LEVELS AND GROWTH OF AGRICULTURE PRODUCTIVITY IN RAJASTHAN (A DISTRICT-WISE STUDY) 1970-71 TO 1999-00

Dissertation submitted to the Jawaharlal Nehru University in partial fulfillment of the requirements for the award of the Degree of

MASTER OF PHILOSOPHY

MAHENDRA SINGH

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT
SCHOOL OF SOCIAL SCIENCES
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI – 110067
INDIA

2003

जवाहरलाल नेहरू विश्वविद्यालय
JAWAHARLAL NEHRU UNIVERSITY
Centre for the Study of Regional Development
School of Social Sciences
New Delhi-110067

CERTIFICATE

Certified that this dissertation, entitled **"Levels And Growth of Agriculture Productivity in Rajasthan (A District-wise Study) 1970-71 to 1999-00"**, submitted by **Mr. Mahendra Singh** in fulfillment of ~~eight~~ six credits out of the total requirements of twenty four credits for the degree of **Master of Philosophy (M.Phil.)** of this University is a bonafide work to the best of my knowledge. It is certified that the same has not been previously submitted for any other degree of this or any other university.

This dissertation may be placed before the examiners for evaluation.

M Singh

(MAHENDRA SINGH)

Forwarded by

RK Sharma

(Professor R. K. Sharma)

Supervisor

(Professor [illegible] Mehmood)
Centre for the Study of Reg. Dev.
School of Social Sciences
Jawaharlal Nehru University
New Delhi-110 067

Tel. : 610 7676, 616 7557 Ext. 4463, 4466 Gram : JAYENU Fax : 91-011-6165886, 619 8234

ACKNOWLEDGEMENT

I am extremely grateful to my supervisor Professor R.K. Sharma. Without his guidance, invaluable suggestions and constant supervision, this study would not have been completed.

I am indebted to my parents for giving me opportunity to enroll in M. Phil. and providing every type of support. Finally, I would like to extend my thanks to my friend Anish Gupta and also thanks to my senior colleagues Allumalai, Surendra Mehra and Biresh, for their immense help and active co-operation.

July, 2003 *(Mahendra Singh)*

CONTENTS

List of tables

CHAPTER-I
INTRODUCTION

Economic development in modern times has come to be associated with information technology and industrialization. Nevertheless it is generally accepted that industrialization can follow only on the sound heels of agriculture. Agricultural progress is normally regarded as a prerequisite of economic development. It provides safety net in the process of adjustment. In fact positive relationship between economic development and agricultural sector there exists

Kuznets identifies four possible types of contribution that the agriculture sector is capable of making to overall economic development they are as follows

(1) Production contribution, i.e. making available food and raw materials

(2) Market contribution, i.e. providing the market for producer's goods and consumer goods produced in non-agricultural sectors

(3) Factor contribution, i.e. making available labor and capital to non-agricultural sectors.

(4) Foreign exchange contribution.

During the process of economic development interdependence between agriculture and industry become stronger. Isher-Ahluwalia and Rangarajar (1988) has drawn attention toward three important linkages that have been developed between agricultural and industrial.sector. These are

1. Production linkages
2. Demand linkages
3. Saving and Investment linkages

Production linkages arise from the interdependence of agriculture and industry for supply of productive inputs and raw materials such

as cotton, jute, sugarcane, etc. to agro based industries and supply of fertilizer machinery and insecticides by industry to agriculture.

Demand linkages means rise in demand of output of agricultural sector due to rise in industrial sector and rise in demand of output of industrial sector due to rise in agriculture sector.

We should take a fresh look at the relationship between agriculture and the Indian economy.

Contribution to gross domestic product (GDP)

Indian agriculture dominated in the economy, contributing about one third of total GDP

Table.1 Percent contribution of agriculture to GDP at factor cost

Years	Percent contribution of agriculture to GDP at fc
1950-51	59.20
1960-61	54.75
1970-71	48.12
1980-81	41.82
1990-91	34.93
1999-2000	27.58

Source: Economic Survey 2001-2002, Government of India Ministry of finenece.

Over time the importance of agriculture declined, and by 195051 its share was 59.2 percent and it has fallen to 27.58 percent in 1999-2000. However, much of the non-agricultural sector is composed of agriculture-related activities such as jute manufacturing and agro processing, it is highly likely that non-agricultural growth would be severely constrained without a strong and vibrant agricultural sector. While much of this growth is expected from expansion in

manufacturing, this growth will also require an agricultural growth rate of almost 3 per cent annually during the same period.

Agriculture also has an important part to play in maintaining an internal balance. It contributes significantly to government revenues through taxes on agricultural commodity trade. At the same time, a decline in agricultural production, particularly in the foodgrain sector, can lead to food deficits that will have to be made up through government imports. Failures in agriculture bring about food shortages and higher prices which, in turn, lead to a loss of real income and to the need for additional food subsidy payments financed by the government.

Another key linkage between the agricultural sector and the Indian economy is real income determination and inflation. On an average, households spend a large proportion of their disposable income on food of which about half is spent on food grains, and thus food prices are a key determinant of real income. Recent increases in agricultural production relative to consumption have kept food prices more or less constant in real terms, and have been a major contributing factor to the lower rate of inflation and resultant economic stability, involving controlled money supply growth and manageable external and internal balances. Agricultural products have a two-thirds weight in the calculation of the wholesale price index.

The final linkage between the agricultural sector and the economy in general is in terms of employment generation. This is especially important because agriculture is by far the largest employer of poor people, and therefore has a key role in poverty alleviation. Though its contribution to the Gross Domestic Product is declining over time. Yet, it is currently the source of livelihood for over 70 per cent of the country's population. In rural areas, about 80 per cent of the workers are engaged in agricultural activities--about 50 per cent are cultivators with varying size of landholdings and the rest are landless laborers. As they are unemployed during non-harvest season, this large sub

population is deprived and highly vulnerable to adverse circumstances. According to the 1981 census, total employment was approximately 24 million people of these, more than 60 per cent were employed in the agricultural sector. This figure represents those directly working in agriculture and does not include employment in agricultural-related manufacturing industries. According to the 1991 census, the number of employed in agriculture increased to 16.3 million. While this figure shows that the share of agriculture in total employment declined over the 10-year period, agriculture still provided employment for well over half the total workforce.

Primary sector continues to remain a major sector of the **Rajasthan** economy. It contributes 32 per cent of GNP, contribution of primary sector in GDP at factor cost is about 62 percent in 1970-71and become 52.3 percent in 1980-81 and 44.8 in 1991-91 which further decline to 43.94 in 1998-99. At the same time contribution of tertiary sector is rise from 23.4 to 36.6 percent which is good trend of development.

Table 2 GDP at factor cost in broad industrial category ofRajasthan

Year	Primary sector	Secondary sector	Tertiary sector
1970-71	62	14.5	23.4
1980-81	52.3	18	29.7
1991-92	44.8	17.5	32.7
1998-99	43.94	19.46	36.6

Source: Economic survey of, Government of Rajasthan 1998-99, Ministry of finance.

Agriculture sector is not only provides a healthy contribution in national income but also important for employment generation. It provides employment to a large part of working population directly and

also indirectly. For this we should see the occupational structure of the state as given in the table below: -

Table 3 Occupational distribution of population in percent

Industrial category	1971	1981	1991
Farmers	64.9	61.6	58.8
Agricultural labour	9.3	7.3	10
Animal husbandry, fishing, forestry	2.5	3.3	2
Others	24.2	27.8	29.2

Source: Some facts about Rajasthan 2001.

As we see in the table 3 in 1971 that there are 64.9 percent farmers and 9.3 percent agricultural labours, in this way about 74.2 percent peoples are directly dependent on agriculture. In 1981 farmers constitute 61.6 and agricultural labours 7.3 percent. The share of farmers are declined to 58.8 percent and that of agricultural labours rose by 10 percent in 1991, in this way 68.8 percent peoples are dependent on the agriculture.

The total geographical area is estimated at 32.87 lac Sq.Km. The gross cropped area is about 192.96 lac ha, of which 37.77 lace ha are under double cropping. Bajara is the most important crop followed by wheat, pulses, oilseeds, and maize. The climatic setting is diverse. Rajasthan is divided into nine agro-climetic zones, which provide varying cropping patterns.

1.1 THE PRESENT CROPPING PATTERNS AND THEIR TREND

Cropping activities go on throughout the year in Rajas than, provided water is available for crops. In Rajasthan, there are two distinct seasons, kharif (July to October), and rabi (October to March). Crops grown between March and June are known as zaid. These crops are grown sole or mixed (mixed-cropping), or in a definite sequence

(rotational cropping). The land may be occupied by one crop during one season (mono-cropping), or by two crops (double-cropping), which may be grown in a year in sequence. Of late, the trend is even more than two crops (multiple-cropping) in a year. These intensive cropping may be done either in sequence or even there may be relay-cropping-one crop under sown in a standing crop. With wide-rowed slow growing cropping patterns, companion crops may be grown.

THE KHARIF-SEASON CROPPING PATTERNS

Among the kharif crops, rice, jowar, bajra, maize, sesamum groundnut and cotton are the prominent crops to be considered the base crops for describing the kharif cropping patterns.

In Rajasthan maize is grown as an extensive crop in some areas, whereas at other places, it is replaced by small millets, pulses, groundnut and wheat (rabi) as alternative crops Jowar is most alternative crops, which can be grown under medium rainfall. Bajra is more drought-resistant crop than several other cereal crops and is generally preferred in low-rainfall areas and on light soils. The area under the bajra crop in India is about 12.4 m ha and Rajasthan (4.6 m ha) shares about the 2/3 total area. Bajra is grown along with pulses, groundnut, oilseeds and kharif jowar in Rajasthan.

THE RABI SEASON CROPPING PATTERNS

Among the rabi crops, mustard wheat, together with barley and oats, jowar and gram, are the main base crops among the rabi cropping patterns. Generally, wheat and gram are concentrated in the subtropical region in northern India

1.2 Behavior of area production and yield of principal crops in Rajasthan

Some crops are loosing area under the crop but some are getting, because the relative importance of that particular crop is changed due to change in market behavior and habits of peoples, new invention of

varieties of some crops. In case of Rajasthan area of bajara, jowar, barley and sesamum is decreased and on the other hand area under the maize wheat mustard gram and cotton is rise.

In case of production bajara, Jowar, barley, sesamum, gram and cotton production is decline, maize has slight rise but production of wheat and mustard is increase sharply. In case of wheat it increased from 19.51 in 1970-71 lace tones to 74.19 lace tones in 1999-2000, in case of mustard, in 1970-71 production was 2.47 lace tones and it is in 1999-2000 increases more then ten times and become 27.10 lace tones.

If we see the productivity only three crops viz., wheat barley and mustard show rise in productivity, Productivity of wheat rose more then two times, initial it was 1320.05 kg per hectare in 1970-71 and became 3018.31 kg per hectare, in 1999-2000 Barley has also most of the same picture its productivity was 1459.10 kg per hactare in 1970-71 and became 2387.31kg per hectare in case of mustard productivity rise but not sharply it was 972.00 kg per hactare in 1970-71 and became 1102.87kg per hectare. These all three crops are rabi crops, one more rabi crop gram which show opposite trend then these three crops productivity of gram is 739.98 kg per hactare in 1970-71 and became 236.39 kg per hectare in 1999-2000 but it may be the effect of drought because till 1995-96 productivity is more or less same.

Now we should tern toward khariff crops bajra, jowar, maize, sesamum and cotton these all shows declining trend, in case of bajara trend is not clear but is declining, in case of sesamum trend is clearly declining and same in cotton, this because of uncertainty in the rainfall except cotton all are arid crops more rainfall is also harmful for these crops, and these crops are gown in mostly in those districts where occurrence of rainfall in low and irrigation facility is less developed.

Table 4 Area, Production and Yield of major crops of Rajasthan

	Percentage Area under the various crops to Gross cropped area in hectare						
	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	1999-00
Bajara	30.70	21.65	29.00	26.26	25.06	21.71	21.39
jawar	7.05	4.14	5.78	5.41	2.35	3.02	2.83
Maize	4.53	4.00	5.19	5.37	6.73	8.84	9.28
Wheat	8.84	10.27	9.42	9.77	12.65	11.16	12.74
Barley	3.13	4.68	2.36	1.80	1.21	0.89	0.87
Sesamum	2.99	2.14	2.46	2.86	2.91	1.66	1.38
Mustard	1.52	1.47	2.09	4.45	10.04	13.50	12.74
Gram	9.66	11.37	7.06	10.69	6.53	8.24	14.87
Cotton	1.34	1.80	2.06	1.83	2.04	3.02	2.95

	Production of various crops in lace tones						
	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	1999-00
Bajara	26.76	11.29	11.35	7.31	27.46	11.56	14.33
jawar	5.73	1.90	3.38	3.75	5.71	1.39	1.91
Maize	9.30	7.83	7.47	6.44	14.36	8.12	10.67
Wheat	19.51	22.90	29.42	39.15	47.48	54.93	74.19
Barley	7.64	10.05	5.21	5.75	4.83	3.90	4.03
Sesamum	1.14	0.65	0.34	0.27	2.08	0.34	0.17
Mustard	2.47	1.27	2.48	5.95	18.40	23.68	27.10
Gram	11.95	14.98	8.54	16.23	10.11	10.90	6.78
Cotton	2.29	4.04	3.88	4.74	1.72	2.01	1.84

	Productivity of the crops in kg per hectare						
	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	1999-00
Bajara	520.99	303.80	225.60	153.36	565.43	270.70	347.46
jawar	485.95	266.78	336.82	381.18	1252.14	234.95	349.47
Maize	1226.12	1140.34	829.42	660.79	1102.00	466.75	596.51
Wheat	1320.05	1299.75	1799.59	2207.38	1936.67	2501.22	3018.31
Barley	1459.10	1252.22	1270.27	1759.52	2059.86	2219.64	2387.31
Sesamum	228.48	176.94	79.01	52.01	367.72	104.82	64.61
Mustard	972.00	503.03	685.35	735.71	945.45	891.65	1102.87
gram	739.98	767.40	697.14	836.36	799.47	672.88	236.39
Cotton	1020.37	1309.71	1087.69	1423.98	434.87	338.65	324.17

Source: Statistical abstract of Rajasthan, Directorate of Economics and statistics, Rajasthan, Jaipur.

If one examines compound growth rate in area, production and yield per hectare of food-grain from 1970-71 to 1999-2000, in case of bajara production growth rate was 3.1 percent per annum, but growth in area is negligible but growth in yield is responsible for this trend in production. Jowar has loose their area under the crop, its growth rate is negative and dominant on the yield, result of its final growth rate of production is negative and the same thing happens with the Barley. In case of barley, growth in yield is positive at 3.36 percent per hectare but growth in area is much more then yield which is negative i.e., 5.18 percent per annum. Just opposite of it is the case of cotton, where growth in area is positive but growth in yield is negative and effective so production is negative. Maize and gram has negative growth in yield, though in gram it is negligible, but in both cases growth in area is more and dominant so growth in production is positive. Wheat and mustard are shown a positive growth rate in both area and yield. In case of wheat growth rate in yield is more on other side in case of mustard growth rate in area is much more and effective. Sesamum shows negative and negligible growth in area but growth rate in yield is positive and it makes growth rate in production is positive.

In other words we can say that Jowar, barley and cotton show negative growth rate where barley and Jowar due to negative growth in area but cotton due to negative growth in yield. Bajra and sesamum show positive growth rate in production due to growth rate in yield. Both components are positive in wheat and mustard. Gram shows positive growth in production due to growth rate in area.

Table 5 Crop wise growths of production, area and yield (1970-71 to 1999-2000)

Name of crops	Growth rate in production	Growth rate in Area	Growth rate in yield
Bajara	3.10	0.12	3.14
jawar	-0.88	-1.49	1.23
Maize	2.27	3.98	-1.38
Wheat	4.21	1.85	2.96
Barley	-1.84	-5.18	3.36
Sesa	2.51	-0.30	2.63
Mustard	14.23	10.14	3.41
gram	3.15	4.23	-0.33
Cotton	-5.55	2.13	-5.99

1.3 SOME RELETED STUDY

A few studies have been undertaken to look onto the growth and instability of production some of them are:

Bhalla and Allagh(1979) in their pioneer study 'Performance of Indian Agriculture : A District-wise Study' presented a brief picture of the growth rates, productivity levels and variability of annual growth rates and their components of the nine major crops. They also gave e a picture of regional concentration of total agricultural output as well as its constituents.

They analysed that the level of agricultural output and its growth depends on the interaction of the several institutional, technological and environmental factors. It was discovered that the areas with high productivity level in agricultural output were significantly associated with high rainfall and assured levels of irrigation. On the other hand the

lowest productivity areas belong to arid and semi arid zones. In these areas where rainfall was very low and unpredictable, and assured irrigation was almost non existent.

The greater variations in the growth rates of agricultural output were found. In most of the crops variations were due to growth rates in yield. Growth rate in area were cause in very few crops and in few areas where growth in assured irrigation.

S. Mahendradev(1987) in 'Growth and Instability in Foodgrains Production: Aan Intra State Aanalysis' found in the details of the estimated results that the inclusion of rainfall index in the trend variable had improved the value of R^2 in most of the states. It indicate that rainfall was able to explain the major part of the variation in foodgrains production. According to him weather adjusted growth rates were higher in some states and lower in some others as compared to unadjusted growth rates.

Hanumatha Rao (1988) in 'Unstable Agriculture And Drought' explained that instability in agricultural production has increased in the post-green revolution period on account of rise in the sensitivity of output to variations in rainfall. This rising vulnerability of agricultural output, especially food grains output, to droughts is traceable to the high complementarily of new seed-fertilizers technology with water and the inadequate expansion of irrigation facilities.

Further he explained that because of the inadequacy of complementary inputs like irrigation, the consumption of fertilizers has become more sensitive to the variations in rainfall in the postgreen revolution period. Owing to its concentrated use in limited pockets, its consumption has also been more sensitive to the variations in prices.

To bring out the growth in crop output and its instability since the beginning of economic planning in India and to identify the factors

responsible for rise in the sensitivity of output, particularly foodgrains, to variations in rainfall.

Buta Ram(1989) in his study ' Growth and Variability in Pulses (Gram and Tur) Production' found that growth of production of Gram and Tur has been mainly due to the growth of area under these crops. As none of the district showed the negative growth in production due to negative growth in yield only. And area sown, production and yield of gramand tur had not been accelerated over the period. He also found that the instability in area was lower than in yield for both the crops gram and tur.

G.S. Bhalla (2000) in his study ' Indian Agriculture Four Decades of Development' evaluated the. He found that the impact of new technology in transforming traditional agriculture was confined largely, to the north-western and southern regions and to Gujarat and a few irrigated parts of central and eastern India. These states recorded high to very high growth in agricultural productivity and output. It was also seen that the spread of the Green Revolution was rather slow during the first 20 years that is from 1962-65 to 1980-83 but it gathered momentum during the 1980s.

According to Bhalla another important development during this period was that there was a district-wise change in cropping patterns away from coarse cereals towards oilseeds and other commercial crops. This shift from coarse cereals to oilseeds was particularly strong in the central region but was also evident, though to a lesser extent, in the southern region.

In the light of these studies, I wish to find out Performance of agriculture in Rajasthan.

1.4.OBJECTIVES OF THE STUDY

The objective of the present study is to find out spatial patterns of agricultural productivity and temporal growth in order to locate the regions of high and low productivity levels. Following objectives have been set out for the purpose of the analysis:-

1. To estimate the growth pattern of area, production and yield of major crops across the districts of Rajasthan.
2. To compare the contribution of various components of growth in agricultural production such as area and yield across the districts
3. To study the acceleration and deceleration in growth rates of production over period of time.
4. To study the instability in production through veriation in area and yield over period 1970-71 to 1999-2000.
5. To decompose the growth of production into its various components so as to study the factors responsible for the change in average production and also variance of production

1.5 COVERAGE OF STUDY:

(a) Choice of years: The present study covers a time series data of thirty years from 1970-71 to 1999-2000. After taking fifth years moving averages, the analysis has carried out for twenty six observations.

(b) District covered: The coverage in terms of districts is as wide as allowed by the availibility of data. Thre are thirty two districts presently in the Rajasthan. Five districts had to be combined in order to make them comparable temporaly. Hanumangarh have been clubbed to form old Ganganagar. Kota and Baran have been clubbed to form old Kota. Swai-Madhopur and Karoli have been

clubbed to form old Swai-Madhopur. Bharatpur and Dholpur have been clubbed to form old Bharatpur. Udaipur and Rajasmand have been clubbed to form old Udaipur. Jaipur and Dousa have been clubbed to form oldJaipur.

1.6 DATA SOURCE:

Related data will be taken from the belonging sources these are such as:-

1. Indian agricultural statistics (various issues)

Directorate of Economic and statistics,Ministry of agriculture, Government of India.

2.Agricultural Abstract of Rajasthan, (various issues)

Directorate of Economic and statistics,Ministry of agriculture, Government of Rajasthan.

3.Some facts about Rajasthan 2001.

Directorate of Economic and statistics,Ministry of agriculture, Government of Rajasthan.

4. Economic Survey 2001-2002, Government of India Ministry of finance.

5. Economic survey of, Government of Rajasthan 1998-99, Ministry of finance.

1.7 METHODOLOGY:

(a) Percentage annual compound growth rates have been calculated by fitting semi log function as:

$\text{Log } Y=a+bT$

Where a is intercept, b is regression coefficient, T is time, Y is dependent variable such as area/ production/ yield per hectare.

(b) Quadratic function has been fitted to see the acceleration and deceleration in growth rate of area, production and yield such as:-

$\text{Log } Y=a+bt+ct^2$

Where a is intercept and c are coefficient of t and t^2, b shows growth (positive and negative) and c shows acceleration and deceleration in growth rates in the study periods.

To see acceleration and deceleration we first drive the slope of the function, which is

$dY/dt = b+ 2ct$

Now there are four possibilities

1. Coefficients of t and t^2 both will be positive and Y will increases monotonically.

2. Coefficients of t will be positive but coefficient of t^2 will be negative. For small value of t, b may dominate 2ct and hence Y may increase; but as t takes larger value, the second term will dominate to the first term and the slop become negative implying that Y will decrease.

3. Coefficients of t will be negative significant but coefficient of t^2 will be. For small value of t, 2ct may dominate b and hence Y may increase; but as t takes larger value, the first term will dominant to the second term and the slop become positive implying that Y will increase.

4.Coefficients of t and t^2 both will be negative significant Y will decrease monotonically.

(c) Decomposition of the variability in annual output growth rates,

Annual output growth rates have been calculated by

$\log (y_{t+1}/y_t)$

Thus we get

$Got = Gat + Gyt$.....(1)

Where Got, Gat and Gyt are the annual growth rates in output, area and yield of the crop in year 't'.

The variability in annual output growth rates over a specified period of length T can be decomposed as:

$V(Go) = V(Ga) + V(Gy) + 2Cov(Ga, Gy)$.....(2)

CHAPTER-II

SOME CHARACTERISTICS OF RAJASTHAN PHYSIOGRAPHY

Rajasthan is known as the desert state of India, extends from North to south with length of 826 Km while from west to east it is 869 Km broad. Location of Rajasthan between Latitude 23o3' N to 30o12'and Longitude69o30' E to 78o17'E. The sate has a land boundary of 5920 Km out of which 1070 Km long is the Indo-Pak border, which is also known as Radcliff Line. Five districts of Rajasthan viz. Barmer, Jalore, jaisalmer, Bikaner and Sriganganager touch this boarder. This boundary line starts from Hindu Mal Kot (Sriganganagar) in the north and ends at Shahgarh (Jalore).

The state is divided into 32 districts, 30 Zila Parishads and 241 Tehsils. Rajasthan has a lower population density (129/km^2) compared to all India average274/km^2 in 1991. and higher percentage of rural population (77.12 %) showing that the state is still predominantly rural and dependent upon agriculture as the mainstay livelihood.

The physiography of Rajasthan is product of long years of erosional and depositional process. The present landform and drainage systems have been greatly influenced and determined by the geological formation and structures. Aravalli mountains like mid rib divide the state into two

parts.the. Following major physiographical regions can be identified in the state :

1. Western Sandy Plains

1.1. Sandy-Arid Plains (Marusthali)

1.2. Semi-Arid Transitional Plains (Rajasthan Bagar)

1.2.1. Luni Basin (Godwar Tract)

1.2.2. Plain of Interior Drainage (Shekhawati Tract)

1.2.3. Ghaggar Plain

2. The Aravalli Range and Hilly Region

2.1. Aravalli Range and Bhorat Plateau

2.2. North-eastern Hilly Region

3. The Eastern Plains

3.1. Banas Basin

3.2. Chappan Plains

4. South-eastern Rajasthan Plateau (The Hadoti Plateau)

4.1. Vindhyan Scarland

4.2. Deccan Lava Plateau

Western Sandy Plains

About 61% of the state area consists of sandy plains which lies to the west and north of Aravalli hills. The region is charaterised by arid landscape-barren hills, level rocky structural plains, rock cut pediments,

gravel pavements, shallow colluvial plains, other sandy plains with alluvium underneath, sandy hummocks and low sand steaks, sand dunes of various kinds and interdunal plains. These plains have large sand dunes of height 50 to 100 meters and 8 to 10 km in length. In Barmer & Jaisalmer sand dunes are large but stable while in Churu, Sikar & Nagaur districts shifting sand dune are found. This region is most inhospitable region of the state; with scarcity of water the living conditions are very harsh.

The **Luni Jawai plains** occurs in the district of Jodhpur, Pali, Jalore, Sirohi, and in the southern part of the Nagaur. It contain the only integrated drainage system in the Thar desert. The Luni originates in the Aravalli hill ranges nears Ajmer and flows south-westward to the great Rann of Kutch. Enroute it is joined by numerous tributaries from the Aravallies, like the Lilri, the Guhiya, the Bandi, the Mirthri, the Sukri, the Jawai, etc. All these streams are ephemeral and have wide sandy beds. Tributaries from the isolated hills and rocky uplands in the plains also contributes to the flow in the Luni.The major tributaries originating in this zone, and joining the Luni, are two Jojris near Jodhpur and Pipar, the Luniwala near Siwana and the Sagi further southnear Bhinmal. All these streams register some flow during good monsoon rains and flash floods during spells of very high rainfall. All these streams form the vast alluvial plains through which they flow. Younger alluvial plains along the

major streams give assured cultivation because of ground water, the older alluvial plains, the occasional isolated hills with fringing pediments and buried pediments, sand dunes with interdunal plains are the dominant landforms. The ranns of Pachpadra, Sanwarla and Kaparda are important saline depressions. These salt affected alluvial plains are more numerous near the confluence of the Luni with the Great Rann.

The **Shekhawati tract** is in Jhunjhunu, Sikar and Churu districts and northern part of Nagaur district. This zone has very few streams, most of which disappears after flowing for short distances in the sandy plains. The important streams are Mendha and Rupangarh which originate in the Aravalli hill range sand drain into the Sambhar salt lake. The other major stream Kantli flows north-westwards from Aravallies and disappear in the sandy plains near Rajgarh. The rainfall in this zone is higher than in the west and hence sand dunes in this zone support more vegetation.

