary data covering a period from 1982-83 to 2011-12. The main sources of data for this dissertation paper are the Government of West Bengal's 'Economic Review' for different years and statistical Abstract, West Bengal, and another source of data is the Government of West Bengal's directorate of agriculture (GOWB) evaluing Branch. It is now become necessary to define the variable "yield of food grain" clearly.

Food production dominates cropping pattern in West Bengal. Rice is the primary food crop of West Bengal. The other food crops in West Bengal are wheat, gram, barley etc. Hence total food grain mean the sum total of this food crops. Yield of food grain is defined as the total production of food grain, per units of areas, and is obtained by dividing the total production of food grain in a particular district for a certain period of time, by the area produces only food grains in a particular district for a certain period of time. Symbolically -

$$\text{Yield of Food grain of district 'x' at period 't'} = \frac{\text{Total production of food grain in district x, at period 't'}}{\text{Total area covered by production of food grain in the district x at period 't'}}$$

Methodology

Here we use three types of Methodology for measuring growth performance of the yield of foodgrain, these are

i. **Year to Year** growth rate,

ii. **Linear trend** growth rate,

iii. **Exponential trend** growth rate.

Now we begin our analysis with an examination of the movement overtime in yield of food grain. In order to do same we first calculate the **YEAR TO YEAR** growth rate for the yield of food grain for each district separately over the entire period of study. Year to year growth rate are calculated by the formula.

$$\text{Growth rate of Period 't' for district 'x'} = \frac{\text{Difference between the yield of food grain in district- x of period't' and 't - 1'}}{\text{Yield of food grain in district - x at period (t - 1)}}$$

Next in order to understand the growth process of the yield of food grain more precisely and closely two functional forms are used for the estimation of growth rates. First the LINEAR form of the type. $Y = a + b.t$ and next the EXPONENTIAL form as, $\text{Log } Y = \text{Log } a + t.\text{Log } b$

where, Y is the "yield of food grain", 'a' is the constant term and 't' is the time (in year).

The Results

IV. Overall growth performance of the yield of food grain.

The result of the year to year growth rate we cannot identify any long term increasing trend for yield of food grain. It is not only fluctuating over the entire time period for all the district under consideration, but also appear as negative for some cases. This is true for almost all the district.

Table - 1: DISTRICT WISE LEVEL OF AVERAGE AND THE LEVEL OF ABSOLUTE & RELATIVE MEASURES OF DISPERSION OF THE "YEAR TO YEAR" GROWTH RATE OF YEILD

Sl No.	Districts	Mean	Coefficient of variation	Standard Deviation
1.	BURDWAN	0.043	200.00	0.0860
2.	BIRBHUM	0.078	227.95	0.1778
3.	BANKURA	0.088	313.86	0.2762
4.	MIDNAPORE	0.075	308.40	0.2313
5.	HOWRAH	0.045	375.78	0.1691
6.	HOOGHLY	0.036	351.39	0.12.65
7.	24-PARGANAS	0.055	1038.18	0.5710
8.	NADIA	0.050	236.60	0.1183
9.	MURSHIDABAD	0.062	220.00	0.1364
10.	DINAJPUR	0.063	185.71	0.1170
11.	MALDA	0.050	189.80	0.0949
12.	JALPAIGURI	0.055	361.27	0.1987
13.	DERJEELING	0.098	245.92	0.2410
14.	COOCH BEHAR	0.121	208.43	0.2522
15.	PURULIA	0.102	77.16	0.0787

AVERAGE	0.068	302.70	0.1917

Table -2: RELATIVE SITUATION OF DIFFERENT DISTRICTS WITH RESPECT TO A.M., S.D. & C.V. OF "YEAR TO YEAR" GROWTH RATE FOR YIELD OF FOOD GRAIN

SL No.	Measures	Highest	Above Average	Average	Below Average	Lowest
1.	A.M.	0.121 Coach Behar	Birbhum Bankura Midnapore Derjeeling Coach Behar Purulia	0.0681	Burdwan Howrah Hooghly 24-Parganas Nadia Murshidabad Dinajpur Malda Jalpaiguri	0.036 Hooghly
2.	S.D.	5710 24-Parganas	Bankura Midnapur 24 Parganas Jalpaiguri Derjeeling Coach Behar	0.1917	Burdwan Birbhum Howrah Hooghly Nadia Murshidabad Dinajpur Malda Purulia	0.0787 Purulia
3.	C.V.	1038.18 24-Parganas	Bankura Midnapore Howrah Hooghly 24-Parganas Jalpaiguri	302.70	Bardwan Birbhum Nadia Murshidabad Dinajpur Malda Derjeeling Coach Behar Purulia	77.16 Purulia

Due to this fluctuation we obtain Arithmetic Mean (A.M.), co-efficient of variation (C.V.) and standard deviation (S.D.) of these growth rates for yield of food grain which represents district wise level of average, absolute and relative measures of dispersion of the year to year growth rate of yield of food grain.