Much of the Ganganagar district is occupied by vast alluvial **Ghaggar flood plains**. The wide dry valley of Ghaggar is now known to be that of the legendary Saraswati river which originated in the Himalayas. The dry valley passes through Hanumangarh, Suratgarh and Anupgarh, before entering into the Pakistan. Dry valleys of the Drishadvati, a major tributary of the Saraswati , occur in the Nohar-bhadra area in the

eastern part of Ganganagar district. Canals have been constructed through almost all the dry valleys , making the lands around them very productive . The important canal systems are the Gang canal system , the Bhakra canal system, the west Yamuna canal system and the Indira Gandhi canal system. However, problems of water logging and salinity have also come up at places. The most notable examples are between Suratgarh and Anupgarh . Low sand dunes and sandy hummocks are scatteredly distributed on the deep sandy alluvial plains in this zone. Barchans have appeared in some parts of the plains because of deep ploughing of the soil without assured supply of canal water.

The Aravalli hill ranges, the oldest mountains of India constitute the most dominant hilly area of Rajasthan . The ranges run diagonally across the state from north-east Delhi to south-west upto the plains of Gujarat, covering a distance of about 692 kms. Within Rajasthan, the ranges run from Khetri in the north-east to Khed Brahma in the south-west for a length of about 550 kms. In the north-east , the hill ranges become more prominent near Khetri and Alwar. Towards the south-west , the ranges become more prominent with peaks upto 1055 m above MSL. It is also a major water divide. The area to its east is well drained by several integrated drainage systems, while the area to the west has only one integrated drainage system, that is the Luni drainage system in the south-eastern part of the desert. The average height of this region is 600

meters above MSL, and highest at Guru Shikar in Mount Abu (1727 Meters). Mewar hills and Marwar hills are the some of the offshoots of Aravallies.

The eastern plains have rich alluvial soils drained by seasonal rivers, cover most part of Alwar, Bharatput, Sawai Madhopur, Bundi and Kota districts. The region of Banas plain is a broad plain having an altitude of 150 to 300 m MSL, with slope towards east. This plain is drained by Banas river through the northern part of Chitaurgarh and Udaipur district and several of its tributaries. The areas of Bhilwara, Tonk, Ajmer, Jaipur, Dausa and Sawai Madgopur are within catchment of Banas river. The tributaries like Kothari, Dain, Sohadra, Manshi, Bandi, Dhundh, Morel and Kareli join the Banas on its left bank side, while Berach, Wagan and Gambhiri, join it on the right bank side. The Banas is the major tributary of the river Chambal which ultimately joins the river Yamuna. The alluvium deposits become thin towards west where the plain is higher and more irregular, while in the east the thichness of alluvium increases. Another zone in this is of the Chappan plains which lies in the south-eastern part of Udaipur, Banswara, Dungarpur and southern part of Chittorgarh districts. The area is drained by tributaries of Mahi river which ultimately reaches the Arabian sea through the Gulf of Cambay.

4.Southern and south-eastern Rajasthan is mostly a plateau. The **Hadauti plateau**, having intrusions of black volcanic rocks into the Vindhyans, extends to a great part in Jhalawar, Baran and Kota districts. The Malwa plateau also extends into the southern part of Chittorgarh and Banswara districts having an average altitude of 500 m above MSL and is dotted with isolated low ranges at few places. This plateau in Rajasthan occurs in the upper catchment of the Chambal river to the south-east of the Mewar plains. The greater part of this area is drained by the river Chambal and its right bank tributaries like Kali Sindh, Parwan and Parvati. This plateau has two defined units of Vindhyan scrapland Deccan lava plateau.

CHEPTER 3
DISPARITIES IN LEVELS OF DEVELOPMENT

The most important consequences of the adaptation of new technology after the mid-1960s was a perceptible increase in yield levels and output of many crops in a few irrigated areas of the northwestern region and gradual deepening and extension of new technology to new areas. Improvement in agricultural productivity has become a necessity due to the limitation in expansion of cultivated acreage and ever increasing food demand.

The growth of the agricultural productivity depends on the land conditions, for example availability of irrigation water resources, soil deterioration, in addition to an improvement of agricultural technology. Mechanization is also influenced by the topography. Whereas, increase in productivity by applying fertilizer are limited due to their side effect of environmental belonging.. Like this, to foreseen the growth of the agricultural productivity, various environmental factors must be considered, and grasping on detailed space.

The main purpose of this chapter is to study the inter-regional variation in productivity levels and the changes over time as also to analyze the reasons for these variations. Triennium average is used to eliminate seasonal variation. Only terminal means first and last values taken account, and productivity, which is taken in the physical terms as kilogram per hectare. All 26 districts have been classified into three classes on the basis of their levels. All those districts where productivity level exceeding 1000 kilogram per hectare are treated as high productivity districts. Districts with productivity level 500 to 1000 kilogram per hectare are treated as medium productivity districts, and districts with productivity level less then 500 kilogram per hectare are the low productivity districts.

Variation in yield of Bajra increased during study period. In case of Bajra during 1970-73, 22 out of 26 districts i.e. accounting for 84.6

percent of districts belonged to the low productivity districts these are Ajmer, Alwar, Banswara, Barmer, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Sikar, Sirohi and Udaipur, Infect 17 of them can not even attain the productivity level of 340 kilogram per hectare. Only four districts such as Bharatpur, Jaipur, Swai-Madopur and Tonk belonged to medium productivity districts i.e. having a productivity level of 500 to 1000 kgs per hectare. None of the districts belong from the first category had the productivity level of more than 1000 kgs per hectare.

However over a period of three decades (1970-73 to 1997-2000) some changes have taken place as Bharatpur, Swai-Madopur and Alwar, have become i.e. have a productivity level more than 1000 kgs per hectare. Under medium productivity level there are six districts by the year 1997-2000 namely Chittorgarh, Ganganagar, Jaipur, Jhunjhunu, Sirohi, Tonk. Except Jaipur and Tonk other four districts have improved their position from low to medium category. The remaining seventeen districts belonged to low productivity category these are, Ajmer, Banswara, Barmer, Bhilwara, Bikaner, Bundi, Churu, Dungarpur, Jaisalmer, Jalor, Jhalawar, Jodhpur, Kota, Nagaur, Pali, Sikar and Udaipur.

There was not wide variation in yield of Jowar in Rajasthan range from 125 kilogram per hectare in Bhilwara to 525.32 kilogram per hectare in Swai-Madhopur. But it has become wide 85.77 in Pali to 1159.23k.g. per hectare in Kota in 1997-2000. In case of Jowar during 1970-73, 23out of 26 districts belonged to the low productivity districts. These districts include Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur. Only three districts such as Jhalawar Kota and S Madopur belonged to medium productivity districts. No district is related to high productivity districts. During 1997-2000 there is some improvement in Kota district moved up in high productivity category and six districts moved in medium

productivity level Alwar Bharatpur Bundi Chittorgarh Jhalawar and S Madopur, nineteen districts belonged to the low productivity districts and these are Ajmer, Banswara, Barmer, Bhilwara, Bikaner, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur.

In case of **maize** during 1970-73, 18 out of 26 districts belonged to the medium productivity districts and these are Ajmer, Alwar, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Churu, Jaipur, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Pali, Swai-Madopur, Sikar and Tonk. Six districts belonged to high productivity districts they are Banswara, Chittorgarh, Dungarpur, Kota, Sirohi and Udaipur. Only two districts belonged to the low productivity districts and these are Ganganagar and Jaisalmer. During 1997-2000 there is a great change has taken place and 18 out of 26 districts belonged to the high productivity districts these are Ajmer Banswara Barmer Bharatpur Bundi Chittorgarh Churu Dungarpur Jaipur Jalor Jhalawar Jhunjhunu Jodhpur Kota Nagaur Pali Swai Madopur Sikar. Five districts belonged to medium productivity districts. They include Alwar, Bhilwara, Sirohi, Tonk and Udaipur, and under the low productive districts Bikaner, Ganganagar and Jaisalmer.

Wide variation has also been observed in case of **Wheat**, average productivity is 815.9 in Tonk to 1848.0 in Alwar kilogram per hectare become more wider 1070.6 to 5624.14 kilogram per hectare during 1997-2000, average productivity 1277.048 and become double 2201.72 kilogram per hectare. 23 out of 26 districts belonged to the high productivity districts these are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Kota, Pali, Swai-Madopur, Sikar, Sirohi and Udaipur. Three districts belonged to medium productivity districts and these are Jhalawar, Nagaur and Tonk. No one districts belonged to the low productivity districts. During 1997-

2000 there is a significant change has taken place and all the 26 districts belonged to the high productivity districts There is a great rise in wheat is noted during 1970-73 productivity level 1848 was highest in the Alwar district, but during 1997-2000 seventeen districts shows productivity above two thousand kilogram per hectare, besides Ganganager it is 5624.13 kilogram per hectare. This might have been made possible due to the availability of irrigation and HYV seeds coupled with other inputs like fertilizers.

In case of **barley** during 1970-73, 21out of 26 districts belonged to the high productivity districts and these are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jaipur, Jalor, Jhalawar, Jhunjhunu, Kota, Nagaur, Pali, Swai-Madopur, Sikar, Sirohi, Tonk and Udaipur. Four districts belonged to medium productivity districts. They include Bikaner, Churu, Ganganagar and Jodhpur. Only one Jaisalmer district belonged to the low productivity. During 1997-2000 all of 26 districts belonged to the high productivity districts.

Higest level of yield is 185.94 in Sesamum in Alwar. The variations become wider, and yield has been improved in most of the district. During 1970-73, all 26 districts belonged to the low productivity districts. And no great change has been take place only one district reach to medium productivity level that is Swai-Madopur and all other districts are remains at low productivity level.

There exist low variation in **Mustard**, most of the districts showing productivity nearly 650. Variation is slightly increased in 1997-2000. In case of Mustard during 1970-73, 20 out of 26 belonged to the medium productivity districts these are Ajmer Alwar Banswara BarmerBharatpur Bhilwara Bikaner Bundi Chittorgarh Churu Dungarpur Ganganagar Jaisalmer Jalor Jhalawar Jodhpur Kota Pali Sirohi and Udaipur. Five districts belonged to low productivity districts and these are Jaipur,

Jhunjhunu, Swai-Madopur, Sikar and Tonk. Only one districts Nagaur belonged to the high productivity districts.

During 1997-2000 and nine out of 26 districts belonged to the high productivity districts and they are Alwar Bharatpur Bundi Churu Ganganagar Jhunjhunu Jodhpur Kota and Sirohi and fifteen districts belonged to medium productivity districts. They include Ajmer, Barmer, Bhilwara, Bikaner, Chittorgarh, Jaipur, Jaisalmer, Jalor, Jhalawar, Nagaur, Pali, Swai-Madopur, Sikar, Tonk and Udaipur, and under the low productive districts only two Banswara and Dungarpur districts are belonged.

Average productivity is recorded in **Gram** 648.5 kilogram per hectare. Variations are become wider during second period. Average productivity fall and become 614.34 kilogram per hectare. During 1970 73, 18 out of 26 districts belonged to the medium productivity districts these are Alwar, Banswara, Bharatpur, Bikaner, Bundi, Ganganagar, Jaipur, Jhalawar, Kota, Swai-Madopur, Sikar and Tonk Fourteen districts belonged to low productivity districts and these are Ajmer, Barmer, Bhilwara, Chittorgarh, Churu, Dungarpur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Sirohi and Udaipur. During 1997 2000 there is some change takes place and 19 out of 26 districts belonged to the medium productivity districts. These are Ajmer, Barmer, Bhilwara, Bundi, Chittorgarh, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Sirohi, Tonk and Udaipur. Six districts belonged to high productivity districts and these are Alwar, Banswara, Bharatpur, Bikaner Swai-Madopur and Sikar, only Churu come under the low productive districts.

In case of **Cotton** during 1970-73, 10 out of 26 districts belonged to the medium productivity districts. These are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Chittorgarh, Jaipur, Jhunjhunu and Udaipur. Fourteen districts belonged to high productivity districts and these are Bundi, Churu, Dungarpur, Ganganagar, Jaisalmer, Jalor,

Jodhpur, Kota, Nagaur, Pali, Swai-Madopur, Sikar, Sirohi and Tonk. Only two districts belonged to the low productivity districts. They are Bikaner and Jhalawar. During 1997-2000 24 out of 26 districts belonged to the low productivity level districts these are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur, and two districts belonged to medium productivity districts they are Kota and S Madopur.

SUMMARY OF FINDINGS:

Variation in productivity has become wider after the green revolution period. Though it is a wheat revolution but use of pesticides, development in irrigation facilities, use of modern inputs like fertilizer, machinery and advanced verities of crops make the output more sensitive towards the weather conditions, market prices. Because of expensive inputs, risk factor is greater and economic condition of the farmers also has significant effect. The average level of productivity has risen in all the crops except Cotton and inter district variation in each crop has also increased during the study period. The changes in levels of productivity of various crops are presented in the following paragraphs.

Productivity levels of Bajara, Jawar and Sesamum shown very bad picture most of the districts during 1970-73 belongs to low productivity level. In all these cases districts belong to medium productivity level. No one district is belong to higher productivity level. No one district is belong to high productivity level. These three crops are rainfed crops and mostly grown in the dry region no major change have been taken place during three decades.

In case of Maize and Mustered mostly districts fall under medium category, make shows good growth in productivity and major number of districts comes under higher productivity level. But growth in districts in mustered is not so good only eight districts become able migrate to higher level. Productivity level of wheat and barley recorded good trend under both crops most of the districts under both the crops recorded in 1997-2000 under higher productivity level. One of the best trends is recorded in productivity level of Gram. During 1970-73 all districts belongs to medium and low category. No one district fall under higher productivity level. But in 1997-2000 six districts reach to the higher productivity level. These all districts are have assured irrigation system.

It has been observed that different pictures have been seen in the study period in cotton (area production and yields).

Table 3.1 Productivity of Bajra, Jowar, Maize, Wheat and Barley across the districts during 1970-73 and 1997-2000

	Bajra		Jowar		Maize		Wheat		Barley	
	1970-73	1999-2000	1970-73	1999-2000	1970-73	1999-2000	1970-73	1999-2000	1970-73	1999-200
Ajmer	483.02	271.21	169.33	208.76	516.00	593.38	1045.84	1640.48	1190.67	1578.1
Alwar	448.00	1037.68	405.34	755.83	550.02	1535.84	1848.00	3750.75	1622.45	2698.4
Banswara	308.26	462.10	327.22	384.92	1084.00	1297.06	1250.58	1994.86	1282.91	2102.3
Barmer	264.00	122.24	209.90	384.81	984.43	1156.16	1208.40	2146.88	1134.45	2100.7
Bharatpur	654.12	1371.03	457.94	774.17	545.88	1206.20	1550.88	3755.97	1313.34	2522.6
Bhilwara	317.86	464.97	125.34	357.89	922.67	962.03	1113.33	2594.24	1104.00	1865.5
Bikaner	76.00	497.21	357.23	385.24	666.67	367.33	1289.36	1903.27	652.51	2102.2
Bundi	317.89	467.67	483.78	918.64	943.99	1082.15	1278.13	2900.51	1294.06	2247.6
Chittorgarh	312.45	665.11	478.67	803.82	1430.02	1553.46	1296.36	2878.10	1282.88	2046.4
Churu	174.67	310.19	357.17	457.00	666.67	1068.00	1289.29	2680.60	661.88	1867.6
Dungarpur	317.76	467.31	438.08	118.94	1020.00	1201.89	1250.72	2027.63	1944.41	2102.3
Ganganagar	333.33	565.96	357.10	93.33	408.79	0.00	1288.87	5624.14	658.67	4502.9
Jaipur	570.67	959.58	257.04	250.03	609.33	1018.79	1496.00	2596.36	1484.13	2277.0
Jaisalmer	81.80	40.01	209.98	385.00	0.00	0.00	1193.88	2680.59	370.37	2099.0
Jalor	432.00	226.40	209.96	384.91	964.75	1203.87	1332.00	1634.39	1195.90	2102.4
Jhalawar	317.97	462.29	513.33	829.72	868.19	1323.65	949.21	2535.33	1294.16	2102.8
Jhunjhunu	316.00	564.29	284.41	375.50	535.90	1190.44	1363.62	2867.80	1182.68	1907.4
Jodhpur	261.33	179.32	139.98	190.22	962.86	1202.99	1232.71	1795.38	926.60	2102.0
Kota	317.81	235.29	518.67	1159.23	1008.91	1244.89	1104.36	2625.04	1294.67	2102.6
Nagaur	245.51	486.14	202.67	315.63	963.98	1204.04	961.32	1070.61	1196.00	1879.6
Pali	405.31	232.16	192.00	85.77	678.66	530.05	1155.99	1611.37	1196.00	1658.1
S.Madopur	637.33	1284.73	525.33	992.60	547.94	1204.73	1202.67	2920.41	1190.58	2966.0
Sikar	302.67	643.55	281.98	389.65	550.08	1206.23	1189.67	2459.73	1713.89	2407.3
Sirohi	285.13	464.75	210.00	385.25	1388.00	718.78	1392.01	1920.49	1195.87	2203.8
Tonk	509.19	605.53	225.33	343.49	583.90	860.62	815.91	1690.16	1222.68	1730.6
Udaipur	314.91	251.42	253.33	498.46	1149.33	1038.56	1310.03	2043.68	2390.80	1576.7
RAJASTHAN	317.79	455.28	356.98	579.572	1011.9	579.294	1277.05	2201.72	1435.4	2320.7

Table 3.2 Productivity of Sesamum, Mustard, Grem and Cotton across the districts during 1970-73 and 1997-2000

	Sesamum		Mustard		Gram		Cotton	
	1970-73	1999-2000	1970-73	1999-2000	1970-73	1999-2000	1970-73	1999-2000
Ajmer	59.69	162.52	668.85	633.48	297.40	674.37	949.39	218.87
Alwar	185.94	348.44	724.00	1040.34	857.33	1088.41	993.31	229.84
Banswara	94.64	124.38	628.17	272.15	559.99	1230.92	814.82	268.23
Barmer	45.58	79.51	665.56	949.46	443.32	820.01	822.92	266.56
Bharatpur	86.56	192.60	638.67	1062.05	998.66	1329.14	853.39	266.21
Bhilwara	82.53	178.77	661.62	949.45	437.35	779.38	804.94	268.35
Bikaner	2.66	155.48	666.10	937.18	544.12	2118.12	354.57	144.68
Bundi	70.57	339.09	665.98	1011.74	572.00	956.10	1003.08	269.81
Chittorgarh	145.08	282.89	660.21	787.76	375.94	969.41	736.44	265.54
Churu	2.53	123.86	666.99	1138.40	294.67	407.47	1000.00	269.22
Dungarpur	102.43	124.07	674.58	211.44	379.14	881.25	1000.57	264.24
Ganganagar	2.82	124.12	845.33	1380.54	578.67	619.55	1350.62	262.51
Jaipur	55.68	170.24	380.32	830.34	805.33	893.04	999.25	265.37
Jaisalmer	86.79	124.11	658.95	949.46	221.29	820.21	1000.00	266.40
Jalor	47.00	72.87	813.00	886.40	443.56	820.23	1000.66	224.31
Jhalawar	100.65	124.30	611.11	949.46	551.05	979.25	472.23	265.13
Jhunjhunu	82.78	198.18	460.39	1003.70	241.34	840.36	850.00	265.92
Jodhpur	84.01	109.01	666.75	1107.46	443.77	819.83	1001.08	355.62
Kota	73.30	124.70	670.96	1446.84	608.00	856.04	1012.30	775.83
Nagaur	91.55	73.88	1040.59	968.90	443.95	737.66	1000.42	308.14
Pali	55.87	54.85	666.85	693.08	443.56	648.45	1208.44	294.68
S.Madopur	178.29	515.20	406.64	765.47	732.00	1773.70	1007.94	512.00
Sikar	96.00	123.81	375.68	894.59	745.81	1184.15	1000.00	266.08
Sirohi	56.24	182.28	710.91	1078.50	443.55	820.14	1000.82	410.86
Tonk	68.23	190.67	393.85	810.88	506.67	762.66	1000.70	267.41
Udaipur	138.70	144.42	694.86	944.82	486.92	683.01	622.85	143.71
RAJASTHAN	139.8	118.41	424.624	967.3077	648.5	614.3691	1011.11	272.7017

Table: 3.3 Productivity levels of Bajra across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare)		Alwar, Bharatpur, and S Madopur Total districts (3)
Medium(500-1000Kilogram per hectare)	Bharatpur, Jaipur, S Madopur, and Tonk Total districts (4)	Chittorgarh, Ganganagar, Jaipur, Jhunjhunu, Sirohi and Tonk. Total districts (7)
Low(below 500 Kilogram per hectare)	Ajmer, Alwar, Banswara, Barmer, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Sikar Sirohi and Udaipur Total districts (22)	Ajmer, Banswara, Barmer, Bhilwara, Bikaner, Bundi, Churu, Dungarpur, Jaisalmer, Jalor, Jhalawar, Jodhpur, Kota, Nagaur, Pali, Sikar and Udaipur Total districts (16)

Table: 3.4 Productivity levels of Jowar across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare		Kota Total districts (1)
Medium(500-1000Kilogram per hectare)	Jhalawar, Kota ,and S Madopur. Total districts (3)	Alwar, Bharatpur, Bundi, Chittorgarh, Jhalawar and S Madopur Total districts (6)
Low(below 500 Kilogram per hectare)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur. Total districts (23)	Ajmer, Banswara, Barmer, Bhilwara, Bikaner, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur. Total districts (19)

Table: 3.5 Productivity levels of Maize across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare	Banswara, Chittorgarh, Dungarpur, Kota, Sirohi and Udaipur Total districts (6)	Ajmer, Banswara, Barmer, Bharatpur, Bundi, Chittorgarh, Churu, Dungarpur, Jaipur, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, S Madopur and Sikar Total districts (18)
Medium(500-1000Kilogram per hectare)	Ajmer, Alwar, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Churu, Jaipur, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Pali, S Madopur, Sikar and Tonk Total districts (18)	Alwar, Bhilwara, Sirohi, Tonk and Udaipur Total districts (5)
Low(below 500 Kilogram per hectare)	Ganganagar and Jaisalmer. Total districts (2)	Bikaner, Ganganagar and Jaisalmer Total districts (3)

Table: 3.6 Productivity levels of Wheat across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Kota, Pali, S Madopur, Sikar, Sirohi and Udaipur Total districts (23)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, S Madopur, Sikar, Sirohi, Tonk and Udaipur Total districts (26)
Medium(500-1000Kilogram per hectare)	Jhalawar, Nagaur and Tonk. Total districts (3)	
Low(below 500 Kilogram per hectare)		.

Table: 3.7 Productivity levels of Barley across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jaipur, Jalor, Jhalawar, Jhunjhunu, Kota, Nagaur, Pali, S Madopur, Sikar, Sirohi, Tonk and Udaipur Total districts (21)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, S Madopur Sikar, Sirohi, Jhalawar, Tonk and Udaipur. Total districts (26)
Medium(500-1000Kilogram per hectare)	Bikaner, Churu, Ganganagar and Jodhpur Total districts (4)	
Low(below 500 Kilogram per hectare)	Jaisalmer Total districts (1)	.

Table: 3.8 Productivity levels of Sesamum across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare)		
Medium(500-1000Kilogram per hectare)		S Madopur Total districts (2)
Low(below 500 Kilogram per hectare)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur,Pali, S Madopur, Sikar, Sirohi Udaipur and Tonk Total districts (26)	. Ajmer Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Kota, Pali, Sikar, Sirohi, Udaipur, Jhalawar, Nagaur and Tonk Total districts (25)

Table: 3.9 Productivity levels of Mustard across different districts 1970 73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare	Nagaur. Total districts (1)	Alwar, Bharatpur, Bundi, Churu, Ganganagar, Jhunjhunu, Jodhpur, Kota and Sirohi. Total districts (9)
Medium(500-1000Kilogram per hectare)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaisalmer, Jalor, Jhalawar, Jodhpur, Kota, Pali, Sirohi, and Udaipur, Total districts (20)	Ajmer, Barmer, Bhilwara, Bikaner, Chittorgarh, Jaipur, Jaisalmer, Jalor, Jhalawar, Nagaur, Pali, S Madopur Sikar, Tonk and Udaipur Total districts (15)
Low(below 500 Kilogram per hectare)	Jaipur, Jhunjhunu, S Madopur, Sikar, and Tonk Total districts (5)	. Banswara and Dungarpur Total districts (2)

Table: 3.10 Productivity levels of Gram across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare		Alwar, Banswara, Bharatpur, Bikaner, S Madopur and Sikar Total districts (6)
Medium(500-1000Kilogram per hectare)	Alwar, Banswara, Bharatpur,Bikaner, Bundi,Ganganagar, Jaipur,Jhalawar, Kota, S Madopur, Sikar and Tonk Total districts (12)	Ajmer, Barmer, Bhilwara, Bundi, Chittorgarh, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Sirohi, Tonk and Udaipur Total districts (19)
Low(below 500 Kilogram per hectare)	Ajmer, Barmer, Bhilwara, Chittorgarh, Churu, Dungarpur, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Sirohi and Udaipur Total districts (14)	. Churu Total districts (1)

Table: 3.11 Productivity levels of Cotton across different districts 1970-73 to 1997-2000

Productivity level	1770-73	1997-2000
High(more then 1000 Kilogram per hectare	Bundi, Churu, Dungarpur, Ganganagar, Jaisalmer, Jalor, Jodhpur, Kota, Nagaur, Pali, S Madopur, Sikar, Sirohi and Tonk Total districts (14)	
Medium(500-1000Kilogram per hectare)	Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Chittorgarh, Jaipur, Jhunjhunu and Udaipur Total districts (10)	Kota and S Madopur Total districts (2)
Low(below 500 Kilogram per hectare)	Bikaner and Jhalawar Total districts (2)	. Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur. Total districts (24)

CHEPTER-IV

GROWTH IN AREA, PRDUCTION AND YIELD

In this chapter the growth rates of area, production and yield have been analyzed to see the comparative performance of the various districts. It will also help to analyze the contributions in growth of production in terms of area and yield. Growth rates in area, production and yield have been calculated by semi log function with time as an independent variable such as

$$\text{Log } Y=a+bT$$

Where a is intercept, b is regression coefficient, T is time, Y is dependent variable such as area/ production/ yield per hectare.

Linear function such as Y=a + bt is based on assumption that growth rate of dependent variable in current year does not depend upon the previous year. Use of linear equation for the estimation of growth rate over the period of time is inappropriate. What is worse, the linear rate of growth because the linear rate of growth is not found to be very convenient for any comparison of growth between two periods, and between two regions or between two crops. Logically, if we need to estimate the compound rate of growth over the period, the right and proper procedure is to choose the semi-log linear function log Y= a+ bt and not the linear one Y= a+ bt .

It is obvious that if the linear rate of growth is constant over the period, the compound rate of growth cannot be constant; in fact the former implies a declining compound rate of growth. This is made the basis for fitting both the linear and nonlinear and if the linear function yields a higher value of R^2 than the log linear function, it is taken as evidence that the compound rate of growth over the period is not constant but is declining. If the value of R^2 in both the case is equal hen it is difficult to decide whether the rate of growth is constant or declining. Therefore, it

is illogical choosing between the linear and log linear functions on the basis of R^2 values. In this study, the analysis is carried out with the log linear function only as it directly gives the compound growth rates, which are more sensible.

All the growth rates during 1970-71to1999-2000 have been estimated on the basis of five yearly moving averages because the secular trends in the cropped area production and yield of the various crops are found out by removing the short-term fluctuations. The data of area and production have been taken for all the districts of Rajasthan for nine major crops. Growth of cropped area, under the crop (for all nine crops) and its yield are the two main factors responsible for the growth in the production. For analysis all the districts have been divided into four categories on the basis of growth in production of crops. The four categories are as follows:

-

1.Districts showing positive significant growth in production due to positive significant growth in cropped area as well as yield per hectare.

2. Districts showing positive significant growth in production due to positive significant growth in cropped area but yield per hectare is either non-significant or negative significant.

3. Districts showing positive significant growth in production due to positive significant growth in yield per hectare cropped area but growth in cropped area is either non-significant or negative significant.

4. Districts showing negative significant growth in production.

Bajra

Bajra's performance in terms of growth has been very good, compound growth rate in Bajra is 3.1 percent and it is due to rise in yield. Growth rate in production is positive for most of the districts and it is due to growth in yield per hectare, area is mostly stagnant because it has grown

in dry areas, so area expansion is not possible but due to improvement in the varieties of it yield growth rate is positive.

In the first category, one can finds that there are five districts namely Banswara, Bundi, Chittorgarh, Jaipur and Jaisalmer, which have shown positive significant growth in production due to positive significant growth in cropped area as well as yield per hectare during 1970-71 to 1999-2000. Among these districts Banswara and Chittorgarh shows high rate of growth by growth rate of cropped area in these two districts growth in yield per hectare is also high than other districts. Other three districts Bundi, Jaipur and Jaisalmer shows high rate of growth in production dominantly by the growth rate in yield.

In the second category, there are fourteen districts showing positive growth in production due to positive growth in cropped area during 1970-71 to 1999-2000.These are Alwar, Bharatpur, Bhilwara, Bikaner, Churu, Jalor, Jhunjhunu, Jodhpur, Nagaur, Pali, Swai-madopur, Sikar, Sirohi and Tonk. Among these districts, Sirohi is the only case where area under the cropped shows negative significant growth rate, though three more districts Jalor, Nagaur and Pali shows negative growth rate but it is not significant. Bikaner shows highest growth rate followed by Churu, Jhunjhunu, Nagaur Sikar and Sirohi it is interesting that five of them are related to desert part of Rajasthan. Remaining districts shows positive but not significant growth in cropped area.

In the third category, three districts Ajmer, Kota and Udaipur which shows positive significant growth in production of Bajra due to positive significant growth in yield per hectare during this period. All these three districts show positive but not significant growth in yield per hectare. Kota shows highest growth rate and Ajmer shows lowest in this category. No one districts are not lies in desert part of state.

Four districts can be located under the fourth category Barmer, Jhalawar, Dungerpur and Ganganeger. Barmer has negative significant growth due to negative growth in area under cropped in Bajra during 1970-71to 1999-2000.Though yield shows positive, Only one district Jhalawar, shows negative significant growth in production because of negative growth in yield per hectare. Growth rate in area under the cropped is negative but not significant. Dungarpur and Ganganagar shown non-significant growth of production during this period. In both districts growth rate of yield is positive and significant but area under the cropped shows negative significant growth

Jowar

Jowar has a mixed picture of the growth rates of under the study period. Fifteen districts show positive growth in production and eleven districts shows negative growth in output. Growth in yield per hectare is positive in most of the districts only Dungerpur and Ganganagar shows negative growth rate in yield per hectare. The reason behind it, the farmers cultivate it for the green food for chattels and thy cut it before time.

In the first category, one finds that there are five districts namely Banswara, Bundi, Chittorgarh, Jaipur and Jaisalmer, which have show n positive significant growth in production due to positive significant growth in cropped area as well as yield per hectare during 1970-71 to 1999-2000. Among these districts Pali, Bhilwara, Jodhpur and Jalor shows high rate of growth cropped area and the districts, which shows high rate of growth in yield per hectare as compared to Ajmer, Bhilwara and Jodhpur districts. Other three districts Sirohi, Jalor and Jaisalmer shows high rate of growth in production.

In the second category, there are two districts showing positive growth in production due to positive growth in cropped area during 197071 to

1999-2000.These are Dungarpur and Bikaner Among these districts Dungarpur is a case which shows negative significantgrowth rate in yield.

In the third, category four districts Barmer, Nagaur, Udaipur and Jaipur which shows positive significant growth in production of jowar due to positive significant growth in yield per hectare during this period. All these three districts did not show significant growth in area under the cropped. Udaipur shows highest growth rate and Nagour shows lowest in this category. Two districts lie in desert part of state are Barmer and Nagour.

Ten districts fall under forth category. Eight of them are namely Bundi, Chittorgarh, Jhallawar, Churu, Jhunjhunu, Kota, Swai-Madopur and Sikar which have negative significant growth due to negative significant growth in area under cropped in Bajra during 1970-71to 1999-2000. Though yield shows positive significant growth rate in five districts, which are Jhalawar, Churu, Ganganagar, Banswara and Tonk. Only Jhalawar and Churu did not shows any significant growth rate. Ganganagar district shows negative significant growth in production because of negative significant growth in yield per hectare. Growth rate in area under the cropped is positive and significant. But it is very interesting that too much growth rate in area cannot afferent and two districts which show non-significant growth of production during this period. These are Banswara and Tonk in both districts growth rate of yield per hectare is positive and significant but area under the cropped shows negative significant growth. We also see from the result that the growth rate of production has reported non-significant growth rate.

Maize

Performance in terms of growth in yield has been very good in Maize. Growth rate in yield per hectare is positive in most of the districts though the variation in growth has wide range of variation. Only eight districts shows positive growth rate.

In the first category, one finds that there are six districts namely Bhilwara, Banswara, Bundi, Chittorgarh, Jhalawar and Kota which have shown positive significant growth in production due to positive significant growth in cropped area as well as yield per hectare during 1970-71 to 1999-2000. Among these districts Bundi and Jhalawar shows high rate of growth by growth in cropped area in these two districts. Growth in yield per hectare is also high then other districts. Other three districts shows high rate of growth in production dominantly by the growth rate in yield. Only Kota shows high rate of growth in production dominantly by the growth rate area under the cropped.

In the second category, only one Udaipur district shown positive growth in production due to positive growth in cropped area during 197071 to 1999-2000.

In the third category, eight districts which shows positive significant growth in production of Bajra due to positive significant growth in yield per hectare during this period. These are Alwar, Barmer, Dungerpur, Jalor, Pali, Swai Madhopur, Sirohi and Tonk All these eight districts shows negative significant or non-significant growth in yield per hectare. Barmer shows highest growth rate and jalor shows lowest in this category. If we talk about yield per hectare Swai Madhopur is on the top with 6.68 percent and followed by Alwar, Barmer and Jalor.

In forth category, there are ten which have witnessed negative significant growth. There are three districts, which have witnessed negative significant growth due to negative significant growth in production due to negative significant growth in cropped area as well as yield per hectare they are Bikaner and Churu, Bikaner shows highest negative growth in production, higher negative growth in area under the crop. Two districts Jhunjhunu and Jodhpur, which have negative significant growth due to negative significant growth in area under cropped in Maize during 1970-71to 1999-2000.Though yield shows positive significant and six districts which shown non-significant growth of production during this period. These are Ajmer, Bharatpur, Ganganagar, Jaipur, Nagour and Sikar. Four districts of them in this category growth rate of yield is positive and significant which is good sign but area under the cropped shows negative significant growth and we see the result of this on the production as non significant growth rate.

Wheat

Wheat production growth rate has recorded one of the highest growth rates, thanks to new tub-well seed technology in area with assured irrigation. Wheat output increased at an average rate of 4.21 perpent per annum. Growth in production and yield in case of what for al districts shows positive, only fourteen districts shows positive growth.

In the first category, one finds that there are thirteen districts namely Alwar, Bhilwara, Banswara, Bundi, Churu, Dungerpur, Ganganagar, Jaipur, Jaiselmer, Nagour, Sikar and Udaipur, which have show positive significant growth in production due to positive significant growth in cropped area as well as yield per hectare during 1970-71 to 19992000. Among these districts Churu, Banswara, Jhujhunu, Sikar andshows high

rate of growth due growth rate of cropped area. In two districts Ganganagar and Jaiselmer growth in yield per hectare was high than other districts.

In the second category, only one district Bikaner has shown positive growth in production due to positive growth in cropped area during 1970-71 to 1999-2000.

In the third category, districts which shows positive significant growth in production of Bajra due to positive growth in yield per hectare during this period. These districts are Ajmer, Barmer, Bharatpur, Chittorgarh, Jalor, Jhalawar, Jodhpur Kota Sikar Pali Swai Madhopur Sirohi Tonk All. these twelve districts shows negative significant or non-significant growth in area under the crop. Jhalawar shows highest growth rate and jalor shows lowest in this category.

Barley

Table 4.5 shows very bed performance of the growth in production of Barley, most of the districts show negative growth rate in production and growth rate in area. But growth rate in yield is positive for all districts.

In the first category, it has been seen that there are three districts namely Bikaner, Churu and Jaisalmer, which have shown positive growth in production due to positive growth in cropped area as well as yield per hectare during 1970-71 to 1999-2000. Among these district Bikaner shows high rate of growth in area under crops and growth in yield per hectare is also higher then other districts. In Jaiselmer area under the cropped is highest in this category.

In the third category, districts which shows positive growth in production of Barley due to positive growth in yield per hectare during this period. Only Ganganager lies in this category. Though in this districts growth rate

in yield per hectare is high but negative growth rate in area under the crop makes it insignificant.

Twenty-two districts can be located under the forth category. Seventeen districts namely Ajmer, Alwar, Barmer, Bharatpur, Bundi, Dungarpur, Jaipur, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Swai-Madopur, Sirohi, Tonk and Udaipur which have negative significant growth due to negative significant growth in area under cropped in Barley during 1970-71to 1999-2000, though-yield shows positive significant. In all districts expect Udaipur Jodhpur those shows non-significant growth rate and five districts have been shown non-significant growth of production during this period. These are Banswara, Bhilwara, Chittorgarh, Jalor and Sikar. Four districts of them in this category growth rate of yield is positive and significant which is a good sign but area under the cropped shows negative growth and we see the result of this on the production as non significant growth rate these are Banswara, Bhilwara, Chittorgarh and Sikar.

Sesamum

Growth in yield is positive for all the districts and growth in yield has wide variation. Growth in output is positive for most of the districts only five districts shows negative growth rate in output but it has vide range of variation. In case of growth rate in area is it positive for some districts.

In the first category, one finds that there are seven districts namely Bhilwara, Bikaner, Ganganagar, Jaisalmer, Jhunjhunu, Nagaur and Sikar, which have shown positive significant growth in production due to positive significant growth in cropped area as well as yield per hectare during 1970-71 to 1999-2000. Among these districts Ganganagar shows high rate of growth in production by both growth rate of cropped area and growth in yield per hectare than other districts. In this categorygrowth in

production is more than 10% in four districts as name are Bikaner, Ganganagar, Jhunjhunu and Sikar.

In the third category, there are twelve districts, which shows positive significant growth in production of Barley due to positive significant growth in yield per hectare during this period these are Ajmer, Alwar, Bharatpur, Bundi, Churu, Jaipur, Jalor, Jodhpur, Pali, S .Madopur, Sirohi and Tonk.

In the forth category, one can find seven districts. Four districts of them are Banswara, Dungarpur, Jhalawar and Kota which have negative growth in production due to negative growth in area under cropped in Barley during 1970-71to 1999-2000. Though yield shows positive significant in all districts. Three districts which shown non-significant growth of production during this period. These are Barmer, Chittorgarh and Udaipur.

Mustard

Growth rate in mustard has recorded highest growth rate in production. Growth rate in yield is positive for all the districts except Dungerpur, and growth in yield has not wide variation. Growth is positive for all the districts and it has widest variation. This is the only crop, which shows all component of growth positive for all districts.

We can find very interesting things in growth rates of production of mustard. All the districts show positive growth in production. In the first category, one finds that there are twenty-five districts namely Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Swai-Madopur, Sikar, Sirohi, Tonk and Udaipur which have shown positive growth in production due to positive growth in cropped area as well as yield per hectare during 1970-

71 to 1999-2000. Among these districts, ten districts show more then 20 percent rate of growth in production and this is dominantly by the growth rate area under the cropped. These are Ajmer, Bhilwara, Bundi, Chittorgarh, Churu, Jaipur, Jaisalmer, Jhalawar, Kota and Tonk. Growth rate in yield per hectare is highest in S Madopur that is 4.6 per hectare and minimum 1.29 percent in Bikaner. This can easily understood by anyone that heavy variation in growth has increased mainly due to increase in gross cropped area. This shows a fact that after introducing HYV more and more lend is shifted under cultivation of mustard.

In the second category, only one district Dungarpur shown positive growth in production due to positive growth in cropped area and negative growth rate in yield per hectare during 1970-71 to 1999-2000

Gram

Fifty percent, districts growth in output is positive. Growth in yield is positive for most of the districts; growth rate in area under the crop is negative for most of the districts.

In the first category one finds that there are five districts namely, Bikaner, , Jhalawar and Sikar which have show positive growth in production due to positive growth in cropped area as well as yield per hectare during 1970-71 to 1999-2000. Among these districts Bhilwara and Jaisalmer shows high rate of growth in production. In these two districts growth rate of cropped area is dominated besides this growth rate in yield per hectare is also high. Growth rate in area in Barmer is very high i.e., 19.5 percent per annum.

In the second category, only Churu district which shown positive growth in production due to positive growth in cropped area during 197071 to 1999-2000.

In the third category, seven districts namely Ajmer, Banswara, Chittorgarh, Dungarpur, Jhunjhunu, Pali and Tonk which shows positive growth in production of Gram due to positive growth in yield per hectare during this period. Five out of these districts shows not significant growth in. area under the cropped. Ajmer and Dungarpur shows negative highest growth rate

Thirteen districts fall under the forth category. Six districts Alwar, Barmer, Bharatpur, Jodhpur, Kota and Swai-Madopur which have negative significant growth due to negative significant growth in area under cropped in Bajra during 1970-71to 1999-2000.Though yield shows positive significant growth rate in five districts and only Kota shows not significant growth rate, and seven districts which shown non-significant growth of production during this period. These are Bundi Ganganagar Jaipur Jalor Nagaur Sirohi and Udaipur. Four out of these districts names are Bundi Jalor Nagaur Sirohi Udaipur growth rate of yield per hectare is positive and significant which is good sign but area under the cropped shows negative significant growth and we see the result of this on the production as non significant growth rate.

Cotton

The cotton recorded an average growth rate negative 5.55 percent per annum. Nine districts have shown positive growth rate in output, remaining seventeen districts have shown negative growth rate in output as well as area. Growth in yield is negative for all the districts and growth in yield has vide variation.

In the second category, there are nine districts which show positive growth in production due to positive growth in cropped area during 1970-71 to 1999-2000.These are Alwar, Bikaner, Churu, Jaipur, Jaisalmer, Jhunjhunu, Kota, Nagaur and Sikar. Among these districts Alwar,

Bikaner, Churu, Jhunjhunu and Sikar are those districts where growth rate in yield show negative significant but growth in cropped area is very high which makes positive growth rate in production.

There are twelve districts, which have shown negetive growth rate in production can be located in forth category. There are nine districts which have witnessed negative significant growth due to negative growth in production due to negative growth in cropped area as well as yield per hectare. These are Ajmer, Banswara, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jhalawar, Tonk and Udaipur. Among these nine districts Dungarpur and Jhalawar show highest negative growth in production and higher negative growth in area under the crop, and five districts which shows negative growth in production because of negative growth in yield per hectare. These are Ganganagar, Jalor, Pali, S Madopur and Sirohi where growth rate in area under the cropped is positive. Ganganagar Jalor and Sirohi but it is not effective. Three districts namely Barmer Bharatpur and Jodhpur which shown non-significant growth of production during this period. In all these districts growth rate of yield per hectare is positive which is good sign but area under the cropped shows negative significant growth and we see the result of this on the production as non-significant growth rate.

SUMMARY AND FINDING

The positive impact of new technology on the growth of wheat is observed with the stagnant growth in area and positive growth in output is just because of growth in yield per hectare. It has been examined that growth of production of Jowar, Maize, Barley, sesamum, mustered, gram and cotton has been mainly due to growth of area under these crops.

Only Ganganagar district in Jowar show that negative growth in production is due to negative growth in yield only. It has been observed that growth of production of Bajra, wheat, some districts in sesamum and some in Gram has been mainly because of growth of area under these crop. Growth rate in yield is positive for all the distrcits for all eight crops except cotton, exceptional districts are Churu in Gram, Bikaner and Churu in Maize, Durgapur in Jower and Barmer in Bajra. Given districts shows negative growth rate in yield.

Mustard shows good picture of growth rate in production and its components. It shows very high growth rate in production, which is mostly influenced by the growth rate in area.

Growth of area in fifty percent of the districts under Barley, maize, Sesamum and gram shows negative growth rate. And same in the case in Bajra, Jowar and Cotton.

Table: 4.1Growth of production, area, and, yield of Bajara in Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Banswara	9.72	5.20	5.21
Bundi	5.30	3.40	1.81
Chittorgarh	7.65	3.94	4.23
Jaipur	4.48	2.94	1.57
Jaisalmer	3.95	2.38	1.65
Secound category			
Alwar	3.98	3.49	0.65
Bharatpur	2.91	3.09	0.49
Bhilwara	3.52	3.61	0.11
Bikaner	6.90	6.46	0.06
Churu	4.70	4.65	0.10
Jalor	2.13	2.54	-0.24
Jhunjhunu	4.97	4.13	0.87
Jodhpur	3.36	2.72	0.34
Nagaur	4.33	4.43	-0.12
Pali	1.87	2.31	-0.39
S.Madopur	3.76	3.59	0.35
Sikar	5.02	4.45	0.69
Sirohi	3.10	4.93	-1.27
Tonk	4.06	3.65	0.38
Third category			
Ajmer	2.20	0.92	1.23
Kota	3.30	0.58	2.97
Udaipur	2.64	0.13	2.80
Forth category			
Barmer	-1.24	-1.25	-0.30
Jhalawar	-7.77	3.40	-11.05
Dungarpur	-0.55	3.48	-3.34
Ganganagar	0.50	4.07	-3.15
RAJASTHAN	3.10	3.14	0.12

Table: 4.2Growth of production, area, and, yield of Jowarin Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Ajmer	6.91	5.93	1.01
Alwar	3.55	3.15	1.75
Bharatpur	4.18	3.21	1.43
Bhilwara	8.91	5.03	3.88
Jaisalmer	6.47	4.88	2.41
Jalor	7.53	4.70	3.15
Jodhpur	9.91	7.23	3.53
Pali	6.86	1.54	6.36
Sirohi	7.42	4.93	2.30
Secound category			
Dungarpur	7.74	-4.15	15.24
Bikaner	4.31	0.76	3.56
Third category			
Barmer	4.21	4.73	-0.11
Nagaur	3.51	4.27	-0.66
Udaipur	5.11	4.38	0.61
Jaipur	4.01	4.28	-0.30
Forth category			
Bundi	-2.86	2.14	-4.36
Chittorgarh	-2.58	1.38	-4.08
Churu	-13.36	0.87	-13.33
Jhalawar	-4.71	0.79	-4.17
Jhunjhunu	-4.17	2.43	-7.13
Kota	-3.92	2.89	-6.75
S.Madopur	-4.05	1.81	-5.47
Sikar	-11.52	3.17	-14.23
Ganganagar	-7.37	-8.75	17.60
Banswara	0.21	1.20	-2.36
Tonk	0.16	1.16	-1.09
RAJASTHAN	-0.88	1.23	-1.49

Table: 4.3Growth of production, area, and, yield of Maize in Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Banswara	4.85	2.79	1.79
Bhilwara	2.54	1.19	1.27
Bundi	4.34	2.11	2.17
Chittorgarh	3.45	1.74	1.65
Jaisalmer	7.64	2.67	5.34
Jhalawar	4.25	2.36	1.85
Kota	3.42	1.16	2.26
Udaipur	2.05	0.26	1.74
Third category			
Alwar	3.84	3.95	-0.16
Barmer	4.64	3.24	-0.28
Dungarpur	1.19	1.53	-1.91
Jalor	1.01	3.12	-2.80
Pali	1.15	1.46	-0.36
S.Madopur	3.27	6.68	-3.31
Sirohi	2.45	2.63	-0.28
Tonk	1.29	2.86	-1.45
Forth category			
Bikaner	-4.27	-1.19	-6.24
Churu	-2.40	-1.57	-4.52
Jhunjhunu	-6.50	4.48	-11.01
Jodhpur	-8.32	3.34	-11.91
Ajmer	0.98	1.57	-0.96
Bharatpur	-0.58	4.20	-4.89
Ganganagar	0.00	0.00	0.00
Jaipur	-0.64	2.68	-3.11
Nagaur	-0.69	3.33	-3.83
Sikar	-0.97	4.57	-5.60
RAJASTHAN	2.27	-1.38	3.98

Table: 4.4Growth of production, area, and, yield of Wheat in Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Alwar	5.96	3.73	2.28
Banswara	8.45	3.50	4.67
Bhilwara	5.67	4.01	1.54
Bundi	5.48	4.03	1.48
Churu	12.07	2.98	9.12
Dungarpur	4.03	2.48	1.55
Ganganagar	6.03	4.93	1.24
Jaipur	6.23	2.83	3.43
Jaisalmer	8.07	4.56	3.08
Jhunjhunu	9.42	3.86	5.56
Nagaur	5.16	3.81	1.27
Sikar	9.21	3.58	5.60
Udaipur	3.89	2.28	1.71
Secound category			
Bikaner	12.84	0.37	12.73
Third category			
Ajmer	2.59	2.75	-0.18
Barmer	3.37	4.34	-0.76
Bharatpur	4.68	4.15	0.56
Chittorgarh	4.29	3.81	0.38
Jalor	1.28	2.23	-1.03
Jhalawar	5.43	4.61	0.84
Jodhpur	1.80	3.74	-1.89
Kota	3.39	3.99	-0.56
Pali	2.52	2.25	-0.31
S.Madopur	4.29	4.07	0.24
Sirohi	2.40	3.66	-0.88
Tonk	3.37	4.07	-0.70
RAJASTHAN	4.21	2.96	1.85

Table: 4.5Growth of production, area, and, yield of Barley in Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Bikaner	7.66	4.76	3.46
Churu	5.80	4.60	2.55
Jaisalmer	2.54	2.09	8.83
Third category			
Ganganagar	1.26	7.65	-6.53
Forth category			
Ajmer	-1.96	2.28	-4.23
Alwar	-5.18	1.85	-6.96
Barmer	-1.08	2.27	-12.96
Bharatpur	-5.80	3.21	-8.85
Bundi	-3.73	3.32	-7.04
Dungarpur	-2.86	2.22	-5.08
Jaipur	-1.32	3.43	-2.90
Jhalawar	-4.79	2.82	-7.63
Jhunjhunu	-2.79	2.24	-5.37
Jodhpur	-8.34	0.99	-2.49
Kota	-3.17	3.10	-6.22
Nagaur	-1.20	2.23	-3.45
Pali	-7.83	1.75	-9.50
S.Madopur	-6.91	3.35	-10.06
Sirohi	-4.79	2.88	-5.59
Tonk	-5.07	1.52	-6.47
Udaipur	-2.40	0.65	-3.41
Banswara	-0.50	2.40	-3.27
Bhilwara	-0.95	2.65	-3.70
Chittorgarh	-0.15	2.73	-2.97
Jalor	0.07	0.88	-0.60
Sikar	-0.38	1.62	-1.98
RAJASTHAN	-1.84	3.36	-5.18

Table: 4.6Growth of production, area, and, yield of Sesamumin Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Bhilwara	4.73	3.55	1.02
Bikaner	11.63	6.80	3.89
Ganganagar	18.10	7.42	9.88
Jaisalmer	7.66	3.85	5.41
Nagaur	4.20	2.52	1.18
Sikar	10.73	3.16	7.54
Jhunjhunu	11.71	3.35	8.57
Third category			
Ajmer	6.33	6.40	0.13
Alwar	1.24	3.42	-2.05
Bharatpur	3.33	2.33	0.73
Bundi	2.62	6.05	-3.13
Churu	8.01	7.65	0.82
Jaipur	1.58	1.85	-3.91
Jalor	2.11	3.93	-1.18
Jodhpur	2.83	2.08	0.52
Pali	2.08	2.72	-0.62
S.Madopur	2.50	5.16	-2.56
Sirohi	4.35	5.20	-0.36
Tonk	2.51	4.55	-2.34
Forth category			
Banswara	-6.16	4.44	-10.03
Dungarpur	-4.61	3.09	-7.94
Jhalawar	-2.48	3.33	-5.86
Kota	-1.59	3.04	-4.60
Barmer	-0.47	0.48	-2.17
Chittorgarh	0.46	2.75	-2.26
Udaipur	0.44	1.17	-0.78
RAJASTHAN	2.51	2.63	-0.30

Table: 4.7Growth of production, area, and, yield of Mustardin Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Ajmer	26.77	2.78	24.17
Alwar	10.90	3.86	6.99
Banswara	9.21	2.18	5.31
Barmer	9.21	3.77	7.69
Bharatpur	10.45	3.37	7.20
Bhilwara	29.34	3.41	25.79
Bikaner	10.11	1.29	8.99
Bundi	26.71	3.36	23.60
Chittorgarh	33.21	3.45	29.91
Churu	21.56	3.66	18.06
Ganganagar	10.27	3.64	6.71
Jaipur	21.48	4.09	17.20
Jaisalmer	30.23	3.52	26.62
Jalor	9.62	3.58	5.70
Jhalawar	43.76	2.74	41.66
Jhunjhunu	16.40	3.07	13.75
Jodhpur	16.09	3.48	12.69
Kota	31.54	4.30	27.34
Nagaur	19.02	4.24	14.31
Pali	12.85	2.98	9.70
S.Madopur	17.23	4.60	12.73
Sikar	14.92	3.44	11.63
Sirohi	10.59	4.23	6.34
Tonk	23.54	2.26	21.20
Udaipur	9.76	2.45	7.56
Third category			
Dungarpur	10.41	-2.72	14.58
RAJASTHAN	14.23	3.41	10.14

Table: 4.8Growth of production, area, and, yield of Gram in Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
First category			
Bhilwara	5.39	2.79	2.60
Bikaner	23.76	4.78	19.55
Jaisalmer	8.44	3.31	5.24
Jhalawar	2.78	1.27	1.56
Sikar	3.72	1.48	2.39
Secound category			
Churu	5.39	-1.06	6.02
Third category			
Ajmer	1.37	2.83	-1.30
Banswara	3.81	3.51	-0.14
Chittorgarh	2.51	2.68	-0.11
Dungarpur	2.35	3.97	-1.81
Jhunjhunu	1.57	3.67	-0.98
Pali	2.13	1.90	0.31
Tonk	1.11	1.04	0.18
Forth category			
Alwar	-2.37	1.04	-3.45
Barmer	-1.47	1.45	-2.23
Bharatpur	-4.41	1.30	-5.76
Jodhpur	-1.55	2.34	-3.68
Kota	-2.31	0.85	-2.97
S.Madopur	-1.20	2.31	-2.96
Bundi	-0.60	1.86	-2.49
Ganganagar	-0.51	0.24	-0.74
Jaipur	-0.54	0.85	-1.26
Jalor	0.45	1.00	-0.49
Nagaur	-0.18	2.10	-2.33
Sirohi	0.21	1.42	-1.08
Udaipur	-0.06	1.05	-1.10
RAJASTHAN	3.15	-0.33	4.23

Table: 4.9 Growth of production, area, and, yield of Cotton in Rajasthan during 1970-71 to 1999-2000

	production	yield per hactare	area under the cropped
Secound category			
Alwar	18.27	-6.91	25.67
Bikaner	16.05	-8.63	26.25
Churu	12.94	0.06	12.25
Jaipur	6.21	-5.99	12.27
Jaisalmer	19.90	-0.69	20.49
Jhunjhunu	11.67	-4.51	16.77
Kota	3.71	-5.99	9.69
Nagaur	3.70	-5.07	9.69
Sikar	10.59	-6.91	17.26
		Forth category	
Ajmer	-10.51	-8.55	-2.04
Banswara	-11.03	-3.21	-6.37
Bhilwara	-8.94	-4.64	-3.09
Bundi	-13.36	-4.47	-7.50
Chittorgarh	-18.88	-3.95	-13.49
Dungarpur	-23.03	-5.53	-16.74
Jhalawar	-22.73	-4.38	-17.14
Tonk	-15.66	-6.45	-9.20
Udaipur	-14.28	-6.91	-6.65
Ganganagar	-3.50	-6.91	4.06
Jalor	-4.33	-6.45	1.87
Pali	-5.53	-5.07	0.25
S.Madopur	-4.56	-5.53	2.48
Sirohi	-5.53	-5.53	0.22
Barmer	0.66	-6.57	7.00
Bharatpur	0.90	-5.09	5.73
Jodhpur	-0.73	-6.45	5.79
RAJASTHAN	-5.55	-5.99	2.13

CHEPTER- V

ACCELARATION AND DECELARATION IN GROWTH OF FOODCROPS

semi log function fitted in the last chapter as :-

$\log Y = a + bt$.....(1)

Where 'a' is intercept, 'b' is regression coefficient,' T' is time, 'Y' is dependent variable such as area/ production/ yield per hectare. It gives uniform growth rate over the period. However growth rate need not be uniform over the period.