To explain the inner-spirit of Table -1 I construct Table - 2. A detail inspection of the Table - 2 brings out some interesting features, which can be summarised as follows. There are some districts for which the growth rate are less dispersed in the sense of having lower S.D. and also more consistent in the sense of having below average level of coefficient of variation (c.v.). At the same time for these districts Arithmetic Mean (A.M.) of year to year growth rate of yield of food grain also high with respect to the A.M. of the **Year to Year** growth rate, as obtained by all the districts taken to gather. These districts are termed as "GOOD PERFORMER" and are represented Table - 4.

Table - 3: Performance of the District judged by A.M., S.D. & C.V.

Serial No.	Dependent Variable	Among the good performer	Among the bad performer
1.	Yield of Food grain	Birbhum, Purulia	24-Parganas, Jalpaiguri

Similarly, there are some districts for which the growth rates are more dispersed in the since of having more S.D. and C.V. It is also true that for these the A.M. of **Year to Year** growth rates are below than that of the A.M. as obtain by taking all the district together. These districts are termed as BAD PERFORMER and presented in the Table - 3. From the above Table we can derive the fact that BIRBHUM and PURULIA are only two districts for which growth rate of yield of food grain exhibit satisfactory result (i.e., high A.M., low S.D. and C.V.). The results obtained in the case of **Linear** and **Exponential** trend are presented in the Table - 4 and the Table - 5 respectively. In this two cases value of adjusted coefficient of determination ($\bar{R}^2$) for examining the goodness of fit and value of the Durbin Watson 'd' statistics for reflecting autocorrelation in the time series data are obtain. From Table 5 and 6, our analysis suggest that some districts like, Burdwan, Birbhum, Bankura, Midnapore, Hooghly, 24-Parganas, Nadia, Murshidabad, Coochbehar,

Malda, Dinajpur for which both Linear and Exponential trend gives good fit in the sense of having $R^2 > 0.5$. Here we suggest that out of these 11 districts Linear trend is better for Burdwan, Birbhum, Bankura, Midnapore, Hooghly, 24-parganas, Nadia, Murshidabad, and Cooch Behar, and Exponential trend is better for only two district Malda and Dinajpur.

Now for ready reference, we present all the three growth rates **(YEAR TO YEAR, LINEAR** and **EXPONENTIAL)** together each districts of our consideration. This is shown in Table - 6. Comparing alternative growth rates (Average, year to year, Linear, Exponential shown in Tabl6.) we find that the three growth rates differ considerably for almost all the districts of our consideration, whereas, for one type of growth say linear, the rate of growth of yield in sufficiently high at the same time for another two types (say, Year to year and Exponential) are not sufficiently high.

Table - 4: ESTIMATED LINEAR TREND EQUATIONS FOR DIFFERENT DISTRICTS

Sl. No.	Districts	Estimated Coefficients for Y = a + b.t		$\bar{R}^2$	D.W.
		Constant	Time (t)		
1.	BURDWAN	1766.8 (22.525)	74.174 (9.1439)	0.8463	1.6372
2.	BIRBHUM	1496.8 (12.762)	66.741 (5.5025)	0.6612	1.1948
3.	BANKURA	1287 (15.209)	82.421 (9.4116)	0.8538	1.7520
4.	MIDNAPORE	1232 (12.289)	62.776 (6.0547)	0.7039	1.8133
5.	HOWRAH	1586.8 (12.012)	24.166 (1.7689)	0.1243	1.4042
6.	HOOGHLY	1685.8 (22.165)	59.988 (7.6266)	0.7921	1.8768
7.	24-PARGANAS	1272.0 (11.595)	51.304 (4.5223)	0.5646	1.5065
8.	NADIA	1467.0 (18.014)	56.272 (6.68150	0.7442	1.3643
9.	MURSHIDABAD	1233.0 (16.734)	75.840 (9.9522)	0.8673	2.6484
10.	DINAJPUR	983.57 (16.528)	60.219 (9.7847)	0.8633	1.9028
11.	MALDA	1160.6 (17.294)	60.881 (8.7722)	0.8351	1.3248
12.	JALPAIGURI	912.97 (13.541)	24.260 (3.4794)	0.4254	2.3786
13	DERJEELING	1301.9 (5.4531)	59.104 (2.2938)	0.2397	1.9254
14.	COACH BEHAR	1028.0 (27.038)	22.449 (5.7092)	0.6781	1.6236
15.	PURULIA	1104.9 (10.246)	33.806 (3.0313)	0.3531	1.5185