Therefore to analyze acceleration and deceleration in growth, the following quadratic function has been fitted such as: -

$\log Y = a + bt + ct^2$.....(2)

where b and c are coefficient of t and t^2 respectively. Coefficient of t shows growth and t2 shows acceleration and deceleration in growth rates.

It should be noted that the function (1) is a special case of the function (2) when c=0. Hence to judge whether the rate of growth is uniform, one needs to test whether c is significantly different from zero. The test involves that whether the improvement in R^2 due to introduction of the additional parameter c is statistically significant or not. Further depending upon the sign of c, it can be inferred weather growth rate is increasing or decreasing.

There is said to be a problem of multicollinearity posed by fitting $\log Y = a + bt + ct^2$ because of correlation between t and t^2 and it is sought to be resolved by measuring time (t) not from the beginning of the first year

(calling the first year) but from the mid point of the period namely (n+1/2). If we refer to time so measured by t, then its square (t^2) are orthogonal and it makes for some convenience in the estimation of parameter and the subsequent test of significance. Hence, the procedure may be adopted. But this should not cause an impression that the normal procedure of measuring time from beginning of the first year is somehow erroneous because multicollinearity. Either procedure would give the same results. Moreover, while the shifting of zero of time to the mid point of the period has certain computational convenience, it may be more then outweighed by the requirement that there should be no gap in the time series. The correlation between t and t^2 will not cause any more problems then a minor computational inconvenience and does not deserve special attention on that account.

In examine the acceleration and deceleration in growth rate all the twenty-six districts of Rajasthan have been taken into consideration and these districts have been classified into four categories on the basis of their sign and statistical significance of the coefficientt and coefficient of t^2, The growth in area ,production and yield have been calculated for nine major crops across districts in Rajasthan-

Category 1: Districts showing positive growth at increasing rate. In this category coefficients of t and t^2 both will be positive output will increases monotonically.

Category 2: Districts showing positive growth at decreasing rate. In this category coefficients of t will be positive significant but coefficient of t^2 will be negative.

Category 3: Districts showing negative growth at decreasing rate. In this category coefficients of t will be negative significant but coefficient of t^2 will be positive significant.

Category 4: Districts showing negative growth at increasing rate. In this category coefficients of t and t^2 both will be negative significant output will decreases monotonically.

GROWTH PERFORMECE IN AREA UNDER DIFFERENT CROPS

BAJRA

The results shows that there are three districts in the first category i.e. area under the Bajra is shows positive growth at increasing rate over the period. These are Banswara, Jaisalmer and Udaipur. It is interesting to know that Jaisalmer is.a desert district , but recorded positive in area. This may be effect of Rajasthan Canal. The regression function is a good fit for all the districts in this category.

There are fifteen districts in the second category, which have shown that area under Bajra has increased at declining rate during 1970-71to 1999-2000. These all districts Ajmer, Alwar, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Jaipur, Jhunjhunu, Jodhpur, Kota, S Madopur, Sikar and Tonk. Four of them Bikaner, Chittorgarh, Churu and Jodhpur belong to western part of Rajasthan which experiences below normal rainfall, and six districts Alwar, Bharatpur, Kota, S Madopur, Sikar and Tonk are in eastern part of Rajasthan which experiences normal rainfall. It has been observed that under less risky conditions, farmers always prefer to grow high yielding varieties of other

crops. This may be due to availability of improved irrigation facilities. The regression function is good fit for all the districts in this category.

In the third category, only one district Ganganagar which has shown that area under Bajra has declined at declining rate during the study period. Since this is arid crop with rise in irrigation facilities farmers shift it by HYV of other crops. The regression function is good fit for this districts
In the fourth category there are seven districts Barmer, Dungarpur, Jalor, Jhalawar, Nagaur, Pali, and Sirohi, which have shown negative growth at increasing rate in area under the Bajra. In all these districts area under the Bajra is being shifted towards other high yielding varieties of other crops. Barmer district is irrigated through Rajasthan Canal. Jhalawar is belong to plateau part which is a high rainfall zone. The regression function is good fit for all the districts in this category.
Rajasthan at aggregate level belongs to first category i.e. area under the Bajra is shows positive growth at increasing rate over the period.

JOWAR

Seven districts in Rajasthan shows positive growth in area under the jowar at increasing rate over the period. They are Bharatpur, Bikaner, Dungarpur, Ganganagar, Jaisalmer, Jalor and Jodhpur. It is interesting that Bikaner Ganganagar Jaisalmer Jodhpur are belonging to desert part of Rajasthan. The regression function is good fit for all the districts in this category.

There are six districts in the second category, which have shown that area under Jowar has increased at declining rate during 1970-71to 1999-2000.These districts include Ajmer, Alwar, Bhilwara, Pali, Sirohi and Udaipur. All these districts belong to eastern part of Rajasthan which experiences normal rainfall. It has been observed that under less risky conditions, farmers always prefer to grow high yielding varieties of other crops. The regression function is good fit for all the districts in this category.

In the third category, only one district Jhunjhunu which has shown that area under jowar has declined at declining rate during the study period. Since this is arid crop with rise in irrigation facility farmers tend to grow HYV of other crops.

The districts Banswara, Barmer, Bundi, Chittorgarh, Churu, Jaipur, Jhalawar, Kota, Nagaur, S Madopur, Sikar and Tonk which have shown negative growth at increasing rate in area under the Jowar. In all twelve districts area under the Jowar is shift toward other high yielding varieties.

MAIZE

The results show that there are two districts registered positive growth at increasing rate over the period. They are Jaisalmer and Udaipur. It is interesting that Jaisalmer belongs to desert part of Rajasthan. The positive growth in area may be due to utilizetion of water from Rajasthan Canal.

There are seven districts in the second category, which have shown that area under Maize has increased at declining rate during 1970-71to 1999-2000.These all districts Banswara, Bhilwara, Bundi, Chittorgarh, Jhalawar and Kota. Only one of them Jhunjhunu is belong to western part of Rajasthan which experiences below normal rainfall, and remaining six districts Banswara Bhilwara Bundi Chittorgarh Jhalawar and Kota belong to eastern part of Rajasthan. It has been normally observed that under less risky conditions, farmers always preferred to grow high yielding varieties of other crops. This is clearly effect of improved irrigation facilities. The regression function is good fit for all the districts in this category.

In the third category, only two district Ajmer and Churu which has shown that area under maize has declined at declining rate during the study period. Since this is arid crop with rise in irrigation facility farmer shift it by HYV of other crops. The regression function is good fit for both districts.

The fourth category include sixteen districts Alwar, Barmer, Bharatpur Bikaner Dungarpur Jaipur Jalor Jodhpur, Nagaur, Pali, S Madopur, Sikar, Sirohi and Tonk, which have shown negative growth at increasing rate in area under the maize. Farmers shift area under maize crop to other high yielding varieties crops becouse of availability of irrigation facilities in all these districts.

WHEAT

Eleven districts in Rajasthan recorded positive growth in the area under wheat at increasing rate over the period. These are Bharatpur, Bhilwara, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaisalmer,

Jhalawar, Nagaur and Udaipur. It is interesting that five of nemely are Chittorgarh, Churu, Ganganagar, Jaisalmer and Nagaur belong to desert part of Rajasthan. and other six remaining are belonging eastern part of Rajasthan. The regression function is good fit for all the districts in this category.

There are seven districts in the second category, which have shown that area under wheat has increased at declining rate during 1970-71to 1999-2000.These districts Alwar, Banswara, Jaipur, Jhunjhunu, Swai-Madopur and Sikar. Only two of them Bikaner and Jhunjhunu is belong to western part of Rajasthan which experiences below normal rainfall zone , and remaining five districts Alwar Banswara Jaipur Swai Madopur and Sikar belong to eastern part of Rajasthan which is a normal rainfall zone .Under less risky conditions, farmers prefer to grow high yielding varieties of other crops. The regression function is good fit for all the districts in this category.

Seven districts namely Ajmer, Barmer, Jalor, Jodhpur, Kota, Pali and Sirohi. Area under wheat has declined at declining rate during the study period. Since this is water consuming crop with lack of irrigation facility farmer shift it by HYV of other arid crops like gram. The regression function is good fit for all districts.

In the fourth category there is only one district Tonk, which have shown negative growth at increasing rate in area under the wheat. Decline in wheat area in this district can be attributed to spread of commercial crops.

BARLEY

The results shows that there are only two districts in which area under the barley is shows positive growth at increasing rate over the period. These are Bikaner and Jaisalmer. It is interesting that both are belonging to desert part of Rajasthan, but the increase in area under barley crop in these districts is due to presence of Rajasthan cenal.

Only Churu district fall in the second category, which have shown that area under barley has increased at declining rate during 1970-71to 1999-2000.This district is belong to western part of Rajasthan.

Seventeen districts viz. Ajmer, Bhilwara, Chittorgarh, Dungarpur, Ganganagar, Jaipur, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur have shown that area under barley has declined at declining rate during the study period. Since this is water consuming crop with lack of irrigation facilities farmers shift it by HYV of other arid crops. The regression function is good fit for all districts.

In the fourth category there are six districts Alwar, Banswara, Barmer, Bharatpur, Bundi and S Madopur, which have shownnegative growth at increasing rate in area under the barley. In these districts area under the barley is shift toward other crops due to irrigation facities. Though all districts belong to western part which experiences normal rainfall, but may be due to other crops. The regression function is good fit for these districts in this category.

Sesamum

Five districts fall in the first category i.e. area under the sesamum is shows positive growth at increasing rate over the period. These are Ajmer Churu Ganganagar Jaisalmer and Jodhpur. It is interestingthat three of them are Bikaner ,Jhunjhunu and Nagaur are belonging to desert part of Rajasthan and remaining are belonging to eastern part of Rajasthan.
There are six districts in the second category, which have shown that area under sesamum has increased at declining rate during 1970-71to 1999-2000.These districts Bharatpur, Bhilwara, Bikaner, Jhunjhunu, Nagaur and Sikar. Only one of them Bikaner belong to western part of Rajasthan which records below normal rainfall, and remaining five districts belong to eastern part of Rajasthan.

Third category comprises six districts Barmer, Jaipur, Jalor, Pali, Swai-Madopur and Sirohi which has shown that area under sesamum has declined at declining rate during the study period. Since this is water consuming crop with lack of irrigation facilities farmers shift it by HYV of other arid crops. The regression function is good fit for all districts.

In the fourth category there are nine districts Alwar, Banswara, Bundi, Chittorgarh, Dungarpur, Jhalawar, Kota, Tonk and Udaipur, which have shown negative growth at increasing rate in area under the sesamum. Farmers in these districts shift the area under the sesamum to commercial crops due to availability of irrigation facilities.

Mustard

Sixteen districts fall in the first category i.e. area under the mustard is shows positive growth at increasing rate over the period. They are Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Churu, Dungarpur, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Nagaur, Swai-Madopur and Sirohi The districts Barmer Bikaner Churu Jaisalmer Jhunjhunu and Nagaur are belonging to desert part of Rajasthan and other remaining districts are belong to eastern part of Rajasthan which experiences high or normal rainfall.

There are ten districts in the second category, which have shown that area under mustard has increased at declining rate during 1970-71to 1999-2000.These districts include Ajmer, Chittorgarh, Ganganagar, Jhalawar, Jodhpur, Kota, Pali, Sikar, Tonk and Udaipur. Only Jodhpur belong to western part of Rajasthan which experiences below normal rainfall, and remaining five districts belong to eastern part of Rajasthan.

Gram

The results show that five districts in Rajasthan recorded positive growthin area under gram at increasing rate over the period. They are Bhilwara, Jaisalmer, Pali, Sikar and Tonk. It is interesting to note that Jaisalmer is belongs to desert part of Rajasthan. However the increase in area in Jaselmer under gram is due to the effect of Rajasthan Canal and other irrigation projects, the remaining districts are belonging eastern part of Rajasthan which experiences high or normal rainfall zone .

There are three districts in the second category, which have shown that area under gram has increased at declining rate during 1970-71to 1999-2000. Bikaner and Churu belong to western part of Rajasthan which experiences below normal rainfall and Jhalawar district belong to eastern part of Rajasthan which experiences normal rainfall. It has been

observed that under less risky conditions, farmers always prefer to grow high yielding varieties of this crop in place of other crops.

In the third category, thirteen districts namely Ajmer, Alwar, Barmer, Bharatpur, Dungarpur, Jaipur, Jalor, Jhunjhunu, Jodhpur, Nagaur, S Madopur, Sirohi and Udaipur which has shown that area under gram has declined at declining rate during the study period. Since this is arid crop with improvement in irrigation facility farmer shift it by HYV of other crops like wheat and mustard.

Five districts fall in fourth category Banswara Bundi Chittorgarh Ganganagar and Kota, which have shown negative growth at increasing rate in area under the gram. The area under the gram is being shifted toward the cultivation of commercial crops due to availability of irrigation facilities The regression function is good fit for all districts in this category.

Cotton

Thrteen districts shows that area under the cotton is increasing at increasing rate over the period. They are. Alwar, Barmer, Bharatpur, Churu, Jaisalmer, Jalor, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Swai-Madopur and Sirohi It is interesting that five of them Barmer, Churu, Jaisalmer, Jodhpur and Jhunjhunu are belonging to desert part of Rajasthan. The positive growth in area due to Rajasthan Canal and other irrigation projects. The regression function is good fit for all the districts in this category.

There are four districts in the second category, which have shown that area under cotton has increased at declining rate during 1970-71to

1999-2000.They are Bikaner, Ganganagar, Jaipur and Sikar. Only two of them Bikaner and Ganganagar belong to western part of Rajasthan which experiences below normal rainfall, and remaining Jaipur district belong to eastern part of Rajasthan which experiences normal rainfall. Under less risky conditions, farmers always prefer to grow high yielding varieties of this crop in place of other crops. This is water-consuming crop and its growth is depend on improved irrigation facilities. The regression function is good fit for all the districts in this category.

In the third category, six districts Banswara, Bhilwara, Bundi, Chittorgarh, Dungarpur and Udaipur which have shown that area under cotton has declined at declining rate during the study period. Since this is water consuming crop with improvement in irrigation facility farmer shift toward it by HYV of crops. The regression function is good fit for all districts.

Three districts comes under fourth category namely the Ajmer, Jhalawar and Tonk, which have shown negative growth at increasing rate in area under the cotton. In these districts area under the cotton is shift toward other crops due to irrigation facilities. Though all districts record normal rainfall At all Rajasthan level in cotton belong to first category i.e. area under the crop is rise increasing rate.

GROWTH PERFORMENCE IN PRODUCTION OF DIFFERENT CROPS

BAJRA

There are sixteen districts in of bajra shows positive growth at increasing rate over the period. They are. Ajmer, Banswara, Bikaner, Churu, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jodhpur, Kota Nagaur, Sikar, Sirohi, Tonk and Udaipur It is interesting that four of them Churu, Jaisalmer, Jodhpur and Jhunjhunu are belonging to desert part of Rajasthan. The increase in production is due to Rajasthan Canal and other irrigation projects.the remaining districts are belonging eastern part of Rajasthan which experiences high or normal rainfall. The regression function is good fit for all the districts in this category.

There are nine districts in the second category, which have shown that production of bajra has increased at declining rate during 1970-71to 1999-2000.These districts include Alwar, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Jhunjhunu, Pali and S Madopur. Only two of them Barmer and Jhunjhunu belong to western part of Rajasthan which experiences below normal rainfall, and remaining all other district belong to eastern part of Rajasthan which experiences normal rainfall. It has been noted that under less risky conditions, farmers always prefer to grow high yielding varieties of other crops becouse this is arid crop. The regression function is good fit for all the districts in this category.

In the third category, only one district Dungarpur which has shown that production of bajra has declined at declining rate during the study period. Since this is arid crop with improvement in irrigation facility farmer shift toward other crops by HYV of crops. At all rajasthan level

production of crop is increasing at increasing rate. The regression function is good fit for this district in this category.

JOWAR

In eight districts the. production of jowar is positive growth at increasing rate over the period. These are. Ajmer, Alwar, Bharatpur, Bikaner, Jaipur, Jodhpur, Nagaur and Sirohi It is interesting that three of them Bikaner Jodhpur Nagaur are belonging to desert part of Rajasthan. There are nine districts in the second category, which have shown that production of jowar has increased at declining rate during 1970-71to 1999-2000.They are Banswara, Barmer, Bhilwara, Dungarpur, Jaisalmer, Jalor, Pali, Tonk and Udaipur. Only two of them Barmer and Jaisalmer belong to western part of Rajasthan which experiences below normal rainfall, and remaining all other district belong to eastern part of Rajasthan. The regression function is good fit for all the districts in this category.

In the third category, only one district Jhunjhunu which has shown that production of jowar has declined at declining rate during the study period. Since this is arid crop with improvement in irrigation facility farmer shift toward other crops by HYV of crops.

Eight districts comes under fourth category Bundi, Chittorgarh, Churu, Ganganagar, Jhalawar, Kota, Swai- Madopur and Sikar, which have shown negative growth at increasing rate in production of jowar. In these districts production of jowar is shift toward other crops due to irrigation

facilities. Though all districts occur normal rainfall zone but may be due to other commercial crops.

At all rajasthan level in production of jowar is declining at increasing rate.

MAIZE

The results show that there are two districts in the first category i.e. production of maize is shows positive growth at increasing rate over the period. These are. Banswara and Dungarpur This may be due to the effect of irrigation projects. The regression function is good fit for all the districts in this category.

There are fourteen districts in the second category, which have shown that production of maize has increased at declining rate during 1970 71to 1999-2000.These districts are Ajmer, Alwar, Barmer, Bhilwara, Bundi, Chittorgarh, Jalor, Jhalawar, Kota, Pali, S Madopur, Tonk, Sirohi and Udaipur. Only one of them Barmer belong to western part of Rajasthan which experiences below normal rainfall and remaining all other district belong to eastern part of Rajasthan which experiences normal rainfall. Under less risky conditions, farmers always preferred to grow high yielding varieties of other crops. The regression function is good fit for all the districts except Jalor in this category.

In the third category, only two districts Churu and Jaisalmer have shown that production of maize has declined at declining rate during the study period. Since with improvements in irrigation facility farmer shift toward other HYV crops. The regression function is good fit for both districts.

In the fourth category there are eight districts Bharatpur, Bikaner, Ganganagar, Jaipur, Jhunjhunu, Jodhpur, Nagaur and Sikar, which have shown negative growth at increasing rate in production of maize. In these districts production of maize is shift toward other crops due to availabilities of irrigation facilities. At all Rajasthan level in production of maize is increasing at declining rate.

WHEAT

The results show that there are eighteen districts in the first category i.e. production of wheat is shows positive growth at increasing rate over the period. These are. Ajmer, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Churu, Dungarpur, Jaisalmer, Jalor, Jhalawar, Jodhpur, Kota, Nagaur, Pali, Sirohi, Tonk and Udaipur. The regression function is good fit for all the districts in this category.There are eight districts in the second category, which have shown that production of wheat has increased at declining rate during 1970-71to 1999-2000.These districts includes Alwar, Banswara, Bikaner, Ganganagar, Jaipur, Jhunjhunu, Swai- Madopur and Sikar. Only two of them Bikaner and Jhunjhunu belong to western part of Rajasthan which experiences below normal rainfall, and remaining all other district belong to eastern part of Rajasthan which experiences normal rainfall. It has been normally observed that under less risky conditions, farmers always prefer to grow high yielding varieties of this crop in place of other crops.The regression function is good fit for all the districts except Jalorin this category.

BARLEY

Three districts in production of barley is recorded positive growth at increasing rate over the period. They are Bikaner, Ganganagar, Jaisalmer,. All three districts are located in desert part of Rajasthan. The regression function is good fit for all the districts in this category.

There is only one district Churu fall in the second category, which have shown that production of barley has increased at declining rate during 1970-71to 1999-2000.This belongs to western part of Rajasthan which is below normal rainfall zone. It has been normally observed that under less risky conditions, farmers always preferred to grow high yielding varieties of other crops. The regression function is good fit for this districts.

In the third category, there are sixteen districts Ajmer, Barmer, Bhilwara, Dungarpur, Jaipur, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur which have shown that production of barley has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of wheat. The regression function is good fit for both districts.

In the fourth category there are seven districts Alwar, Banswara, Bharatpur, Bundi, Chittorgarh and S Madopur, which have shown negative growth at increasing rate in production of barley. In these districts production of barley is being shifted toward other crops like wheat and mustard, due to irrigation facilities. The regression function is good fit for all districts in this category except Banswara. At all Rajasthan level in barley this is belonging to forth category.

SESAMUM

Nine districts showd positive growth at increasing rate in production of sesamum over the period. These are Ajmer, Bikaner, Ganganagar, Jaipur, Jalor, Jodhpur, Nagaur, Swai- Madopur and Sirohi. Four of them belong to desert part of Rajasthan and they are Bikaner, Ganganagar, Jodhpur and Nagaur. The regression function is good fit for all the districts in this category except Jaipur.

There are thirteen district Alwar, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Churu, Jaisalmer, Jhunjhunu, Pali, Sikar, Tonk and Udaipur come in the second category, which have shown that production of sesamum, has increased at declining rate during 1970-71to 1999-2000.Four of them Barmer, Churu, Jaisalmer and Jhunjhunubelong to western part of Rajasthan which experiences below normal rainfall. Under less risky conditions, farmers always prefer to grow high yielding varieties of this crop in place of other crops. The regression function is good fit for all these districts except Tonk.

In the third category, there are four districts viz, Banswara, Dungarpur, Jhalawar and Kota which have shown that production of sesamum has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of other crops. The regression function is good fit for all districts.At all Rajasthan level production of sesamum is increasing at increasing rate.

MUSTARD

The results shows that there are five districts in the first category i.e. production of mustard is shows positive growth at increasing rate over the period. These are Banswara, Jaisalmer, Jalor, Jhunjhunu and Sirohi. Two of them are belong to desert part of Rajasthan these are Jaisalmer and Jhunjhunu. This is effect of Rajasthan Canal in desert part and other irrigation projects. This is also effect of support given under technology operation from government of India. The regression function is good fit for all the districts in this category

There are twenty one district Ajmer, Alwar, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jhalawar, Jodhpur, Kota, Nagaur, Pali, S Madopur, Sikar, Tonk and Udaipur in the second category, which have shown that production of mustard has increased at declining rate during 1970-71to 1999-2000.Four of them Barmer Churu Ganganagar Jodhpur and Nagaur belong to western part of Rajasthan which experiences below normal rainfall. It has been observed that under less risky conditions, farmers always preferred to grow high yielding varieties of this crop in place of other crops. The regression function is good fit for all these districts. At all Rajasthan level in mustard belong to second category

GRAM

The results show that there are twelve districts fall in the first category i.e. production of gram is shows positive growth at increasing rate over the period. They are. Ajmer, Barmer, Bhilwara, Bikaner, Dungarpur, Jaisalmer, Jalor, Jhunjhunu, Pali, Sikar, Sirohi and Tonk. Four of them belong to desert part of Rajasthan namely Barmer, Bikaner, Jaisalmer

and Jhunjhunu. The regression function is good fit for all the districts in this category.

There are four district Banswara, Chittorgarh, Churu and Jhalawar fall in the second category, which have shown that production of gram has increased at declining rate during 1970-71to 1999-2000.One of them Churu belong to western part of Rajasthan which experiences below normal rainfall zone . It has been normally observed that under less risky conditions, farmers always preferred to grow high yielding varieties of other crops. The regression function is good fit for all these districts.

In the third category, there are ten districts Alwar, Bharatpur, Bundi, Ganganagar, Jaipur, Jodhpur, Kota, Nagaur, Swai- Madopur and Udaipur which has shown that production of gram has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of other crops. The regression function is good fit for all districts. At all rajasthan level in gram this is belong to third category

COTTON

Five districts of Rajasthan come in the first. They are. Alwar, Bharatpur, Churu and Jaisalmer. Two of them belong to desert part of Rajasthan these are Churu and Jaisalmer. The regression function is good fit for all the districts in this category.There are six districts Bikaner, Jaipur, Jhunjhunu, Kota, Nagaur and Sikar fall in the second category, which have shown that production of cotton increased at declining rate during 1970-71to 1999-2000.Three of them Bikaner, Jhunjhunu and Nagaur belong to western part of Rajasthan which experiences below normal rainfall. It has been normally observed that under less risky conditions, farmers always preferred to grow high yielding varieties of other crops in

place of this crops. The regression function is good fit for all these districts.

In the third category, there are thirteen districts Ajmer, Barmer, Bhilwara, Bundi, Chittorgarh, Ganganagar, Jalor, Jhalawar, Jodhpur, Pali, Sirohi, Tonk and Udaipur which has shown that production of cotton has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of other crops. The regression function is good fit for all districts.

GROWTH PERFORMENCE IN YIELD OF DIFFERENT CROPS

BAJRA

Twenty-one districts showd positive growth in yield of bajra at increasing rate over the period. They are. Ajmer, Banswara, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, S Madopur, Sikar, Sirohi, Tonk and Udaipur It is interesting to notice that five of them Churu, Jaisalmer, Jodhpur, Jhunjhunu and Nagour are belonging to desert part of Rajasthan and remaining districts are belonging eastern part of Rajasthan. However the positive growth in yield is due to Rajasthan Canal and other irrigation projects. The regression function is good fit for all the districts in this category.

There are four districts in the second category, which have shown that yield of bajra has increased at declining rate during 1970-71to 1999 2000.These districts includes Alwar, Ganganagar, Kota and Pali. Only Ganganagar belong to western part of Rajasthan This is arid crop and its

growth is not depending on improved irrigation facilities. The regression function is good fit for all the districts in this category.

In the third category, only one district Barmer that has shown that yield of bajra has declined at declining rate during the study period. Since this is arid crop with improvement in irrigation facilities farmers shift toward other crops by HYV of crops. At all rajasthan level in bajra this is belonging to second category. The regression function is good fit for this district in this category.

JOWAR

The results shows that there are eight districts in the first category i.e. yield of jowar is shows positive growth at increasing rate over the period. They are. Ajmer, Alwar, Bundi, Jaipur, Jhalawar, Jodhpur, Nagaur and Swai- Madopur It is interesting that two of them Jodhpur and Nagaur are belonging to desert part of Rajasthan and remaining districts are belonging eastern part of Rajasthan which experiences high or normal rainfall. The regression function is good fit for all the districts in this category.

There are fifteen districts in the second category, which have shown that yield of jowar has increased at declining rate during 1970-71to 1999-2000.They are Barmer, Bharatpur, Bhilwara, Bikaner, Chittorgarh, Churu, Jaisalmer, Jalor, Jhunjhunu, Kota, Pali, Sikar, Sirohi, Tonk and Udaipur. Five of them Barmer, Bikaner, Churu, Jaisalmer and Jhunjhunu belong to western part of Rajasthan and remaining all other

district, belong to eastern part of Rajasthan. This is arid crop and its growth is not depending on improved irrigation facilities the regression function is good fit for all the districts in this category.

In the third category, only one district Banswara that has shown that yield of jowar has declined at declining rate during the study period. Since this is arid crop with improvement in irrigation facility farmer shift toward other crops by HYV of crops. The regression function is good fit for this district.

In the fourth category there are two districts Dungarpur and Ganganagar, which have shown negative growth at increasing rate in yield of jowar. In these districts yield of jowar is shift toward other crops due to irrigation facilities. At all Rajasthan level in.yield of jowar is increasing at declining rate. The regression function is good fit for these districts in this category.

MAIZE

Eight districts in the first category i.e. yield of maize is shows positive growth at increasing rate over the period. These are Ajmer, Banswara, Barmer, Bundi, Dungarpur, Ganganagar, Jaipur and Kota The regression function is good fit for all the districts in this category.

There are sixteen districts in the second category, which have shown that yield of maize has increased at declining rate during 1970-71to 1999 2000.These districts Alwar, Bharatpur, Bhilwara,, Chittorgarh, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Pali, S

Madopur, Sikar, Sirohi, Tonk, and Udaipur,. Four, one of them Jaisalmer, Jhunjhunu, Jodhpur and Nagaur belong to western part of Rajasthan which experiences below normal rainfall and remaining all other district belong to eastern part of Rajasthan which experiences normal rainfall. Under less risky conditions, farmers always preferred to grow high yielding varieties of other crops. The regression function is good fit for all the districts in this category.

In the third category, only one districts Bikaner that has shown that yield of maize has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops. The regression function is good fit for this district.

In the fourth category there is only one district Churu, which has shown negative growth at increasing rate in yield of maize. In this district area of maize is shift toward other crops due to irrigation facilities.At all rajasthan level in maize this is belonging to forth category. The regression function is good fit for this districts.

WHEAT

The results show that there are twelve districts in the first category i.e. yield of wheat is shows positive growth at increasing rate over the period. These are Banswara, Barmer, Bhilwara, Churu, Dungarpur, Ganganagar, Jaipur, Jalor, Jhalawar, Jodhpur, Sirohi and Tonk. The increase in yield of wheat may be due to irrigation projects and spread of new fertilizer and technology. The regression function is good fit for all the districts in this category.

There are fourteen districts in the second category, which have shown that yield of wheat has increased at declining rate during 1970-71to 1999-2000.They are Ajmer, Alwar, Bharatpur, Bikaner, Bundi, Chittorgarh, Jaisalmer, Jhunjhunu, Kota, Nagaur, Pali, S Madopur, Sikar and Udaipur. Four of them Bikaner, Jaisalmer, Jhunjhunu and Nagaur are belong to western part of Rajasthan and remaining all other district belong to eastern part of Rajasthan. It has been normally observed that under less risky conditions, farmers always preferred to grow high yielding varieties of this crop in place of other crops. The regression function is good fit for all the districts in this category. At all Rajasthan level in barley this is belonging to second category i.e. yield of crop is inclining at decreasing rate.

BARLEY

Sixteen districts show positive growth at increasing rate over the period. These are Banswara, Barmer, Bhilwara, Bundi, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Kota, Nagaur, Pali, S Madopur, Sikar, Sirohi, Tonk and Udaipur. Four of them belong to desert part of Rajasthan they are Barmer Ganganagar Jaisalmer and Nagaur. The increase in yield of Barley may be due to effect of Rajasthan Canal and other irrigation projects and new fertilizer and technology. The regression function is good fit for all the districts in this category.

There are ten districts in the second category namely Ajmer, Alwar, Bharatpur, Bikaner, Chittorgarh, Churu, Jalor, Jhalawar, Jhunjhunu are Jodhpur, which have shown that yield of barley has increased at declining rate during 1970-71to 1999-2000.Four of them are belong to western part of Rajasthan. It has been normally observed that under less risky conditions, farmers always prefer to grow high yielding varieties of other crops in place of this crop. The regression function is good fit for

these districts.At all Rajasthan level in barley this is belonging to second category.

SESAMUM

The results show that there are ten districts in the first category i.e. yield of sesamum is shows positive growth at increasing rate over the period. These are. Ajmer, Barmer, Bikaner, Bundi, Jaipur, Jhunjhunu, Jodhpur, Nagaur, Swai- Madopur and Sirohi. Five of them are belong to desert part of Rajasthan these are Barmer Bikaner Jhunjhunu Jodhpur and Nagaur. The regression function is good fit for all the districts in this category except Jaipur.

There are fifteen district Alwar, Bharatpur, Bhilwara, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaisalmer, Jalor, Jhalawar, Kota, Pali, Sikar, Tonk and Udaipur in the second category, which have shown that yield of sesamum has increased at declining rate during 197071to 1999-2000.Three of them Churu Ganganagar and Jaisalmer belong to western part of Rajasthan. The regression function is good fit for all these districts except Tonk.

In the third category, there is only one district Banswara, which has shown that yield of sesamum, has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of other crops. The regression function is good fit for this districts.

At all rajasthan level in sesamum this is belonging to first category.

MUSTARD

The results show that there are nine districts in the first category. These are. Ganganagar, Jalor,Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Sikar, Sirohi and Udaipur. Three of them are belong to desert part of Rajasthan and they are Jhunjhunu, Jodhpur and Nagaur. This may be effect of Rajasthan Canal and other irrigation projects and new fertilizer and technology. The regression function is good fit for all the districts in this category

There are fifteen districts Ajmer, Alwar, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Jaipur, Jaisalmer, Kota, Pali, Swai-Madopur and Tonk in the second category, which have shown that yield of mustard has increased at declining rate during 1970-71to 1999-2000.Four of them Barmer Bikaner Churu and Jaisalmer belong to western part of Rajasthan which experiences below normal rainfall.Under less risky conditions, farmers always preferred to grow high yielding varieties of this crop in place of other crops. The regression function is good fit for all these districts.

In the third category, there is only two districts Banswara and Dungarpur which have shown that yield of sesamum has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of other crops. The regression function is good fit for both districts. At all rajasthan level in mustard this is belonging to second category.

GRAM

The results shows that there are nine districts in the first category i.e. yield of gram is shows positive growth at increasing rate over the period.

These are. Banswara, Bharatpur, Bhilwara, Bikaner, Jalor, Nagaur, Pali, Swai- Madopur and Sikar. Two of them are belong to desert part of Rajasthan these are Bikaner and Nagaur. The regression function is good fit for all the districts in this category

There are sixteen districts Ajmer, Alwar, Barmer, Bundi, Chittorgarh, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jhalawar, Jhunjhunu, Jodhpur, Kota, Sirohi, Tonk and Udaipur fall in the second category, which have shown that yield of gram has increased at declining rate during 1970-71to 1999-2000.Five of them are Barmer Ganganagar Jaisalmer Jhunjhunu Jodhpur belong to western part of Rajasthan. The regression function is good fit for all these districts.

In the fourth category there is only one district Churu, which have shown negative growth at increasing rate in production of gram. The regression function is good fit for this district. At all rajasthan level in gram this is belong to third category i.e. yield of crop is decreasing at decreasing rate.

COTTON

In the third category, there are only two districts Jaisalmer Jhalawar, which has shown that yield of cotton, has declined at declining rate during the study period. Since with improvement in irrigation facility farmer shift toward other HYV crops of other crops. The regression function is good fit for all districts.

In the fourth category there are twenty four districts Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jalor, Jhunjhunu, Jodhpur,

Kota, Nagaur, Pali, S Madopur, Sikar, Sirohi, Tonk and Udaipur, which have shown negative growth at increasing rate inproduction of cotton. In these districts production of cotton is shift toward other crops due to lack of irrigation facilities required for this crop. Though all districts loceted in normal rainfall zone, but it cannot fulfill the water requirement of this crop as a result this crop has been replaced by other crops.At all rajasthan level in cotton this is belong to fourth category.

SUMMARY AND FINDING

It has been observed that area, production and yield of the crops has different pictures. It is not possible to present the analysis on aggregate basis for all the crops. Therefore it has been decided to present the analysis for individual crop.

Growth rate of area under the Bajra, wheat and mustered has been increasing at an increasing rate. Growth rate in area under the crop is increasing in most of the districts may be increasing at decreasing rate in the Bajra, wheat, mustered and cotton. All districts incase of mustered have shown positive growth either increasing or decreasing. Only eight districts show negative growth in case of wheat all other districts shows positive growth rate. Eleven districts with increasing rate and seven districts at decreasing rate. Growth rate is positive at declining rate in most of the districts in Bajra where positive at increasing rate in cotton. This may be due to assured irrigation by canal system development or by the tube wells or these districts are located in relatively humid zones. Growth rate of average area under the Jowar, Maize and Sesamum is negative at increasing rate. In all these cases one third to fifty per cent districts have shown positive growth rate remaining districts shows negative growth rate may be increasing or decreasing. In Jowar and Maize most of the districts shows negative growth rate at increasing rate but sesamum shows a mixed picture for all four category.

Growth rate in area under Barley is negative at a decreasing rate. 90 per cent of districts shows negative growth rate most of the districts can be categorized under the same category i.e. negative growth at increase rate. Growth rate at average level area under Gram is positive at increasing rate and most of the districts shows negative growth rate at declining rate.

Average growth rate of production is positive at increasing rate in Bajra and sesamum, positive at decreasing rate in Maize, Wheat, mustered, Negative at decreasing rate in gram, negative at increasing rate in Jowar, Barley and cotton. Growth in production of Bajra, wheat, sesamum and mustered have shown mostly same picture first and second category cover, either all or most of the districts. Let we take individual cases growth of production in Bajra and wheat growth is positive at increasing rate in most of the districts it means first category is very large. On the other hand in the case of sesamum and mustered, second category is very large and mostly districts shows positive growth at declining rate. Growth in production of Jowar, maize and gram showing negative growth rate are present in a significant numbers but positive growth showing districts are large in number. In case of production of maize second category is dominant it means most of the districts shows positive growth at increasing rate. In case of gram first category in large, but in case of Jower we can see a mixed picture no clear dominance of any category. Growth rates under Barley and cotton production are negative in most of the districts.

Growth in yield does not have such type of complication as in growth of area and production. Cotton shows negative growth rate in all the districts and most of the districts shows negative growth rate at increasing rate. All remaining eight major crops have shown more or less same trend. Except some districts, which are very, few in number all the districts shows positive growth. In case of bajra and Barley first category is large and in remaining crops namely Jowar, maize, wheat , sesamum, mustered and

gram the second category is very large in numbers. This trend shows that irrigation facilities imposed in the most of the districts in some places canal system is developed and where it not possible tube wells are set to assure irrigation.

Table: 5.1 Acceleration and deceleration of growth in area under the Bajara (1970-71 to 1999-2000)
Fundamental from: log Y =a + bt +ct²

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Banswara	0.01131*	0.000326	0.216
	2.351	***0.908***	
Jaisalmer	0.00359*	0.000224*	0.312
	2.483	2.07	
Udaipur	0.006072	8.39E-05	.117
	1.715	.317	
Second category: Positive growth at declining rate			
Ajmer	0.002678*	-3.3E-05	.237
	2.345	**1.289**	
Alwar	0.001401*	-6E-05**	0.514
	4.284	-2.344	
Bharatpur	0.001061*	-0.0004*	0.337
	0.663	-3.357	
Bhilwara	0.000244*	-0.00046*	0.266
	0.114	-2.881	
Bikaner	0.000127*	-2.6E-06*	0.004
	0.295	***-0.08***	
Bundi	0.003919*	-0.00055*	0.419
	1.91	-3.596	
Chittorgarh	0.00919*	-0.00075*	0.545
	3.553	-3.87	
Churu	0.000226	-5.7E-06	0.036
	0.875	***-0.293***	
Jaipur	0.003413*	-7.9E-06	0.564
	5.449	***-0.168***	
Jhunjhunu	0.001894*	-6.4E-05*	.511
	4.467	*-2.031*	
Jodhpur	0.000728**	2.28E-05	.208
	2.266	***.949***	
Kota	0.006447*	9.56E-05	.629
	6.13	***1.217***	
S.Madopur	0.000761*	-0.00011*	.503
	2.252	-4.271	

Sikar	0.0015*	2.71E-06	.33
	3.363	***.081***	
Tonk	0.00082	-5.5E-05	.051
	.831	***-.741***	

Third category: Negative growth at declining rate

Ganganagar	-0.00684*	0.000182*	0.945
	-18.665	6.658	

Forth category: Negative growth at increasing rate

Barmer	-0.00066**	-5.3E-05**	0.244
	-1.843'	-2.01	
Dungarpur	-0.00726***	-0.00013	0.147
	-1.935	***-0.482***	
Jalor	-0.00052	-0.00012*	0.214
	-0.778	-2.378	
Jhalawar	-0.02399*	-0.00116*	.985
	-32.311	-20.874	
Nagaur	-0.00027	-5.3E-05*	.241
	-.948	*-2.528*	
Pali	-0.00085*	-6.7E-05*	.048
	-.738	-.779	
Sirohi	-0.00277*	4.58E-06	.12
	-1.771	***.039***	
RAJASTHAN	0.000261	3.36E-05	.074
	.681	***1.176***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.2 Acceleration and deceleration of growth in area under the jowar (1970-71 to 1999-2000)

Fundamental from: $\log Y = a + bt + ct^2$

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Bharatpur	0.003112*	0.000114*	0.455
	3.937	*1.931*	
Bikaner	0.007739*	0.000194	0.46
	4.198	***1.407***	
Dungarpur	0.03309**	0.000593	0.907
	14.528	***3.482***	
Ganganagar	0.03822*	0.001776*	0.76
	7.247	4.51	
Jaisalmer	0.005226*	0.000112	0.271
	2.813	***0.808***	
Jalor	0.006838*	-0.00011	.602
	5.759	**-1.257**	
Jodhpur	0.00766*	0.000476*	.755
	6.476	5.391	
Second category:Positive growth at declining rate			
Ajmer	0.002202*	-0.00018*	.66
	6.428	1.824	
Alwar	0.003802*	-4.7E-05	0.299
	3.089	***-0.511***	
Bhilwara	0.008428*	-0.00035**	0.539
	4.535	-2.503	
Pali	0.0138*	-0.00057*	.47
	3.952	*-2.193*	
Sirohi	0.005001*	-0.00028*	.571
	4.421	-3.33	
Udaipur	0.001321	-0.00012	.115
	1.116	***-1.324***	
Third category : Negative growth at declining rate			
Jhunjhunu	-0.01548*	5.72E-05	.39
	-3.834	***.19***	

Forth category : Negative growth at increasing rate

Banswara	-0.00512**	-0.00105*	0.731
	-2.71	-7.425	
Barmer	-0.00024	-0.0001	0.063
	-0.222	***-1.224***	
Bundi	-0.00946*	-0.00043*	0.936
	-15.639	-9501	
Chittorgarh	-0.00886*	-0.00031*	0.956
	-20.279	-9.559	
Churu	-0.02893*	-0.00012	0.93
	-17.495	***-0.935***	
Jaipur	-0.00065	-0.00027*	0.491
	-0.82	-4.643	
Jhalawar	-0.00905*	-0.00078*	.649
	-4.274	-4.933	
Kota	-0.01466*	-0.00046*	.983
	-33.54	-14.016	
Nagaur	-0.00143*	-8.3E-05*	.156
	-1.628	-1.26	
S.Madopur	-0.01187*	-0.00065*	.967
	-20.792	-15.262	
Sikar	-0.03089*	-0.00064	.585
	-5.498	***-1.527***	
Tonk	-0.00237*	-0.00021*	.879
	-8.305	-9.871	
RAJASTHAN	-0.00323*	-0.0001*	.585
	-5.262	-2.191	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.3 Acceleration and deceleration of growth in area under the Maize (1970-71 to 1999-2000)

Fundamental from :log Y =a + bt +ct²

Disticts	b	c	R-square
First category: Positive growth at increaasing rate			
Jaisalmer	0.1428***	0.03647	0.787
	2.449	***-2.259***	
Udaipur	0.003784*	9.57E-05*	.94
	17.928	6.127	
Second category: Positive growth at declining rate			
Banswara	0.000388*	-6.4E-05*	0.901
	14.124	-3.12	
Bhilwara	0.002748*	-3.6E-07	0.927
	17.147	***-0.3***	
Bundi	0.004718*	-0.00031*	0.906
	11.132	-9.84	
Chittorgarh	0.003579*	-5.2E-05*	0.97
	27.156	-5.328	
Jhalawar	0.004019*	-0.00318*	.922
	11.346	-12.028	
Jhunjhunu	0.0239*	-0.0006*	.85
	10.816	-3.611	
Kota	0.004897*	-0.00044*	.94
	12.182	-14.613	
Third category : Negative growth at declining rate			
Ajmer	-0.00208*	9.69E-06	.558
	-'5.345	***.682***	
Churu	-0.00969*	0.000232	0.347
	-3.21	***1.54***	
Forth category: Negative growth at increasing rate			
Alwar	-0.00036	-4.5E-05*	0.264
	-1.461	-2.473	
Barmer	-0.00061	-0.00011	0.036
	-0.361	***0.847***	
Bharatpur	-0.01061*	-2.3E-05	0.848

	-11.344	***-0.33***	
Bikaner	-0.01354*	-0.0021*	0.929
	-7.504	-15.606	
Dungarpur	-0.00416*	-6.6E-06*	0.186
	-2.238	-0.478	
Jaipur	-0.00675*	-0.00011*	0.903
	-14.339	-3.053	
Jalor	-0.00607*	-0.00013*	.408
	-3.831	**-1.085**	
Jodhpur	-0.02585*	-0.00034*	909
	-14.88	-2.627	
Nagaur	-0.00831*	2.75E-05	.68
	-4.448	***1.197***	
Pali	-0.00079***	-0.00015*	.487
	-1.697	-4.352	
S.Madopur	-0.00718*	-0.00035*	.788
	-7.763	-5.033	
Sikar	-0.01216*	-0.0002**	.807
	-9.581	-2.069	
Sirohi	-0.00062	-0.00018*	.301
	-.773	-3.052	
Tonk	-0.00315*	-3.8E-05	.762
	-8.479	***-1.367***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.4 Acceleration and deceleration of growth in area under the wheat (1970-71 to 1999-2000)
Fundamental from :log Y =a + bt +ct²

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Bharatpur	0.001211*	8.58E-05*	0.532
	3.712	3.523	
Bhilwara	0.003345*	0.000141*	0.652
	5.715	3.234	
Bundi	0.003211*	0.0001*	0.845
	10.327	4.321	
Chittorgarh	0.000819**	0.000134*	0.585
	2.366	5.183	
Churu	0.0198*	0.000564*	0.806
	9.132	3.483	
Dungarpur	0.003363*	3.38E-06	0.42
	4.079	***0.055***	
Ganganagar	0.002691*	0.000179*	0.85
	8.538	-7.602	
Jaisalmer	0.006696*	0.001113*	0.717
	3.129	6.966	
Jhalawar	0.001819*	0.000163*	.885
	8.515	10.229	
Nagaur	0.002767***	0.000278*	.383
	2.258	3.032	
Udaipur	0.003704*	0.000158**	.502
	4.18	2.383	
Second category: Positive growth at decliningrate			
Alwar	0.004941*	-0.00011**	0.806
	9.389	-2.686	
Banswara	0.01014*	-0.00011*	0.984
	36.777	-5.255	
Bikaner	0.02764*	-0.00031*	0.959
	22.954	-3.481	
Jaipur	0.007439*	-0.00012*	0.887
	13.173	-2.805	

Jhunjhunu	0.01208*	-0.00025*	.889
	13.121	-3.594	
S.Madopur	0.000527*	-4.2E-05	.104
	1.121	***-1.184***	
Sikar	0.01215*	-0.00012*	.95
	20.781	-2.755	

Third cetegory : Negetive growth at declining rate

Ajmer	-0.00039*	0.000152*	.536
	4.995	1.287	
Barmer	-0.00164*	0.000312*	0.585
	-2.084	5.3	
Jalor	-0.00223*	0.000176*	.487
	-3.214	3.39	
Jodhpur	-0.0041*	9.94E-05*	.371
	-3.5	***1.138***	
Kota	-0.00121*	0.000142*	.622
	-3.311	5.19	
Pali	-0.00068	0.000348*	.391
	-.552	3.807	
Sirohi	-0.00191	0.000325*	.42
	-1.645	3.733	

Forth category : Negative growth at increasing rate

Tonk	-0.00152*	-1.6E-05*	.253
	-2.764	***.694***	
RAJASTHAN	0.004022*	6.45E-05***	.776
	8.732	*1.875*	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.5 Acceleration and deceleration of growth in area under the Barley (1970-71 to 1999-2000)

Fundamental from :log Y =a + bt +ct^2

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Bikaner	0.007521*	0.000663*	0.632
	4.061	4.79	
Jaisalmer	0.01917*	0.00187*	0.315
	1.98	2.585	
Second category: Positive growth at declining rate			
Churu	0.005527	-0.00031	0.057
	0.941	***-0.71***	
Third cetegory : Negetive growth at declining rate			
Ajmer	-0.00919*	0.000364*	.624
	-4.829	3.854	
Bhilwara	-0.00804*	0.000102*	0.924
	-16.501	2.801	
Chittorgarh	-0.00644*	5.58E-05*	0.803
	-9.616	1.116	
Dungarpur	-0.01102*	2.34E-05	0.736
	-8.004	***0.227***	
Ganganagar	-0.01417*	0.000414*	0.827
	-9.757	3.815	
Jaipur	-0.00629**	0.000177**	0.852
	-10.763	4.058	
Jalor	-0.0013	0.000633	.133
	-.287	***1.854***	
Jhalawar	-0.01656*	0.000173*	.96
	-23.27	3.259	
Jhunjhunu	-0.01165*	0.000106	.552
	-5.285	***.641***	
Jodhpur	-0.0054*	0.000968*	.315
	-1.252	3.005	
Kota	-0.0135*	0.000206*	.972
	27.437	-5.614	
Nagaur	-0.0075*	0.000221*	.77
	-8.178	3.226	

Pali	-0.02063*	7.59E-05	.944
	-19.607	***.965***	
Sikar	-0.0043*	0.000123*	.757
	-7.9	3.009	
Sirohi	-0.01214*	0.000188**	.849
	-11.148	.187	
tonk	-0.01404*	6.06E-05*	.973
	-28.481	1.645	
Udaipur	-0.00741*	0.00017*	.812
	-9.522	2.917	
Forth category : Negative growth at increasing rate			
Alwar	-0.0151*	-0.00014*	0.985
	-40.076	-5.077	
Banswara	-0.0071*	-1.5E-09	0.729
	-7.875	***0***	
Barmer	-0.02814*	-2.8E-05*	0.96
	-23.367	-3.118	
Bharatpur	-0.01922*	-9.9E-05	0.961
	-23.78	***-1.636***	
Bundi	-0.01529*	-0.00015**	0.946
	-19.967	-2.56	
S.Madopur	-0.02185*	-9.5E-05*	.99
	-48.527	-2.838	
RAJASTHAN	-0.1125*	9.85E-05*	.963
	-24.358	2.853	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.6 Acceleration and deceleration of growth in area under the sesamum (1970-71 to 1999-2000)
Fundamental from: log Y =a + bt +ct²

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Ajmer	0.000281*	0.00052**	.406
	3.36	2.11	
Churu	0.001779	0.000169	0.068
	0.8	***1.018***	
Ganganagar	0.02144*	0.001976*	0.915
	9.901	12.215	
Jaisalmer	0.01174*	0.000491	0.271
	2.554	***-1.43***	
Jodhpur	0.001135*	0.000205*	.25
	1.06	2.556	
Second category: Positive growth at declining rate			
Bharatpur	0.001595	-0.00034*	0.51
	1.637	-4.611	
Bhilwara	0.002225	-0.00022	0.139
	1.148	***-1.548***	
Bikaner	0.008442*	-3.1E-05	0.378
	3.737	***-0.186***	
Jhunjhunu	0.0186*	-0.00045*	.852
	10.95	-3.548	
Nagaur	0.00257***	-0.00013	.169
	1.784	***-1.216***	
Sikar	0.01638*	-0.0002**	.845
	11.071	-1.785	
Third category: Negative growth at declining rate			
Barmer	-0.0047*	0.000437*	0.395
	-2.43	3.022	
Jaipur	-0.00849*	7.16E-05	0.732
	-7.88	***0.89***	
Jalor	-0.00256*	0.000177*	.597
	-4.279	3.963	
Pali	-0.00134	4.88E-05	.102