** *Figures in brackets give the corresponding t-ratio*.

Table - 5 : ESTIMATED EXPONENTIAL TREND EQUATION OF YIELD OF FOODGRAIN FOR DIFFERENT DISTRICTS OF WEST BENGAL

Sl. No.	Districts	Estimated Coefficients for log Y = log a + t. log b		$\bar{R}^2$	D.W.
		Constant	Time (t)		
1.	BURDWAN	7.4925 (196.20)	0.0325 (8.2396)	0.8168	1.4548
2.	BIRBHUM	7.3078 (100.53)	0.035875 (4.7719)	0.5921	1.1799
3.	BANKURA	7.1833 (106.40)	0.045412 (6.5045)	0.7336	1.4450
4.	MIDNAPORE	7.1176 (96.017)	0.039523 (5.1555)	0.6303	1.4205
5.	HOWRAH	7.3560 (99.023)	0.014625 (1.9037)	0.1489	1.3125
6.	HOOGHLY	7.4403 (186.18)	0.028622 (6.9255)	0.7579	1.5323
7.	24-PARGANAS	7.1413 (96.516)	0.033292 (4.3508)	0.5445	1.4088
8.	NADIA	7.2951 (139.28)	0.031123 (5.7459)	0.6810	1.2392
9.	MURSHIDABAD	7.1552 (145.11)	0.042449 (8.3242)	0.8199	1.7221
10.	DINAJPUR	6.9357 (153.90)	0.041594 (8.9248)	0.8398	1.8496
11.	MALDA	7.1039 (178.52)	0.035907 (8.7250)	0.8336	1.5287
12.	JALPAIGURI	6.8130 (106.00)	0.023020 (3.4632)	0.4229	2.3247
13	DERJEELING	7.1588 (55.638)	0.035259 (2.6498)	0.2864	1.9432
14.	COACH BEHAR	6.9352 (198.60)	0.019381 (5.3665)	0.6495	1.5478
15.	PURULIA	6.9684 (67.908)	0.029247 (2.7559)	0.3054	1.3640

** *Figures in brackets give the corresponding t-ratio.*

Table - 6: COMPARISION OF DIFFERENT GROWTH RATES OF YIELD OF FOOD GRAIN IN DIFFERENT DISTRICTS IN WEST BENGAL

Sl. No.	Districts	Average of year to year growth rate	Trend growth	
			Liner	Exponential
1.	BURDWAN	0.043	74.174	0.033034
2.	BIRBHUM	0.078	66.741	0.037526
3.	BANKURA	0.088	82.421	0.046459
4.	MIDNAPORE	0.075	62.776	0.040314
5.	HOWRAH	0.045	24.166	0.014732
6.	HOOGHLY	0.036	59.988	0.029036
7.	24-PARGANAS	0.055	51.304	0.033852
8.	NADIA	0.050	56.272	0.031612
9.	MURSHIDABAD	0.062	75.840	0.043363
10.	DINAJPUR	0.063	60.219	0.042471
11.	MALDA	0.050	60.881	0.036559
12.	JALPAIGURI	0.055	24.260	0.023287
13.	DERJEELING	0.098	59.104	0.035888
14.	COOCH BEHAR	0.121	22.449	0.0195700
15.	PURULIA	0.102	33.806	0.029679

N. B. - *Growth rates of Exponential trend, we get by taking Anti-log of estimated coefficient of time trend and subtracting one from each value. (i.e., Growth rate of Exp. Trend = Anti log. of b-1).*

Here we have made an attempt to examine the growth profile of the yield of food grain district wise for the West Bengal economy. To fulfill this purpose, alternative growth rates (like, Year to year, Linear and Exponential) are calculated for each districts over the entire period of our consideration. Finally in Table - 6 we represents three alternative growth rates together. Form this table, it is clear that in case of **Year to Year** growth rate, Cooch behar district perform highest and Hooghly district perform lowest among the 15 district of our consideration. In case of Linear trend growth rate Bankura perform highest and Cooch Behar performed lowest among the 15 district of our consideration. Lastly we find that in case of Exponential trend growth rate, Bankura perform highest and Howrah performed lowest among the 15 district of our consideration. Therefore we conclude that there are dissimilarity among the three growth rate of yield of food grain.