	-1.45	***.706***	
S.Madopur	-0.00555*	4.92E-05	.376
	-4.104	***.487***	
Sirohi	-0.00079	5.01E-05	.096
	-1.189	***1.014***	
Forth category: Negative growth at increasing rate			
Alwar	-0.00445*	-0.00019*	0.662
	-5.825	-3.343	
Banswara	-0.02177*	-0.00031**	0.873
	-12.338	-2.38	
Bundi	-0.0068*	-0.00109*	0.765
	-3.647	-7.847	
Chittorgarh	-0.00491*	-0.0005*	0.514
	-2.908	-3.982	
Dungarpur	-0.01723*	-0.00036**	0.757
	-8.149	-2.249	
Jhalawar	-0.01272*	-0.00121*	.88
	-8.004	-10.198	
Kota	-0.00999*	-0.00148*	.772
	-3.98	-7.88	
tonk	-0.00508**	-4E-05	.149
	-1.997	***-.211***	
Udaipur	-0.0017	-8.4E-05	.088
	-1.247	***-.822***	
RAJASTHAN	-0.00065	-2.2E-05	.037
	-.86	***-.389***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.7 Acceleration and deceleration of growth in area under the Mustard (1970-71 to 1999-2000)

Fundamental from :log Y =a + bt +ct²

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Alwar	0.01517*	0.000111	0.812
	9.919	***0.967***	
Banswara	0.01153*	0.000287	0.464
	4.23	***1.41***	
Barmer	0.0167*	0.000194	0.443
	4.172	***0.926***	
Bharatpur	0.01564	2.02E-06*	0.827
	10.473	0.018	
Bundi	0.05124*	2.62E-05	0.892
	13.798	***0.095***	
Churu	0.0392*	2.02E-05	0.909
	15.182	***0.105***	
Dungarpur	0.03166*	0.000925*	0.91
	14.166	5.54	
Jaipur	0.03735*	0.000137	0.891
	13.691	***0.674***	
Jaisalmer	0.05779*	0.001784*	0.983
	33.881	14.001	
Jalor	0.01238*	1.49E-05	.828
	10.507	***.169***	
Jhunjhunu	0.02986*	0.000167	.92
	16.262	***1.219***	
Nagaur	0.03107*	0.000395*	.947
	19.96	-3.399	
S.Madopur	0.02764*	3.88E-06	.882
	13.756	***.026***	
Sirohi	0.01376*	7.88E-05	.908
	15.023	***1.152***	
Second category: Positive growth at declining rate			
Ajmer	0.05247*	-0.00038*	.924
	16.528	-2.161	
Bhilwara	0.056*	-0.00069*	0.939
	18.592	-3.082	
Bikaner	0.01951*	-5.1E-05	0.988

	43.237	***-1.506***	
Chittorgarh	0.06493*	-0.00157*	0.974
	27.859	-8.989	
Ganganagar	0.01456*	-0.0002*	0.947
	19.882	-0.3585	
Jhalawar	0.09045*	-0.00027	.974
	29.367	***-1.187***	
Jodhpur	0.02755*	-0.00037*	.964
	25.632	-4.607	
Kota	0.05935*	-0.00062*	.966
	25.293	-3.545	
Pali	0.02105*	-0.0001	.887
	13.415	***-.88***	
Sikar	0.02526*	-5.1E-05	.875
	12.711	***-.344***	
tonk	0.04602*	-0.00023	.926
	16.901	***-1.119***	
Udaipur	0.01642*	-0.00045*	.829
	9.92	-3.662	
RAJASTHAN	0.02202*	4.09E-05	.959
	23.256	***.578***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.8 Acceleration and deceleration of growth in area under the Gram (1970-71 to 1999-2000)

Fundamental from: log Y =a + bt +ct²

Disticts	b	c	R-square
First category: Positive growth at increasing rate			
Bhilwara	0.005638*	0.000399*	0.879
	9.394	8.896	
Jaisalmer	0.01137*	0.001519*	0.903
	7.157	12.797	
Pali	0.000662	0.000762*	.427
	.268	4.129	
Sikar	0.00518*	0.000152***	.501
	4.47	*1.76*	
tonk	0.000383	0.000238**	.372
	.441	3.662	
Second category: Positive growth at declining rate			
Bikaner	0.04245*	-0.00154*	0.982
	32.046	-15.579	
Churu	0.01306*	-1.3E-05*	0.909
	15.168	***-0.209***	
Jhalawar	0.003393*	-0.0002*	.754
	6.577	-5.234	
Third category: Negative growth at declining rate			
Ajmer	-0.00282*	0.000426*	.309
	1.402	2.881	
Alwar	-0.00749*	0.000148**	.812
	-9.647	2.552	
Barmer	-0.00483	0.001465**	0.313
	-0.775	3.146	
Bharatpur	-0.01251*	0.000285*	0.791
	-8.926	2.721*	
Dungarpur	-0.00394*	0.000285*	0.789
	-6.657	6.443	
Jaipur	-0.00273*	0.000168***	0.245
	-2.107	*1.737*	
Jalor	-0.00106	0.000629***	.248

	-.34	*2.733*	
Jhunjhunu	-0.00212	0.000495*	.416
	-1.235	3.858	
Jodhpur	-0.00798*	0.000915	.315
	-1.777	2.728**	
Nagaur	-0.00507	0.001032*	.31
	-1.105	3.015	
S.Madopur	-0.00642*	0.000158*	.819
	-9.692	3.186	
Sirohi	-0.00234	0.00021	.177
	-1.422	***1.713***	
Udaipur	-0.00238*	0.000413*	.644
	-2.551	5.92	
Forth category: Negative growth at increasing rate			
Banswara	-0.0003	-9.3E-05*	0.217
	-0.596	-2.456	
Bundi	-0.0054*	-0.00018*	0.835
	-9.835	-4.457	
Chittorgarh	-0.00024	-0.00019**	0.167
	-0.201	-2.136	
Ganganagar	-0.0016*	-8.8E-05*	0.284
	-2.435	*-1.782*	
Kota	-0.00646*	-0.00045*	.925
	-12.327	-11.478	
RAJASTHAN	0.009191*	0.000356	.363
	3.211	***1.666***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.9 Acceleration and deceleration of growth in area under the Cotton (1970-71 to 1999-2000)
Fundamental from: log Y =a + bt +ct^2

Districts	b	c	R-square
First category: Positive growth at increasing rate			
Alwar	0.05573*	0.001577*	0.929
	16.272	6.166	
Barmer	0.01519*	0.001143*	0.707
	5.243	5.282	
Bharatpur	0.01243**	0.001394*	0.432
	2.317	3.479	
Churu	0.0266*	0.000581	0.427
	3.974	***1.16***	
Jaisalmer	0.04448*	0.002426*	0.853
	9.315	6.801	
Jalor	0.004059*	0.000176*	.351
	3.05	1.773	
Jhunjhunu	0.0364*	0.000528*	.416
	3.973	***.77***	
Jodhpur	0.01256*	0.000467*	.89
	12.186	6.066	
Kota	0.02103*	0.000151***	.951
	20.974	*2.02*	
Nagaur	0.02103*	0.000151***	.95
	20.974	2.02	
Pali	0.000539	0.000174	.06
	.274	***1.185***	
S.Madopur	0.005394	0.001365*	.311
	.912	3.088	
Sirohi	0.000476	0.000245**	.155
	.295	2.032	
Second category: Positive growth at declining rate			
Bikaner	0.05699*	-0.00037**	0.948
	20.417	-1.795	
Ganganagar	0.008823*	-5.7E-05***	0.947
	20.236	*-1.745*	

Jaipur	0.02664*	-7E-05	0.804
	9.711	***-0.342***	
Sikar	0.03748*	-0.00069**	.783
	8.842	-2.169	
Third category: Negative growth at declining rate			
Banswara	-0.01382*	0.000194*	0.973
	-28.438	5.33	
Bhilwara	-0.00671*	8.17E-06	0.75
	-8.316	***0.136***	
Bundi	-0.01629*	0.000438**	0.69
	-6.738	2.425	
Chittorgarh	-0.02929*	0.000199**	0.971
	27.707	2.517	
Dungarpur	-0.03635*	0.000647*	0.95
	-20.323	4.84	
Udaipur	-0.01444*	0.000505*	.827
	-9.482	4.436	
Forth category: Negative growth at increasing rate			
Ajmer	-0.00443*	-6.7E-05*	.677
	-6.733	-1.727	
Jhalawar	-0.03722*	-0.00075*	.976
	-29.799	8.05	
Tonk	-0.01998*	-0.00012	.893
	-13.808	***-1.071***	
RAJASTHAN	0.004616*	7.71E-05*	.781
	8.848	*1.979*	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.10 Acceleration and deceleration of growth in production of the Bajara (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.00478**	0.000196*	
	2.345	1.289	.237
Banswara	0.0211*	0.000837*	0.473
	4.014	2.129	
Bikaner	0.01499*	0.00062*	0.701
	6.431	3.561	
Churu	0.0102*	0.00015	0.758
	8.323	***1.634***	
Ganganagar	0.00108	0.000264*	0.41
	1.1164	3.822	
Jaipur	0.009716*	2.75E-05*	0.751
	8.322	0.316	
Jaisalmer	0.00858*	0.000414*	0.304
	2.66	1.718	
Jalor	0.004614*	0.000292*	0.319
	2.504	2.123	
Jodhpur	0.007292*	0.000616*	0.601
	3.903	4.414	
Kota	0.007168*	3.01E-05*	0.649
	6.509	0.366	
Nagaur	0.00941*	3.13E-06	0.674
	6.879	***0.031***	
Sikar	0.0109*	8.42E-05	0.796
	9.423	***0.972***	
Sirohi	0.00673*	0.000126	0.284
	2.927	***0.734***	
Tonk	0.00882*	0.000295***	0.438
	3.859	*1.731*	
Udaipur	0.00574	0.000252	***0.142***
	1.686	***0.989***	
Second category:Positive growth at declining rate			
Alwar	0.008638*	-9.5E-05*	0.873
	12.456	-1.83	

Barmer	0.07646*	-0.00026*	0.487
	-1.92	4.258	
Bharatpur	0.006318*	-0.00013*	0.671
	6.59	-1.88	
Bhilwara	0.007646*	-0.00026*	0.301
	2.87	-1.299	
Bundi	0.0115*	-0.00042*	0.533
	4.616	-2.221	
Chittorgarh	0.0166*	-0.00047*	0.646
	6.069	-2.281	
Jhunjhunu	0.0108*	-2.9E-05*	0.548
	5.272	-0.191	
Pali	0.00406	-0.00016	***0.124***
	1.603	***-0.829***	
S.Madopur	0.00816*	-5.1E-05*	0.802
	9.624	-0.893	
Forth category : Negative growth at increasing rate			
Dungarpur	-0.0012	-2.3E-05	0.004
	-0.288	***-0.072***	
Jhalawar	-0.01687*	-0.00088*	0.898
	-11.676	-8.147	
RAJASTHAN	0.00672*	0.000143*	0.72
	7.396	2.11	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.11 Acceleration and deceleration of growth in production of the Jowar (1970-71 to 1999-2000)

Fundamental form: $\log Y = a + bt + ct^2$

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.015*	0.000318*	0.67
	2.356	1.254	
Alwar	0.00771*	0.000117	0.6
	5.757	***1.165***	
Bharatpur	0.009071*	0.000128	0.638
	6.252	***1.184***	
Bikaner	0.009357*	0.000102	0.548
	5.225	***0.773***	
Jaipur	0.008716*	0.000257*	0.551
	4.943	1.947	
Jodhpur	0.02152*	0.000622	0.482
	4.313	***1.668***	
Nagaur	0.00762*	0.000291*	0.511
	4.363	2.232	
Sirohi	0.0161*	-0.0007*	0.81
	8.548	-4.981	
Second category:Positive growth at declining rate			
Banswara	0.000458	-0.001323*	0.663
	0.174	-6.725	
Barmer	0.01935*	-0.000785*	0.678
	5.795	-3.853	
Bhilwara	0.01935*	-0.000785*	0.786
	8.082	-4.391	
Dungarpur	0.0168*	-0.00049*	0.613
	5.626	-2.171	
Jaisalmer	0.01404*	-0.000245***	0.731
	7.694	*-1.797*	
Jalor	0.01634*	-0.0003*	0.826
	10.137	-2.495	
tonk	0.000347	-0.00026*	0.398
	0.383	-3.881	
Udaipur	0.0111*	-0.000059*	0.53
	4.136	-2.963	
Pali	0.0149*	-0.00033	0.53
	4.882	***-1.459***	
Third cetegory : Negative growth at declining rate			

Jhunjhunu	-0.00905*	1.407E-05*	0.12
	-1.767	0.037	
Forth category : Negative growth at increasing rate			
Bundi	-0.0062*	-0.00044*	0.64
	-4.616	-4.42	
Chittorgarh	-0.0056*	-0.00047*	0.808
	-6.504	-7.383	
Churu	-0.029*	-0.00037*	0.871
	-12.86	-2.223	
Ganganagar	-0.016*	-0.00069*	0.675
	-6.026	-3.385	
Jhalawar	-0.01022*	-0.000375*	0.92
	-14.596	-7.167	
Kota	-0.0085*	-0.000574*	0.9
	-10.654	-9.625	
S.Madopur	-0.0088*	-0.0005*	0.773
	-7.037	-5.371	
Sikar	-0.025*	-0.00079*	0.504
	-4.463	-1.863	
RAJASTHAN	-0.0019*	-0.00021*	0.529
	-2.824	-4.224	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.12 Acceleration and deceleration of growth in production of the Maize (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Banswara	0.01052*	0.0000611	0.741
	8.092	***0.629***	
Dungarpur	0.00259*	0.0000863	0.204
	2.219	***0.992***	
Second category:Positive growth at declining rate			
Ajmer	0.002125*	-0.00002025*	.558
	5.346	-.682	
Alwar	0.00834*	-0.0004154*	0.73
	6.562	-4.376	
Barmer	0.005509*	-0.00009167*	0.591
	5.424	-1.937	
Bhilwara	0.005509*	-0.00009167*	0.793
	9.161	-2.04	
Bundi	0.00942*	-0.00031*	0.862
	1.254	2.354	
Chittorgarh	0.00749*	-0.00015*	0.897
	13.651	-3.696	
Jalor	0.002198	-0.0001708	***0.083***
	0.998	***-1.039***	
Jhalawar	0.009236*	-0.0003341*	0.881
	11.723	-5.676	
Kota	0.007422*	-0.000369*	0.745
	6.832	-4.547	
Pali	0.00249*	-0.00036*	0.707
	3.398	-6.622	
S.Madopur	0.00711*	-0.00084*	0.376
	1.986	-3.147	
Sirohi	0.00531*	-0.00022*	0.451
	3.786	-2.132	
tonk	0.00279*	-0.00012	0.314
	2.821	***-1.597***	
Udaipur	0.00444*	-0.000019	0.668
	6.799	***-0.38***	

Third cetegory : Negative growth at declining rate			
Churu	-0.0052*	0.000531*	0.359
	-2.01	2.801	
Jaisalmer	-163*	0.004687	0.507
	-1.835	***1.197***	
Forth category : Negative growth at increasing rate			
Bharatpur	-0.001251	-0.0001732*	0.293
	-1.466	-2.718	
Bikaner	-0.009265*	-0.002145*	0.905
	-4.545	14.089	
Ganganagar	-0.017*	-0.00057*	0.972
	25.53	-11.74	
Jaipur	-0.001397	-9.158E-08	***0.096***
	-1.565	***-0.001***	
Jhunjhunu	-0.01411*	-0.0008393*	0.717
	-5.977	-4.759	
Jodhpur	-0.01807*	-0.0004423*	0.846
	-10.669	-3.495	
Nagaur	-0.0015*	-0.000039*	0.036
	-0.87	-0.307	
Sikar	-0.0021*	-0.00032*	0.358
	-1.544	-3.23	
RAJASTHAN	0.00493*	-0.00011*	0.785
	8.801	-2.55	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table 5.13 Acceleration and deceleration of growth in production of the Wheat (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct^2

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.00562*	0.000108	.536
	4.995	1.287	
Barmer	0.0123*	0.000208*	0.899
	13.91	3.209	
Bharatpur	0.01015*	6.17E-05*	0.958
	22.803	1.855	
Bhilwara	0.0123*	0.000208*	0.952
	20.888	4.733	
Bundi	0.0119*	8.27E-05*	0.98
	33.645	3.132	
Chittorgarh	0.00931*	8.57E-05*	0.931
	17.526	2.161	
Churu	0.0262*	0.000575*	0.893
	13.298	3.9	
Dungarpur	0.00875*	0.000081	0.87
	12.321	***1.527***	
Jaisalmer	0.01752*	0.001007*	0.87
	9.829	7.564	
Jalor	0.002779*	0.000258*	0.85
	7.163	8.884	
Jhalawar	0.01179*	0.000282*	0.967
	24.805	7.932	
Jodhpur	0.003904*	0.000135*	0.38
	3.408	1.582	
Kota	0.007369*	0.000502***	0.955
	21.961	*2.004*	
Nagaur	0.0112*	6.99E-05	0.864
	12.062	***1.007***	
Pali	0.00548*	0.000249*	0.623
	5.267	3.203	
Sirohi	0.0052*	0.000379*	0.67
	4.888	4.775	
tonk	0.00732*	6.32E-05***	0.919
	15.999	*1.849*	
Udaipur	0.00845*	0.000141*	0.863
	11.732	2.628	

Second category: Positive growth at declining rate

Alwar	0.01294*	-0.00011*	0.946
	20.014	-2.281	
Banswara	0.01834*	-4.2E-05	0.945
	19.824	***-0.611***	
Bikaner	0.02787*	-0.00046*	0.957
	22.026	-4.852	
Ganganagar	0.0131*	-5.7E-05*	0.985
	39.25	-2.305	
Jaipur	0.01353*	-8.4E-05	0.949
	20.556	***-1.7***	
Jhunjhunu	0.02045*	-0.00026*	0.951
	20.898	-3.5	
S.Madopur	0.00932*	-0.00016*	0.928
	16.705	0.946	
Sikar	0.02*	-0.00021*	0.987
	41.999	-5.884	
RAJASTHAN	0.00913*	-6.6E-05*	0.955
	22.896	-2.231	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.14 Acceleration and deceleration of growth in production of the Barley (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Bikaner	0.01664*	0.000172	0.812
	9.861	***1.364***	
Ganganagar	0.00274*	0.000792	0.809
	2.468	***9.555***	
Jaisalmer	0.005523	0.001357*	0.202
	0.701	2.306	
Second category:Positive growth at declining rate			
Churu	0.0126*	-0.00075	0.2
	1.87	***-1.496***	
Third cetegory : Negative growth at declining rate			
Ajmer	-0.00425*	0.000254*	.624
	-4.829	3.854	
Barmer	-0.00206*	0.000168*	0.947
	-20.146	-2.56	
Bhilwara	-0.00206*	0.000168*	0.499
	-3.241	3.526	
Dungarpur	-0.0062*	0.000113	0.668
	-6.609	***1.631***	
Jaipur	-0.00287*	0.000246	0.737
	-5.273	6.057	
Jalor	-0.01535*	0.000103	0.896
	-14.043	***1.257***	
Jhalawar	-0.01039*	9.28E-05	0.846
	-11.158	***1.334***	
Jhunjhunu	-0.00605*	7.63E-05*	0.376
	-3.672	0.62	
Jodhpur	-0.01811*	0.000328	0.92
	-15.817	***3.835***	
Kota	-0.00689*	1.63E-05	0.83
	-10.609	***-0.335***	
Nagaur	-0.0026*	0.000277*	0.47
	-2.624	3.679	

Pali	-0.017*	0.000241*	0.916
	-15.591	3.019	
Sikar	-0.00082	0.000288*	0.691
	-1.5	7.016	
Sirohi	-0.056	0.000202*	0.624
	-5.575	2.677	
tonk	-0.011*	0.000162*	0.942
	-19.867	4	
Udaipur	-0.0052*	0.000177*	0.776
	-0.801	3.726	
Forth category : Negative growth at increasing rate			
Alwar	-0.01125*	-5.7E-05*	0.604
	-4.901	-3.326	
Banswara	-0.00108	-2E-05	***0.092***
	-1.481	***-0.368***	
Bharatpur	-0.01259*	-0.00021*	0.946
	-19.582	-4.305	
Bundi	-0.0081*	-0.00013	0.683
	-6.873	***-1.495***	
Chittorgarh	-0.00033	-7.2E-05	0.092
	-0.489	***-1.441***	
S.Madopur	-0.015	-7.5E-05*	-19.971
	-1.355	0.206	
RAJASTHAN	-0.004*	-0.00016*	0.231
	-2.33	-1.223	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.15 Accèleration and deceleration of growth in production of the Sesamum (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.01374*	0.000644**	.406
	3.36	2.11	
Bikaner	0.02526*	0.000565	0.553
	5.106	***1.53***	
Ganganagar	0.0393*	0.00122*	0.85
	10.522	4.389	
Jaipur	0.003439	0.000181	***0.106***
	1.354	***0.953***	
Jalor	0.004571*	0.00025*	0.321
	2.657	1.948	
Jodhpur	0.006143*	0.000925*	0.425
	1.831	3.693	
Nagaur	0.00912*	8.27E-05	0.215
	2.495	***0.303***	
S.Madopur	0.00543	0.000362*	1.824
	1.627	14.206	
Sirohi	0.00944*	0.000274*	0.617
	5.676	2.207	
Second category:Positive growth at declining rate			
Alwar	0.002688	-0.00029*	0.229
	1.499	-2.138	
Barmer	0.01026	-0.00058*	0.406
	-1.39	3.714	
Bharatpur	0.007224*	-0.00055*	0.57
	3.852	-3.951	
Bhilwara	0.01026*	-0.00058*	0.497
	3.794	-2.893	
Bundi	0.00568*	-0.0011*	0.676
	2.513	-6.447	
Chittorgarh	0.001	-0.00055*	0.421
	0.555	-4.052	
Churu	0.0174*	-0.00053	0.465
	4.142	***-1.675***	
Jaisalmer	0.01662*	-0.00048*	0.536

	4.806	-1.857	
Jhunjhunu	0.02543*	-0.00043*	0.789
	9.034	-2.053	
Pali	0.00452*	-0.00011*	0.107
	1.574	-0.52	
Sikar	0.0233*	-0.00055*	0.76
	8.137	-2.578	
tonk	0.00546	-0.00023	***0.046***
	1.558	***-0.886***	
Udaipur	0.000966	-0.00048*	0.313
	0.481	-3.2	
Forth category : Negative growth at increasing rate			
Banswara	-0.01337*	-0.00037*	0.588
	-5.364	*-2.003*	
Dungarpur	-0.01*	-0.00041*	0.542
	-4.925	-2.698	
Jhalawar	-0.00539*	-0.00125*	0.793
	-2.891	-8.945	
Kota	-0.00346	-0.00182*	0.717
	-1.071	-7.556	
RAJASTHAN	0.00544*	0.00006*	0.244
	2.698	0.398	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.16 Acceleration and deceleration of growth in production of the Mustard (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Banswara	0.02*	7.24E-05	0.736
	7.994	**0.387**	
Jaisalmer	0.06564*	0.001575*	0.986
	37.686	12.106	
Jalor	0.02088*	3.62E-05	0.955
	21.998	***0.511***	
Jhunjhunu	0.0356*	0.000205*	0.933
	17.865	1.38	
Sirohi	0.023*	8.15E-05	0.917
	15.964	***0.756***	
Second category:Positive growth at declining rate			
Ajmer	0.05812*	-0.00057*	.917
	16.528	-2.161	
Alwar	0.02366*	-3.5E-05	0.857
	11.719	***-0.234***	
Barmer	0.06371*	-0.00076	0.736
	7.994	***0.387***	
Bharatpur	0.02269*	-0.00025	0.852
	11.395	***-1.682***	
Bhilwara	0.06371*	-0.00076*	0.939
	18.622	-2.954	
Bikaner	0.02194*	-6.1E-05	0.953
	21.505	***-0.794***	
Bundi	0.058*	-9.4E-05	0.904
	14.718	***-0.32***	
Chittorgarh	0.0721*	-0.0018*	***0.967***
	24.701	-8.091	
Churu	0.0468*	-6.2E-05*	0.925
	16.893	-0.298	
Dungarpur	0.0226*	-4.1E-05	0.695
	7.239	***-0.175***	
Ganganagar	0.0223*	-0.00004	0.976
	30.859	***-0.738***	
Jaipur	0.04663*	-0.00016	0.928
	17.152	***-0.786***	
Jhalawar	0.09501*	-0.0002	0.977

	31.585	***-0.903***	
Jodhpur	0.03493*	-0.00034	0.981
	34.478	***-4.544***	
Kota	0.06847*	-0.00107*	0.959
	22.568	-4.707	
Nagaur	0.0413*	-0.00025*	0.948
	20.426	-1.632	
Pali	0.0279*	-0.00023*	0.96
	23.349	-2.616	
S.Madopur	0.0374*	-0.00039*	0.889
	-3.102	2.007	
Sikar	0.0324*	-6.6E-05	0.919
	16.111	***-0.441***	
tonk	0.0511*	-0.00036*	0.939
	18.76	*-1.792*	
Udaipur	0.0212*	-0.00036*	0.843
	10.821	-2.465	
RAJASTHAN	0.0309*	-0.0002*	0.971
	27.449	-2.434	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.17Acceleration and deceleration of growth in production of the Gram (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.002969	0.000456*	.309
	1.402	2.881	
Barmer	0.01171	0.000414*	0.304
	-5.524	3.129	
Bhilwara	0.01171*	0.000414*	0.898
	12.831	6.076	
Bikaner	0.05158*	-0.00119*	0.98
	31.69	-9.758	
Dungarpur	0.0051*	0.000233*	0.619
	5.22	3.194	
Jaisalmer	0.01833*	0.001212*	0.87
	9.288	8.222	
Jalor	0.000969	0.001147*	0.406
	0.25	3.958	
Jhunjhunu	0.003402*	0.000466*	0.178
	1.068	1.96	
Pali	0.00463	0.001*	0.553
	1.741	5.043	
Sikar	0.00808*	0.000366*	0.451
	3.72	2.254	
Sirohi	0.00046	0.000106	***0.036***
	0.289	***0.887***	
tonk	0.0024*	0.000212*	0.336
	2.205	2.612	
Second category:Positive growth at declining rate			
Banswara	0.008262*	-5.7E-05	0.868
	12.252	***-1.141***	
Chittorgarh	0.00546*	-0.00028*	0.472
	3.756	-2.54	
Churu	0.0117*	-7.9E-06*	0.493
	4.726	-0.043	
Jhalawar	0.00603*	-0.00028*	0.716
	6.447	-4.038	
Third cetegory : Negative growth at declining rate			

Alwar	-0.00515*	4.63E-05	0.421
	-4.059	***0.489***	
Bharatpur	-0.00958*	0.000277*	0.641
	-5.978	2.315	
Forth category : Negative growth at increasing rate			
Bundi	-0.0013*	-0.00026*	0.781
	-3.162	-8.493	
Ganganagar	-0.0011	-0.00019*	0.223
	-1.035	-2.355	
Jaipur	-0.00117	0.00025*	0.23
	-0.867	2.476	
Jodhpur	-0.00336	0.000996*	0.216
	-0.727	2.889	
Kota	-0.00502*	-0.00054*	0.911
	-8.736	-12.561	
Nagaur	-0.0004	0.00131*	0.433
	-0.097	4.193	
S.Madopur	-0.0026*	0.000127*	0.373
	-3.102	2.019	
Udaipur	-0.00014	0.000298*	0.505
	-0.171	4.842	
RAJASTHAN	-0.00033	9.97E-05	***0.066***
	-0.304	***1.235***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.18 Acceleration and deceleration of growth in production of the Cotton (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Alwar	0.03966*	0.00113*	0.863
	11.23	4.284	
Bharatpur	0.001946	0.000578	***0.057***
	0.287	***1.143***	
Churu	0.0281*	0.000312	0.324
	3.28	***0.488***	
Jaisalmer	0.0432*	0.003195*	0.878
	9.142	9.053	
Second category:Positive growth at declining rate			
Bikaner	0.03485*	-0.00126*	0.902
	13.1	-6.328	
Jaipur	0.01349*	-0.00057*	0.378
	3.25	-1.851	
Jhunjhunu	0.02533*	-5E-05*	0.232
	2.636	-0.069	
Kota	0.008045*	-0.00317*	0.505
	4.284	-2.261	
Nagaur	0.00804*	-0.00032*	0.505
	4.284	-2.261	
Sikar	0.023*	-0.0012*	0.528
	4.146	-2.917	
Third cetegory : Negative growth at declining rate			
Banswara	-0.02395*	0.000116	0.925
	-16.866	***1.095***	
Dungarpur	-0.05*	0.000132	0.931
	-18.461	***0.658***	
S.Madopur	-0.0099	0.00102*	0.201
	-1.41	1.947	
Forth category : Negative growth at increasing rate			
Ajmer	-0.02281*	-0.00044*	.677
	-6.733	-1.727	
Barmer	-0.01941	-0.00029*	0.389
	0.684	3.768	

Bhilwara	-0.1941*	-0.00029*	0.758
	-8.328	***-1.649***	
Bundi	-0.029*	-0.00012	0.779
	-8.987	***-0.5***	
Chittorgarh	-0.041*	-0.00019	0.921
	-16.356	***-1.046***	
Ganganagar	-0.0076*	-0.00046*	***0.595***
	-4.527	-3.652	
Jalor	-0.00941*	-0.00037*	0.558
	-4.767	-2.519	
Jhalawar	-0.04935*	-0.00039	0.9
	-14.312	***-1.522***	
Jodhpur	-0.00158*	-1.1E-05	0.025
	-0.764	***0.073***	
Pali	-0.012*	-0.00025	0.372
	-3.554	***-1.007***	
Sirohi	-0.012*	-0.00025	0.572
	-5.343	***-1.462***	
tonk	-0.034*	-0.00065*	0.882
	-12.686	-3.241	
Udaipur	-0.031*	-0.00027***	0.907
	-14.869	*-1.726*	
RAJASTHAN			0.815
	-8.555	-5.329	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.19 Acceleration and deceleration of growth in yield of the Bajara (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.001989	0.000228*	0.279
	1.632	2.501	
Banswara	0.000124*	0.0113*	0.699
	1.059	7.23	
Bharatpur	0.0067*	3.43E-05	0.839
	10.929	***0.749***	
Bhilwara	0.007831*	0.000219*	0.839
	10.239	3.834	
Bikaner	0.01403*	0.000703*	0.654
	5.473	3.67	
Bundi	0.007389*	0.00019*	0.809
	9.318	3.212	
Chittorgarh	0.008562*	0.000272*	0.903
	13.488	5.731	
Churu	0.0101*	0.000204*	0.798
	9.188	2.495	
Dungarpur	0.00756*	0.000189*	0.805
	9.228	3.092	
Jaipur	0.00638*	2.97E-05	0.811
	9.917	***619***	
Jaisalmer	0.00517	7.66E-05	***0.094***
	1.513	***0.3***	
Jalor	0.00551*	0.000386*	0.59
	4.189	3.936	
Jhalawar	0.00738*	0.000191*	0.809
	9.322	3.226	
Jhunjhunu	0.00897*	3.05E-05	0.553
	5.329	***0.243***	
Jodhpur	0.00591*	0.000572*	0.557
	3.281	4.254	
Nagaur	0.00961*	7.48E-05	0.741
	8.077	***0.842***	
S.Madopur	0.0078*	4.04E-05	0.88
	12.928	***0.897***	
Sikar	0.00966*	9.94E-05	0.861

	11.811	***1.627***	
Sirohi	0.0107*	0.000137*	0.846
	11.067	1.902	
tonk	0.00792*	0.000337*	0.616
	5.276	3.007	
Udaipur	0.000292*	4.29E-05*	0.021
	0.316	***0.621***	
Second category:Positive growth at declining rate			
Alwar	0.00757*	-3.7E-05*	0.897
	14.157	-0.935	
Ganganagar	0.00883*	-4.6E-06	0.735
	7.985	***-0.056***	
Kota	0.00125	-0.00011	***0.144***
	0.211	***0.15***	
Pali	0.00502*	-0.00011	0.35
	3.363	***-1.031***	
Third cetegory : Negative growth at declining rate			
Barmer	-0.00271*	0.000501*	0.512
	-1.84	4.554	
RAJASTHAN	0.00682*	-3.6E-05	0.573
	5.539	***-0.389***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.20 Acceleration and deceleration of growth in yield of the Jowar (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.01288*	0.000414*	0.678
	6.389	2.748	
Alwar	0.00684*	0.000039	0.655
	6.584	***0.503***	
Bundi	0.004642*	8.27E-05*	0.59
	5.594	1.335	
Jaipur	0.0093*	0.000473*	0.799
	7.896	5.378	
Jhalawar	0.00172*	0.000145*	0.376
	2.782	2.472	
Jodhpur	0.0157*	0.000268*	0.43
	4.064	0.929	
Nagaur	0.00926*	0.00286*	0.639
	5.895	2.441	
S.Madopur	0.00394*	0.000163*	0.401
	3.43	1.902	
Second category:Positive growth at declining rate			
Barmer	0.01028*	-0.00398*	0.882
	11.642	-6.038	
Bharatpur	0.006959*	-1.1E-05	0.636
	6.342	***-1.39***	
Bhilwara	0.01092*	-0.00043*	0.905
	13.156	-6.864	
Bikaner	0.001647*	-8.4E-05*	0.442
	3.529	-2.406	
Chittorgarh	0.002992*	-0.00016*	0.639
	5.181	-3.722	
Churu	0.00189*	-0.00013*	0.377
	2.769	-2.504	
Jaisalmer	0.0106*	-0.00037*	0.841
	9.999	-4.634	
Jalor	0.0102*	-0.00035*	0.874
	11.438	-5.38	
Jhunjhunu	0.00527*	-0.0002*	0.556

	4.768	-2.461	
Kota	0.00627*	-0.00012*	0.864
	11.699	-3.04	
Pali	0.00335*	-0.00016	0.19
	1.954	***-1.261***	
Sikar	0.00688*	-0.00023*	0.686
	6.486	-2.853	
Sirohi	0.0107*	-0.0004*	0.887
	12.047	-5.961	
tonk	0.00251*	-0.00005	0.294
	2.992	***-0.798***	
Udaipur	0.0095*	-0.00046*	0.562
	4.561	-2.953	
Third cetegory : Negative growth at declining rate			
Banswara	-0.0004*	0.00261***	0.428
	-3.722	*1.839*	
Forth category : Negative growth at increasing rate			
Dungarpur	-0.009*	-0.00087*	0.504
	-2.952	-3.826	
Ganganagar	-0.019*	-0.0011*	0.521
	-3.974	-3.04	
RAJASTHAN	0.00267*	-6.2E-05	0.313
	3.093	***-0.958***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.21 Acceleration and deceleration of growth in yield of the Maize (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct^2

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.003417*	3.06E-05	0.694
	7.171	***0.859***	
Banswara	7.45E-05	0.00607*	0.502
	0.781	4.753	
Barmer	0.007041*	0.000157*	0.84
	10.529	-3.138	
Bundi	0.004584	8.01E-06	0.649
	6.514	***0.152***	
Dungarpur	0.00332*	7.58E-05	0.29
	2.928	***0.895***	
Ganganagar	0	0	0.813
	9.891	***1.542***	
Jaipur	0.00481*	6.77E-05*	0.813
	9.89	1.542	
Kota	0.00252*	6.62E-05	0.215
	2.365	***0.833***	
Second category:Positive growth at declining rate			
Alwar	0.00857*	-0.00038*	0.741
	6.954	-4.18	
Bharatpur	0.009117*	-0.00023*	0.888
	12.826	-4.259	
Bhilwara	0.002589*	-8.2E-05*	0.492
	4.342	*-1.839*	
Chittorgarh	0.003786*	-8.8E-05*	0.695
	6.913	-2.14	
Jaisalmer	0.481*	-0.014*	0.888
	4.756	-4.756	
Jalor	0.00678*	-4.2E-05	0.782
	9.049	***-0.743***	
Jhalawar	0.00512*	-1.3E-05	0.709
	7.477	***-0.259***	
Jhunjhunu	0.00927*	-0.00023*	0.903
	13.951	-4.398	
Jodhpur	0.00725*	-0.00013*	0.849
	0.896	-0.216	
Nagaur	0.00722*	-0.00013*	0.845
	10.877	-2.672	

Pali	0.00318*	-0.00021*	0.569
	4.098	-3.68	
S.Madopur	0.0145*	-0.0006*	0.535
	4.511	-2.481	
Sikar	0.00993*	-0.00022*	0.888
	12.986	-3.766	
Sirohi	0.00572*	-3.6E-06*	0.453
	4.368	-0.036	
tonk	0.00622*	-0.00014*	0.725
	7.477	-2.186	
Udaipur	0.000571	-9.8E-05*	0.168
	0.855	-1.975	
Third cetegory : Negative growth at declining rate			
Churu	-0.0034***	0.000514*	0.434
	-1.766	3.641	
Forth category : Negative growth at increasing rate			
Bikaner	-0.00258*	-0.00047*	0.65
	-2.475	-6.053	
RAJASTHAN	-0.003*	-0.00026*	0.755
	-5.54	-6.324	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.22 Acceleration and deceleration of growth in yield of the Wheat (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Banswara	4.1E-06	0.0076*	0.771
	0.063	8.792	
Barmer	0.009426*	0.000113*	0.934
	17.863	-2.863	
Bhilwara	0.008705*	5.51E-05*	0.979
	32.596	2.761	
Churu	0.00648*	2.01E-05	0.951
	21.058	***0.875***	
Dungarpur	0.00539*	5.49E-05	0.805
	9.649	***1.316***	
Ganganagar	0.0107*	0.000139*	0.979
	32.289	5.605	
Jaipur	0.00615*	3.18E-05	0.96
	23.459	***1.622***	
Jalor	0.00484*	9.64E-05*	0.805
	9.409	2.509	
Jhalawar	0.01*	0.000116*	0.942
	19.048	2.963	
Jodhpur	0.00811*	2.42E-05	0.913
	15.484	***0.619***	
Sirohi	0.00794*	7.16E-05	0.682
	6.977	***0.842***	
tonk	0.00883*	6.72E-05*	0.947
	20.15	2.053	
Second category:Positive growth at declining rate			
Ajmer	0.005965*	-7.7E-05*	0.798
	9.39	-1.63	
Alwar	0.0081*	-1.6E-05*	0.974
	29.592	-0.784	
Bharatpur	0.009007*	-3.7E-05	0.957
	22.602	***-1.256***	
Bikaner	0.000809	-0.00018*	0.303
	1.006	-3	
Bundi	0.008746*	-2.3E-05	0.971

	27.635	***-0.967***	
Chittorgarh	0.00828*	-5.8E-05*	0.897
	14.079	-1.315	
Jaisalmer	0.0099*	-7.9E-05*	0.95
	20.847	-2.235	
Jhunjhunu	0.00838*	-1.3E-05	0.974
	29.194	***-0.585***	
Kota	0.00866*	-0.00009*	0.941
	19.013	-2.635	
Nagaur	0.00827*	-0.00017*	0.926
	16.336	-4.587	
Pali	0.00488*	-0.00041*	0.357
	2.382	-2.665	
S.Madopur	0.00883*	-0.00011*	0.952
	21.154	-3.68	
Sikar	0.00777*	-8.5E-05*	0.968
	25.994	-3.806	
Udaipur	0.00494*	-0.00004	0.796
	9.414	***-1.011***	
RAJASTHAN	0.00643*	-0.0001*	0.956
	21.813	-4.714	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.23 Acceleration and deceleration of growth in yield of the Barley (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Banswara	8.67E-06	0.00521*	0.928
	0.383	17.193	
Barmer	0.004924*	3.45E-05*	0.946
	0.968	*1.868*	
Bhilwara	0.00575*	5.33E-05*	0.949
	20.614	2.559	
Bundi	0.0072*	2.43E-05	0.909
	15.103	***0.682***	
Dungarpur	0.00482*	7.41E-05*	0.711
	7.366	1.515	
Ganganagar	0.0166*	0.000436*	0.965
	23.824	8.368	
Jaipur	0.00745*	0.000202*	0.829
	9.942	3.605	
Jaisalmer	0.00454*	0.000834*	0.654
	2.484	6.105	
Kota	0.00672*	0.000184*	0.867
	11.5	4.208	
Nagaur	0.00485*	3.48E-05	0.852
	11.454	***1.102***	
Pali	0.00379*	0.000168*	0.87
	10.694	6.342	
S.Madopur	0.00728*	1.55E-05	0.834
	10.751	***0.307***	
Sikar	0.00351*	0.000169*	0.856
	9.826	6.326	
Sirohi	0.00626*	3.91E-06	0.905
	14.819	***0.124***	
tonk	0.0033*	0.000103*	0.809
	9.12	3.758	
Udaipur	0.00142*	5.81E-05	0.143
	1.718	***0.941***	
Second category:Positive growth at declining rate			

Ajmer	0.004941*	-0.00012*	0.919
	15.426	-4.857	
Alwar	0.00402*	-0.00037*	0.283
	1.887	-2.352	
Bharatpur	0.006977*	-0.00011*	0.931
	17.254	-3.575	
Bikaner	0.01033*	-0.00035*	0.92
	14.775	-6.856	
Chittorgarh	0.005924*	-0.00014*	0.884
	12.594	-4.048	
Churu	0.00998*	-0.00038*	0.923
	14.8	-7.465	
Jalor	0.0019*	-4.8E-06	0.187
	2.299	***-0.077***	
Jhalawar	0.00613*	-8.3E-05	0.794
	9.256	***-1.671***	
Jhunjhunu	0.00486*	-0.0001*	0.694
	6.96	*-1.92*	
Jodhpur	0.00214*	-8.3E-05	0.258
	2.51	***-1.302***	
RAJASTHAN	0.00729*	-0.00027***	0.414
	3.606	*-0.289*	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.24 Acceleration and deceleration of growth in yield of the Sesamum (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct²

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ajmer	0.01389*	0.000127*	0.727
	7.76	0.946	
Barmer	0.001041	0.000583*	0.287
	0.392	3.021	
Bikaner	0.01476*	0.000679*	0.522
	4.265	2.624	
Bundi	0.01314*	.00007311	0.884
	13.216	***0.984***	
Jaipur	0.00401*	8.38E-05*	0.291
	2.96	0.828	
Jhunjhunu	0.00728*	0.000103	0.561
	5.331	***1.012***	
Jodhpur	0.00451	0.000722*	0.377
	1.578	3.38	
Nagaur	0.00548*	0.000143	0.226
	2.448	***0.853***	
S.Madopur	0.0112*	0.000377*	0.697
	6.626	2.981	
Sirohi	0.0113*	0.000171	0.734
	7.808	***1.583***	
Second category:Positive growth at declining rate			
Alwar	0.00743*	-0.00016	0.571
	5.306	***-1.573***	
Bharatpur	0.005056*	-0.00019*	0.506
	4.319	-2.216	
Bhilwara	0.007707*	-0.00027*	0.793
	8.529	-3.945	
Chittorgarh	0.005967*	-1.7E-05	0.645
	6.46	***-0.246***	
Churu	0.0166*	-0.00058*	0.829
	9.585	-4.447	
Dungarpur	0.0067*	-5.5E-06	0.521
	5.005	***-0.054***	
Ganganagar	0.0161*	-0.00056*	0.832
	9.683	-4.481	

Jaisalmer	0.00835*	-9.6E-05	0.437
	4.178	***-0.631***	
Jalor	0.00853*	-9.6E-05	0.437
	4.178	***-0.631***	
Jhalawar	0.00724*	-8.8E-05	0.528
	5.003	***-0.815***	
Kota	0.00659*	-0.00028*	0.722
	6.725	-3.807	
Pali	0.0059*	-0.00023	0.294
	2.748	***-1.424***	
Sikar	0.00686*	-0.00018**	0.565
	5.16	*-1.807*	
tonk	0.00988*	-0.00029*	0.773
	8.244	-3.19	
Udaipur	0.00253*	-0.00034*	0.622
	3.014	-5.369	
Third cetegory : Negative growth at declining rate			
Banswara	-0.00009	0.00964*	0.523
	-0.624	4.98	
RAJASTHAN	0.00572*	8.89E-05	0.413
	3.94	***0.82***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.25 Acceleration and deceleration of growth in yield of the mustard (1970-71 to 1999-2000)
Fundamental form: log Y =a + bt +ct^2

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Ganganagar	0.00791*	0.000153*	0.955
	21.315	5.508	
Jalor	0.00777*	0.0000577	0.718
	7.62	***0.758***	
Jhalawar	0.00595*	0.00000942	0.634
	6.315	***0.134***	
Jhunjhunu	0.00666*	0.0000478	0.884
	13.207	***1.27***	
Jodhpur	0.00755*	0.0000229	0.866
	12.157	***0.495***	
Nagaur	0.0092*	0.000282*	0.625
	5.724	2.351	
Sikar	0.00747*	0.0000399	0.787
	9.193	***0.657***	
Sirohi	0.00919*	0.0000347	0.833
	10.687	***0.541***	
Udaipur	0.00533*	0.000105*	0.802
	9.33	2.458	
Second category:Positive growth at declining rate			
Ajmer	0.006037*	-0.0001695*	0.842
	10.368	-3.897	
Alwar	0.00838*	-0.00013*	0.852
	11.232	-2.407	
Barmer	0.008184*	-0.00008933	0.872
	12.391	***-1.811***	
Bharatpur	0.00732*	-0.0002174*	0.84
	10.209	-4.06	
Bhilwara	0.007398*	-0.00005953	0.872
	12.425	***-1.338***	
Bikaner	0.00279*	-0.00001709	0.245
	2.724	***-0.234***	
Bundi	0.007302*	-0.00007571*	0.913
	15.374	-2.134	
Chittorgarh	0.007499*	-0.0001856*	0.828

	9.989	-3.31	
Churu	0.00795*	-0.000068*	0.924
	16.654	-1.897	
Jaipur	0.00889*	-0.00026*	0.941
	17.776	-6.924	
Jaisalmer	0.00765*	-0.00011*	0.891
	13.463	-2.698	
Kota	0.00933*	-0.00031*	0.758
	7.746	-3.47	
Pali	0.00647*	-0.00012	0.669
	6.624	***-1.635***	
S.Madopur	0.00999*	-0.00034*	0.834
	10.751	0.307	
tonk	0.00491*	-0.00011*	0.852
	11.015	-3.346	
Third cetegory : Negative growth at declining rate			
Banswara	-0.00022*	0.00473*	0.729
	-4.211	6.642	
Forth category : Negative growth at increasing rate			
Dungarpur	-0.0059*	-0.0009*	0.698
	-3.196	-6.545	
RAJASTHAN	0.0074*	-0.00011*	0.903
	14.341	-2.782	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.26 Acceleration and deceleration of growth in yield of the Gram (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct^2

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Banswara	9.97E-07	0.00761*	0.889
	0.238	13.571	
Bharatpur	0.002819*	4.69E-05	0.619
	5.968	***1.33***	
Bhilwara	0.006056*	5.5E-06	0.772
	0.878	***0.011***	
Bikaner	0.01037*	0.000352*	0.916
	14.108	6.554	
Jalor	0.00217	0.000407*	0.26
	1.054	2.641	
Nagaur	0.00456*	0.000137*	0.683
	6.539	2.623	
Pali	0.00413*	0.00217*	0.434
	3.439	2.415	
S.Madopur	0.00501*	4.51E-05*	0.697
	6.626	2.981	
Sikar	0.00321*	0.00018*	0.325
	2.661	1.993	
Second category:Positive growth at declining rate			
Ajmer	0.006144*	-1.8E-05*	0.69
	7.142	-0.276	
Alwar	0.00226*	-3.2E-05	0.24
	2.652	***-0.501***	
Barmer	0.003143	-6.3E-05*	0.841
	10.643	-2.848	
Bundi	0.004032*	-7.5E-05*	0.775
	8.177	-2.038	
Chittorgarh	0.005822*	-8.6E-05*	0.882
	12.884	-2.556	
Dungarpur	0.00862*	-5.6E-05	0.795
	0.888	***-0.078***	
Ganganagar	0.000524*	-0.00011*	0.252
	0.899	-2.633	

Jaipur	0.00185*	7.28E-05	0.353
	3.135	***1.652***	
Jaisalmer	0.00719*	-0.00035*	0.877
	10.745	-7.003	
Jhalawar	0.00275*	-5.4E-05	0.526
	4.887	***-1.281***	
Jhunjhunu	0.00796*	-0.00018	0.392
	5.682	***-1.119***	
Jodhpur	0.00509*	-1.5E-05	0.622
	6.71	***-0.256***	
Kota	0.00184*	-7.9E-05	0.667
	5.872	***-3.402***	
Sirohi	0.00308*	-9.1E-05*	0.825
	9.659	-3.841	
tonk	0.00226*	-5.7E-05*	0.627
	5.893	-1.978	
Udaipur	0.00227*	-7.2E-05	0.445
	3.952	***-1.688***	
Third cetegory : Negative growth at declining rate			
Churu	-0.0023	-0.00037*	0.162
	-0.898	-1.907	
RAJASTHAN	-0.00071	-5.3E-05	0.131
	-1.318	***1.314***	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

Table: 5.27 Acceleration and deceleration of growth in yield of the Cotton (1970-71 to 1999-2000)

Fundamental form: log Y =a + bt +ct^2

Districts	b	c	Rsquare
First category: Positive growth at increasing rate			
Jaisalmer	-0.0015*	0.00055*	0.606
	-1.158	5.838	
Jhalawar	-0.0095*	0.000152	0.302
	-3.083	***0.665***	
Forth category : Negative growth at increasing rate			
Ajmer	-0.01857*	-0.00033*	0.772
	-8.057	-4.256	
Alwar	-0.015*	-5.7E-05*	0.885
	-11.84	-6.099	
Banswara	-3.4E-05	-0.007*	0.53
	-0.329	-5.079	
Barmer	-0.01427*	-0.00053*	0.82
	-9.171	-4.545	
Bharatpur	-0.1105*	-0.00061*	0.734
	-6.408	-4.737	
Bhilwara	-0.01007	-0.00022***	0.67
	-6.577*	*-1.882*	
Bikaner	-0.1873*	-0.00095*	0.938
	-15.445	-10.541	
Bundi	-0.00971*	-0.00042*	0.814
	-8.719	-4.996	
Chittorgarh	-0.00857*	-0.0003*	0.577
	-5.075	-2.375	
Churu	0.000141*	-0.00009*	0.008
	0.05	-0.424	
Dungarpur	-0.012*	-0.00045*	0.836
	-9.653	-4.888	
Ganganagar	-0.015*	-0.00038*	0.824
	-9.83	-3.323	
Jaipur	-0.013*	-0.00047*	0.837
	-9.838	-4.656	
Jalor	-0.014*	-0.00053*	0.9

	-12.752	-6.61	
Jhunjhunu	-0.0098*	-0.00055*	0.822
	-0.725	-0.545	
Jodhpur	-0.014*	-0.00047*	0.856
	-10.638	-4.876	
Kota	-0.013*	-0.00035	0.488
	-4.396	***-1.614***	
Nagaur	-0.011*	-0.00044*	0.846
	-9.962	-5.171	
Pali	-0.011*	-0.00039*	0.728
	-7.048	-3.437	
S.Madopur	-0.012*	-0.00038*	0.888
	12.342	-5.563	
Sikar	-0.015*	-0.00051*	0.837
	-9.903	-4.486	
Sirohi	-0.012*	-0.00042*	0.83
	-9.504	-4.648	
tonk	-0.014*	-0.00005*	0.847
	-10.231	-4.754	
Udaipur	-0.015*	-0.00079*	0.918
	-13.01	-9.303	
RAJASTHAN	-0.013*	-0.00047*	0.865
	-10.88	-5.342	

* = Significant at 1% level
** = Significant at 5% level
*** = Significant at 10% level

CHAPTER-VI

DECOMPOSITION OF THE VERIABILITY IN GROWTH RATES

In the earlier chapters growth rates in output, area and yield along with acceleration and deceleration have been analyzed. In this chapter, it is intended to study the variability in annual growth rates of output as a result of variability in area and yield growth rates. This may help to identify the source of change in instability in production over different period.

Since production is equal to area multiplied by yield, taking first differences of the logarithm of production, the percentage increase or decrease in the output of the crop from its previous year's level can be approximately expressed as the total of the corresponding increases as the total of the corresponding increases or decreases in its area and yield

$$Got = Gat + Gyt \quad \ldots\ldots(1)$$

Where Got, Gat and Gyt are the annual growth rates in output, area and yield of the crop in year 't'. Clearly, over a time period of the specified length T, the year-to-year change in production and its two constituent components will not remain constant, unless their respective paths precisely follow a log-linear function of time over the period. Moreover, decomposition of the variability in annual output growth rates may help to identify the sources of change in instability in production over different periods. The variability in annual output growth rates over a specified period of length T can be decomposed as:

$$V(Go) = V(Ga) + V(Gy) + 2Cov(Ga, Gy) \quad \ldots\ldots(2)$$

Since the relative emphasis in production strategy may change from period to period, the two components of output growth rates may trace similar or dissimilar patterns over different periods. The nature

of the association between these two components is important as they influence the variability in the annual output growth rates over the period. Variability in the annual output growth rate is reinforced if year-to-year changes in these two components and output are positively correlated; it is dampened if they are negatively correlated.

The sign of covariance term in (2) may provide some insight regarding the production strategy that might have been followed during the period. Thus, under rainfed conditions, if intensive cultivation is practiced with yield augmenting and land augmenting techniques like multiple cropping, area and yield growth rates may become more sensitive to weather change and production may increase with increasing amplitude of fluctuation in it. On the other hand, if intensification of production is carried out under infrastructure facilities like irrigation, drainage, flood decline and production may increase at the fairly stable rate.

In this chapter, an attempt has been made to decomposition of the variability in annual output growth rate of selected crops during the period 1970-71 to 1999-2000 in all the districts of Rajasthan and .the annual growth rates have been decomposed between two parts 1970-71 to1984-85 called period first and 1985-86 to 1999-2000 called period second. We are interested to know the fact that under which period instability is higher. The annual growth rates have been calculated on the triennium moving average data. It has been stated earlier that variability in annual output growth rate depends upon variability in growth rate of area yield and covariance of both.