V. Fluctuation in the yield of food grain:

In this section an attempt has been made to explain the degree of instability in the yield of food grain of 15 districts of West Bengal for the period 1982-83 to 2014-15. The methodology of the analysis is presented in the following Section.

The method of measurement

The degree of instability is denoted by the specification*.

Degree of Instability= $\frac{y_t - \hat{y}_t}{\hat{y}_t}$, where, y_t = actual value of yield of food grain and $\hat{y}_t$ = predicted value of the yield of food grain

As already noted we have calculated both the Linear and exponential trend. Therefore while selecting the term Y_t, we have taken the variables for which R^2 is high. Here our analysis suggest that **Linear** is better for Burdwan, Bankura, Birbhum, Midnapore, Hooghly, 24-Parganas, Nadia, Murshidabad, Jalpaiguri, Coochbehar and Purulia districts, and **Exponential** trend is better for Howrah, Derjeeling, Malda and Dinajpur districts. Therefore, by using the above method of measurement degree of instability is calculated for the time period of 1982-83 to 2014-15 for each district, which is represented by the Table - 8. Here, we examined degree of instability of the yield of food grain over the period 1982-83 to 2014-15 for every district of West Bengal. To fulfill this purpose we calculated the index of degree of instability for each districts over the entire period of study. Here we examined the relative position of every district in the context of instability of production. In this context we examined that the districts Birbhum, Bankura, 24-Parganas, Dinajpur and Cooch Behar are the good performer indicating that the extent of fluctuation was relatively less and the actual production remains above the trend value for the maximum period of our consideration. However, the other ten districts were unable to restrain their fluctuation in the yield of food grain.

VI. Summary and overall conclusion:

In this paper an attempt has been done to analyse the growth performance of yield rate of food grain, and to analyse the degree of instabilities in the yield of food grain by district. In order to analyse "Growth Performance" we obtain "Year to year", "Linear" and "Exponential" Growth rate for yield of food grain. **Firstly**, an analysis of the relative performance of **Year to Year** growth rate of yield of food grain of different districts of West Bengal indicate that there exist. Only two districts namely BIRBHUM and PURULIA which can be considered as **"Good performer"** in terms of the high Arithmetic Mean (A.M.) and low standard deviation (S.D.) & coefficient of variation (C.V.). On the other hand only two districts i.e., 24-PARGANAS and JALPAIGURI which can be considered as **"Bad Performer"** in terms of low A.M., high S.D. and high C.V.. **Secondly**, Estimation of Linear trend equation clearly indicate that for the yield of food grain. Eleven districts like Burdwan, Birbhum, Bankura, Midnapore, Hooghly, 24-Parganas, Nadia, Murshidabad, Cooch-Behar, Malda, Dinajpur gives good fit in the sense of having $R^2 > 0.5$, and four districts like Jalpaiguri, Purulia, Howrah and Derjeeling give bad fit in the sense of having $R^2 < 0.5$. **Thirdly**, here out of these 11 districts Linear trend is better for Burdwan, Birbhum, Bankura, Midnapore, Hooghly, 24-Parganas, Nadia, Murshidabad and Coochbehar, and Exponential is better for only two districts namely Malda and Dinajpur. **Fourthly**, a comparative study of all the three growth rate (Year to Year, Linear and Exponential) shows that a high value for Linear trend does not necessarily imply high value for year to year growth rate or Exponential trend for all the districts of our consideration. Here we also find that year to year and Exponential growth rates are more or less closer to each other. But the Linear trend is completely different from the two other growth rates for every district. In order to examine the degree of instability of the yield of food grain we try to measure instability in terms of trend in fluctuation, that is by examining the deviation of actual yield of food grain from estimated level. Here we analyse the degree of instability for each district separately. From this analysis finally we conclude that more or less fluctuation are present for every districts. But inspite of this fluctuation, the yield of food grain of five districts namely, Birbhum, Bankura, 24-parganas, Dinajpur and Coochbehar are relatively better among the 15 districts in the context of degree of instability of the yield of food grain.

**In this context we can mention the study by Chattopadhya, N; Neogi,C; Maity, S.K. (1993) which analysed the degree of instability of crop production in Eastern India.*

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