3.1 Bajra

Variation in annual growth rate of output at average level is nearly same in both period, in area it is more in first period and yield it is more in period second. Districts show negative correlated changes are six in first and become twelve in second period. It has been noted that the instability in area is lower than yield in twenty districts out of twenty-six. The instability in the production of Bajra might have

occurred during the period because marginal and less fertile land might have been increasing under the cultivation of Bajra crop. Since the yield from such marginal and less fertile land would be more sensitive to variation in rainfall and it is a fact that bajra is grown generally in dry land area or low irrigated areas, this might have contributed to increase in instability in yield.

It has been observed that there are sixteen districts, which have shown instability in annual output growth rates of bajra has occurred due to variability in annual growth rates in yield and positively correlated between output and its components during study period. The correlation between area and yield has turned positive in these districts because of two possible reasons, such as increase in irrigation in these districts and rainfall during sowing months of bajra. These districts are Ajmer, Alwar, Bharatpur, Bhilwara, Bundi, Dungarpur, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Nagaur, Pali, S Madopur, Sikar, Sirohi and Tonk.

There are ten districts, which have shown instability in annual output growth rates of Bajra due to variability in annual output growth rates of area and yield and negative correlated between area and yield during study period, indicating the stabilizing impact on instability in output during the period. These districts are Banswara, Barmer, Bikaner, Chittorgarh, Churu, Ganganagar, Jhalawar, Jodhpur, Kota and Udaipur.

3.2 **Jowar**

Variation in annual growth rate of output at average level is more in period second, in growth rate of area it is more in first period and growth rate of yield is higher in period second. Districts show negative correlated change are eight to thirteen in second period. It has been observed that there are nineteen districts, which have shown instability in annual output growth rates of Jowar has occurred due to variability in annual growth rates in yield and positive correlated

between output and its component during study period. The instability in area and yield may be due to addition in marginal and less fertile land might have been increasing under the cultivation of Jowar crop. Since the yield from such marginal and less fertile land would be more sensitive to variation in rainfall and change in prices, as such sensitivity can be expected to be greater in a period when scope for autonomous expansion in area become limited. The correlation between area and yield has turned positive in these districts because of two possible reasons, such as increase in irrigation in these districts and rainfall during sowing months of Jowar. These districts are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Chittorgarh, Churu, Jaipur, Jhunjhunu, Jodhpur, Kota, Nagaur, S Madopur, Sikar, Sirohi, Tonk and Udaipur.

There are seven districts, which have shown instability in annual output growth rates of Jowar due to variability in annual output growth rates of area and yield and negative correlated between area and yield during study period, indicating the stabilizing impact on instability in output during the period. These districts are. Bundi, Dungarpur, Ganganagar, Jaisalmer, Jalor, Jhalawar and Pali.

3.3 Maize

Variation in annual growth rate of output at average level is nearly same in both period, in growth rate of area and yield it is high in period second. Districts show negative correlated change are same in both periods. It has been examined that there are eight districts, which have shown instability in annual output growth rates of Maize has occurred due to variability in annual growth rates in yield, production and positively correlated between output and its component during study period. The correlation between area and yield has turned positive in these districts because of two possible

reasons, such as increase in irrigation in these districts and rainfall during sowing months of Maize. These districts are Ajmer, Alwar, Bundi, Jaipur, Jhunjhunu, Kota, Pali and Tonk

There are eighteen districts, which have shown instability in annual output growth rates of maize due to variability in annual output growth rates of area and yield and negative correlated between area and yield during study period, indicating the stabilizing impact on instability in output during the period. These districts are Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Chittorgarh, Churu, Dungarpur, Jaisalmer, Jalor, Jhalawar, Jodhpur, Nagaur, S Madopur, Sikar, Sirohi and Udaipur

3.4 Wheat

Variation in annual growth rate of output at average level noted same in both period, in growth rate of area and yield Variation is large in period second. Districts show negative correlated changes have increased from eleven to thirteen in second period. It has been observed that there are seven districts, which have shown instability in annual output growth rates of wheat has occurred due to variability in annual growth rates in yield except Bikaner and positive correlated between output and its component during study period. The instability in area and yield may be due to addition in marginal and less fertile land might have been increasing under the cultivation of wheat crop. Since the yield from such marginal and less fertile land would be more sensitive to variation in rainfall and change in prices, as such sensitivity can be expected to be greater in a period when scope for autonomous expansion in area become limited. The correlation between area and yield has turned positive in these districts because of two possible reasons, such as increase in irrigation base in these districts. These seven districts are. Bhilwara, Bikaner, Bundi, Chittorgarh, Jhalawar, Jodhpur and S Madopur.

There are nineteen districts, which have shown instability in annual output growth rates of wheat due to variability in annual output growth rates of area and yield and negative correlated between area and yield during study period, indicating the stabilizing impact on instability in output during the period. These districts include Ajmer, Alwar, Banswara, Barmer, Bharatpur, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Kota, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur.

3.5 Barley

It is observed that Variation in annual growth rate of output at average level is nearly same in both period, in annual growth rate of area it is high in first period and for annual growth rate of yield it is more in period second. Districts show negative correlated change declined from nine to eleven in second period.

It has been analyzed that there are eleven districts, which have shown instability in annual output growth rates of barley has occurred due to variability in annual output growth rates in area, production and positive correlated between output and its component during study period except Alwar. The correlation between area and yield has turned positive in eleven districts possibly because increase in irrigation base in these districts. These eleven districts are. Ajmer, Alwar, Bhilwara, Bundi, Churu, Jhalawar, Kota, Nagaur, Pali, Sirohi and Tonk.

There are fifteen districts, which have shown instability in annual output growth rates of Barley due to variability in annual growth rates of area, and negative correlated between output and its component during study period, indicating the stabilizing impact on instability in output during the period. These districts are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhunjhunu, Kota, Nagaur, Pali, Sikar, Sirohi, Tonk and Udaipur.

3.6 Sesamum

Variation in average level of output recorded more in period second, The period also witnessed a large variation in area and yield. Districts show negative correlated change are eleven to eighteen in second period.It has been observed that there are twenty-three districts, which have shown instability in annual output growth rates of sesamum, due to variability in annual growth rates in yield, except in Chittorgarh, Jhunjhunu and Kota. There is also positive correlation between output and components during study period. The correlation between area and yield has turned positive in these districts because of two possible reasons, such as increase in irrigation in these districts and rainfall during sowing months of sesamum. These twenty-three districts are. Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jaipur, Jaisalmer, Jalor, Jhalawar, Jhunjhunu, Jodhpur, Kota, Pali, S Madopur, Sikar, Sirohi, Tonk and Udaipur.

There are only three districts, which have shown instability in annual output growth rates of Sesamum due to variability in annual growth rates of area and yield and negative correlated between area and yield during study period, indicating the stabilizing impact on instability in output during the period. These districts are. Ajmer, Bikaner and Nagaur.

3.7 Mustard

During the period first, variation is high in annual growth rate of output, area and yield. Districts show negative correlated change fall in number six to four in second period. It has been examined that there are eleven districts, which have shown instability in annual output growth rates of mustard has occurred due to variability in annual output growth rates in area, and positive correlated between

output and its component during study period. The instability in area and yield may be due to addition in marginal and less fertile land might have been increasing brought under the cultivation of Masturd crop. Since the yield from such marginal and less fertile land would be more sensitive to variation in rainfall and change in prices, as such sensitivity can be expected to be greater in a period when scope for autonomous expansion in area become limited. The correlation between area and yield has turned positive in these districts because of two possible reasons, such as increase in irrigation in these districts and rainfall during sowing months of mustard. These districts are Banswara, Barmer, Bhilwara, Bikaner, Dungarpur, Ganganagar, Jaipur, Jalor, Kota, Pali and Udaipur.

There are fifteen districts, which have shown instability in annual output growth rates of mustard due to variability in annual growth rates of area and yield and negative correlated between output and its component during study period. These districts are Ajmer, Alwar, Bharatpur, Bundi, Chittorgarh, Churu, Jaisalmer, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, S Madopur, Sikar, Sirohi and Tonk.

3.8 Gram

Variation under annual growth rate of output at average level examined nearly same in both period, where growth rate of area and yield Variation is large in period second. Districts show negative correlated change become eleven to thirteen in second period. It has been observed that there are six districts, which have shown instability in annual output growth rates of gram has occurred due to variability in annual output growth rates in area. Positive correlated between output and its component during study period Sikar is an exception in this regard. The correlation between output and conponent has turned positive in these districts because of two possible reasons, such as increase in irrigation in these districts and

rainfall during sowing months of gram. These districts are Bikaner, Churu, Ganganagar, Jalor, Jodhpur and Kota.

There are twenty districts, which have shown instability in annual output growth rates of gram due to variability in annual growth rates of area and yield and negative correlated between area and yield during study period. These districts are Ajmer, Alwar, Banswara, Barmer, Bharatpur, Bhilwara, Bundi, Chittorgarh, Dungarpur, Jaipur, Jaisalmer, Jhalawar, Jhunjhunu, Nagaur, Pali, S Madopur, Sikar, Sirohi, Tonk and Udaipur.

3.9 Cotton

Variation in annual growth rate of output at average level experienced nearly same in both period, in annual growth rate of area and yield Variation is large in period second. Districts show negative correlated change increased eleven to twenty three in second period.It has been observed that there are eighteen districts, which have shown instability in annual output growth rates of cotton has occurred due to variability in annual growth rates in area, and positive correlated between area and yield during study period except Ajmer. The instability in area and yield may be due to addition in marginal and less fertile land might have been due to increasing under the cultivation of cotton crop. Since the yield from such marginal and less fertile land would be more sensitive to variation in rainfall and change in prices, as such sensitivity can be expected to be greater in a period when scope for autonomous expansion in area become limited. The correlation between area and yield has turned positive in these districts because of two possible reasons, such as increase in irrigation in these districts and rainfall during sowing months of cotton. These districts are Banswara, Barmer, Bharatpur, Bhilwara, Bikaner, Bundi, Chittorgarh, Churu, Dungarpur, Ganganagar, Jhalawar, Jhunjhunu, Jodhpur, Nagaur, Pali, S Madopur, Sirohi and Udaipur.

There are eight districts, which have shown instability in annual output growth rates of cotton due to variability in annual growth rates of area and yield and negative correlated between area and yield during study period, indicating the stabilizing impact on instability in output during the period. These districts are Ajmer, Alwar, Jaipur, Jaisalmer, Jalor, Kota, Sikar and Tonk.

SUMMARY OF FINDINGS

The Variation in annual output growth rate of crops have depended upon the variation in area growth rate, variation in yield growth rate and correlated change in output and its components. It has been observed that annual growth in area and yield are responsible for instability in output in all the districts in all crops. The Decomposition of the annual growth rates between two parts 1970-71 to1984-85 called period first and 1985-86 to 1999-2000 called period second. It has been noted that Variation in annual output growth rate of Jowar and Sesamum increased in period second., In case of mustard, increased variation in annual growth rate of output, area and yield is high in first period. Variation in annual yield growth rate of all remaining crops high in period second. Variation in annual growth rate of area is recorded high in Bajra, Jowar, Barley and Mustard in first period, and remaining are major part of instability is rise in second period. The districts show negative correlated change are increased in seven crops, only under Maize are constant and under Mustard it is decreased. This indicates that dependency on the rainfall has decreased.

The correlated change in output and its component growth rate has been negative for 57 per cent of the total districts in the case of Barley, and 57 per cent of the total districts in the case of mustard,69

percent of Maize, 73 percent of wheat and 76 percent of during the period. Therefore, majority of the districts have witnessed that yield has not been increasing with the increase in area under Barley, mustard, Maize, wheat and Gram and vice-versa during the period. It has been due to the fact that the cultivation of these crops have taken place in relative dry land or marginal lands in those districts. If there is addition in marginal land under these crops then there is no possibility of increase in yield level. On the other hand, the correlated change in area and yield growth rate has been positive for 61percent of Bajra, 73 percent of Jawar, 88 percent of Sesamum,and 69 percent of Cotton of the total districts. Compared with other these crops have beencultivated on more irrigated land.

Table 6.1 Decomposition of instability in Annual growth rates of Bajara output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	2.37	1.32	1.32	0.15	0.19	0.12	1.97	1.00	3.16	0.25	0.14	-1.96
Alwar	1.21	0.86	0.95	0.13	0.06	0.21	0.73	0.69	0.82	0.35	0.11	-0.08
Banswara	5.95	5.03	4.64	4.57	4.64	4.76	2.75	3.78	1.84	-1.37	-3.40	-1.96
Barmer	4.49	2.26	2.90	0.11	0.15	0.08	5.24	3.43	7.41	-0.86	-1.32	-4.59
Bharatpur	3.73	6.65	6.17	1.75	0.13	3.66	0.93	0.73	1.20	1.05	5.79	1.31
Bhilwara	3.20	3.86	4.12	1.04	1.58	0.53	1.23	1.07	1.46	0.92	1.20	2.13
Bikaner	9.31	7.65	10.31	0.20	0.23	0.19	9.38	10.20	8.57	-0.27	-2.79	1.55
Bundi	3.38	3.20	4.05	1.50	2.25	0.80	1.18	1.07	1.34	0.71	-0.11	1.91
Chittorgarh	5.96	8.60	8.02	5.17	7.31	3.14	1.13	0.88	1.39	-0.34	0.41	3.49
Churu	2.87	2.25	2.09	0.05	0.07	0.03	3.15	2.02	4.64	-0.33	0.16	-2.57
Dungarpur	5.40	7.04	6.88	3.39	3.96	3.05	1.21	1.12	1.35	0.80	1.97	2.48
Ganganagar	1.87	1.01	1.06	0.13	0.13	0.14	3.07	0.85	5.73	-1.33	0.04	-4.81
Jaipur	0.73	0.80	0.76	0.10	0.14	0.08	0.50	0.53	0.47	0.13	0.14	0.21
Jaisalmer	18.29	17.00	20.85	1.44	0.31	2.80	11.35	16.68	6.48	5.50	0.02	11.57
Jalor	5.29	3.39	4.00	0.17	0.19	0.15	4.33	3.53	5.32	0.79	-0.33	-1.47
Jhalawar	1.93	1.97	2.21	0.85	0.46	0.69	1.18	1.07	1.34	-0.10	0.44	0.18
Jhunjhunu	3.24	4.27	4.15	0.07	0.14	0.01	3.03	3.79	2.45	0.14	0.34	1.70
Jodhpur	5.32	4.75	5.07	0.10	0.13	0.06	5.38	5.43	5.56	-0.15	-0.82	-0.56
Kota	1.52	1.26	1.62	0.52	0.84	0.19	1.31	1.07	1.67	-0.31	-0.64	-0.23
Nagaur	1.93	1.88	2.16	0.05	0.05	0.07	1.76	1.82	1.83	0.11	0.01	0.27
Pali	4.72	4.36	4.24	0.19	0.26	0.13	3.96	3.38	4.92	0.57	0.73	-0.81
S.Madopur	1.45	1.83	1.71	0.09	0.09	0.11	1.09	1.31	0.92	0.26	0.43	0.68
Sikar	1.33	1.00	0.93	0.07	0.09	0.05	1.21	0.73	1.83	0.05	0.18	-0.95
Sirohi	2.51	3.04	3.00	0.45	0.70	0.22	1.46	1.42	1.58	0.60	0.91	1.20
Tonk	2.17	1.31	1.21	0.25	0.41	0.10	1.67	0.94	2.52	0.25	-0.04	-1.41
Udaipur	2.73	3.33	3.20	1.70	1.10	2.37	1.49	1.05	2.08	-0.45	1.18	-1.25
Rajasthan	1.36	0.93	1.03	0.14	0.19	0.09	2.39	1.62	3.40	-1.18	-0.88	-2.46

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.2Decomposition of instability in Annual growth rates of Jowar output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	7.93	5.02	4.65	0.12	0.06	0.19	7.30	4.34	11.08	0.50	0.62	-6.63
Alwar	2.79	3.04	2.91	0.86	1.45	0.29	1.36	1.19	1.62	0.57	0.41	1.01
Banswara	4.27	3.04	2.93	1.65	2.02	1.05	2.11	0.69	3.81	0.51	0.32	-1.94
Barmer	3.42	6.05	5.61	0.66	0.81	0.54	1.87	2.83	0.98	0.89	2.42	4.10
Bharatpur	3.28	5.32	4.95	0.56	0.78	0.32	1.82	2.31	1.43	0.90	2.22	3.20
Bhilwara	3.47	3.54	3.55	0.99	1.67	0.33	1.97	1.13	3.03	0.51	0.75	0.20
Bikaner	4.08	6.06	5.72	3.03	4.67	1.51	0.59	0.39	0.86	0.46	1.00	3.35
Bundi	1.15	1.03	0.96	0.63	0.11	1.11	1.30	0.69	2.08	-0.79	0.23	-2.23
Chittorgarh	1.45	1.38	1.47	0.14	0.11	0.16	1.13	1.41	0.92	0.18	-0.14	0.39
Churu	5.18	1.59	1.91	2.37	1.22	3.81	0.57	0.33	0.88	2.24	0.05	-2.78
Dungarpur	4.42	3.88	4.12	3.46	2.58	4.59	5.80	1.23	11.22	-4.84	0.07	-11.69
Ganganagar	4.25	2.50	2.41	19.62	2.22	39.42	39.18	0.41	84.21	-54.56	-0.13	-121.22
Jaipur	3.64	3.29	3.33	0.19	0.13	0.24	2.85	2.96	2.88	0.61	0.20	0.20
Jaisalmer	3.34	4.00	4.29	1.37	1.08	1.79	2.26	2.62	2.00	-0.29	0.30	0.50
Jalor	3.91	6.82	6.31	2.06	3.34	0.83	1.96	2.78	1.22	-0.12	0.70	4.27
Jhalawar	0.61	0.50	0.71	3.51	2.31	3.95	0.83	0.74	0.94	-3.74	-2.55	-4.19
Jhunjhunu	15.77	5.86	5.41	11.94	5.93	17.97	1.04	1.02	1.15	2.79	-1.09	-13.71
Jodhpur	21.57	24.40	22.60	0.85	1.09	0.51	14.85	15.01	15.82	5.87	8.30	6.27
Kota	0.58	0.45	0.55	0.25	0.18	0.26	0.28	0.26	0.31	0.05	0.01	-0.02
Nagaur	4.72	3.88	3.66	0.30	0.39	0.21	3.35	3.82	3.07	1.07	-0.33	0.39
Pali	10.23	17.29	17.25	3.88	1.56	6.71	11.02	12.56	10.22	-4.67	3.17	0.32
S.Madopur	1.84	1.76	1.65	0.40	0.14	0.46	1.35	1.21	1.61	0.09	0.41	-0.42
Sikar	22.61	35.91	33.98	15.65	26.64	5.02	1.20	1.09	1.42	5.76	8.18	27.54
Sirohi	4.49	8.08	7.74	1.32	2.42	0.22	1.75	2.83	0.72	1.41	2.83	6.80
Tonk	1.52	1.01	0.99	0.07	0.04	0.08	1.09	0.97	1.30	0.36	0.01	-0.39
Udaipur	4.35	1.99	2.09	0.23	0.26	0.23	3.94	1.95	6.43	0.18	-0.21	-4.56
Rajasthan	1.33	1.00	1.05	0.32	0.52	0.11	1.41	1.06	1.90	-0.40	-0.58	-0.97

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.3 Decomposition of instability in Annual growth rates of Maize output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	0.90	0.51	0.48	0.03	0.02	0.05	0.84	0.57	1.20	0.03	-0.07	-0.77
Alwar	1.17	0.73	0.68	0.12	0.15	0.08	1.05	0.72	1.46	0.01	-0.14	-0.87
Banswara	1.88	1.77	1.75	0.01	0.01	0.01	2.09	1.75	2.49	-0.22	0.01	-0.76
Barmer	2.13	2.76	2.60	4.05	5.95	2.30	0.76	1.07	0.47	-2.67	-4.26	-0.17
Bharatpur	0.97	1.10	1.06	1.16	1.95	0.39	0.78	0.81	0.82	-0.97	-1.66	-0.16
Bhilwara	0.66	0.32	0.38	0.02	0.02	0.02	0.76	0.48	1.12	-0.12	-0.18	-0.76
Bikaner	7.36	2.59	2.42	5.79	1.34	7.72	1.92	0.33	3.74	-0.36	0.93	-9.04
Bundi	0.95	0.89	0.95	0.15	0.18	0.10	0.72	0.85	0.63	0.08	-0.15	0.21
Chittorgarh	0.42	0.33	0.36	0.01	0.02	0.00	0.47	0.42	0.56	-0.07	-0.11	-0.21
Churu	0.00	0.00	0.00	9.07	6.68	12.92	5.38	5.81	4.46	-14.45	-12.49	-17.38
Dungarpur	1.31	1.09	1.10	2.39	4.72	0.05	2.37	3.13	1.62	-3.44	-6.76	-0.57
Ganganagar	0.88	0.64	0.64	0.00		0.00	0.00	0.00	0.00	0.88	#DIV/0!	0.64
Jaipur	1.47	2.04	1.91	0.26	0.27	0.26	1.09	1.40	0.82	0.12	0.37	0.82
Jaisalmer	0.00	0.00	0.00	88.40		88.40	9.23	0.00	9.23	-97.63	#DIV/0!	-97.63
Jalor	2.74	1.65	1.71	2.05	2.76	1.32	1.44	1.39	1.54	-0.75	-2.50	-1.16
Jhalawar	0.87	0.92	0.98	0.05	0.03	0.04	0.85	0.97	0.77	-0.03	-0.07	0.17
Jhunjhunu	2.78	1.22	1.48	1.86	0.86	2.91	0.63	0.58	0.74	0.28	-0.21	-2.17
Jodhpur	1.26	1.58	1.48	0.98	1.32	0.62	0.91	1.07	0.80	-0.63	-0.82	0.06
Kota	1.25	1.32	1.67	0.14	0.14	0.09	1.02	1.42	0.64	0.08	-0.24	0.95
Nagaur	1.02	1.64	1.53	0.56	0.85	0.29	0.91	1.06	0.82	-0.45	-0.27	0.43
Pali	1.04	0.79	0.77	0.07	0.08	0.06	0.92	0.72	1.22	0.05	0.00	-0.51
S.Madopur	5.95	1.81	1.67	0.94	1.29	0.58	5.61	0.60	11.51	-0.60	-0.08	-10.41
Sikar	1.06	0.99	0.93	0.68	0.52	0.83	0.67	0.60	0.82	-0.30	-0.13	-0.71
Sirohi	2.90	1.61	1.82	0.54	0.03	1.13	2.64	1.87	3.63	-0.27	-0.28	-2.94
Tonk	1.91	2.48	2.29	0.16	0.20	0.14	1.71	2.23	1.25	0.04	0.05	0.90
Udaipur	0.95	0.42	0.47	0.02	0.01	0.03	1.05	0.55	1.66	-0.12	-0.14	-1.22
Rajasthan	0.72	0.33	0.38	0.18	0.07	0.29	0.75	0.45	1.13	-0.21	-0.20	-1.05

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.4 Decomposition of instability in Annual growth rates of Wheat output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area , yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	0.52	0.48	0.53	0.35	0.25	0.48	0.22	0.13	0.34	-0.05	0.10	-0.29
Alwar	0.23	0.40	0.39	0.07	0.10	0.03	0.16	0.24	0.08	0.00	0.05	0.28
Banswara	0.21	0.20	0.21	0.09	0.11	0.07	0.21	0.32	0.11	-0.09	-0.22	0.03
Barmer	0.47	0.51	0.47	0.77	0.78	0.78	0.12	0.10	0.15	-0.43	-0.38	-0.46
Bharatpur	0.19	0.31	0.29	0.09	0.10	0.08	0.17	0.24	0.11	-0.08	-0.03	0.09
Bhilwara	0.56	0.54	0.51	0.27	0.27	0.29	0.12	0.13	0.12	0.17	0.14	0.10
Bikaner	1.47	2.08	1.94	1.03	1.67	0.17	0.36	0.04	0.73	0.08	0.37	1.04
Bundi	0.16	0.16	0.17	0.05	0.05	0.06	0.10	0.08	0.12	0.01	0.04	0.00
Chittorgarh	0.36	0.27	0.25	0.12	0.05	0.19	0.17	0.15	0.21	0.07	0.07	-0.15
Churu	1.02	1.11	1.03	1.07	1.00	0.91	0.05	0.04	0.07	-0.10	0.07	0.05
Dungarpur	0.26	0.19	0.31	0.28	0.36	0.21	0.13	0.06	0.21	-0.15	-0.22	-0.12
Ganganagar	0.14	0.13	0.12	0.09	0.06	0.12	0.16	0.07	0.25	-0.11	0.00	-0.25
Jaipur	0.12	0.16	0.17	0.05	0.07	0.03	0.08	0.08	0.09	-0.01	0.02	0.05
Jaisalmer	2.05	2.27	2.98	2.76	3.83	1.09	0.08	0.10	0.07	-0.80	-1.66	1.83
Jalor	0.28	0.12	0.11	0.29	0.27	0.34	0.17	0.16	0.19	-0.18	-0.31	-0.41
Jhalawar	0.49	0.68	0.66	0.11	0.15	0.05	0.27	0.29	0.28	0.12	0.24	0.34
Jhunjhunu	0.24	0.21	0.22	0.16	0.25	0.06	0.18	0.10	0.28	-0.09	-0.14	-0.12
Jodhpur	0.61	1.10	1.01	0.29	0.42	0.16	0.32	0.40	0.25	0.01	0.28	0.60
Kota	0.12	0.09	0.08	0.07	0.04	0.09	0.10	0.03	0.17	-0.05	0.01	-0.18
Nagaur	1.04	1.74	1.61	0.58	1.00	0.15	0.61	0.66	0.52	-0.15	0.07	0.94
Pali	0.63	0.31	0.45	0.60	0.62	0.61	3.24	6.14	0.37	-3.21	-6.45	-0.53
S.Madopur	0.19	0.27	0.27	0.06	0.05	0.09	0.10	0.18	0.03	0.02	0.05	0.16
Sikar	0.30	0.30	0.29	0.09	0.16	0.03	0.25	0.23	0.30	-0.05	-0.09	-0.04
Sirohi	0.65	0.32	0.34	0.38	0.20	0.58	0.55	0.09	1.09	-0.28	0.03	-1.33
Tonk	0.27	0.16	0.15	0.12	0.12	0.13	0.19	0.07	0.33	-0.04	-0.03	-0.31
Udaipur	0.49	0.21	0.21	0.38	0.26	0.56	0.13	0.07	0.22	-0.03	-0.11	-0.56
Rajasthan	0.34	0.06	0.06	0.09	0.05	0.14	0.30	0.05	0.59	-0.04	-0.04	-0.67

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.5 Decomposition of instability in Annual growth rates of Barley output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	0.72	0.72	0.72	0.34	0.42	0.26	0.22	0.14	0.32	0.16	0.16	0.14
Alwar	3.34	6.98	6.45	0.25	0.32	0.18	2.59	5.03	0.16	0.49	1.63	6.11
Banswara	0.29	0.34	0.43	0.25	0.43	0.07	0.07	0.08	0.08	-0.04	-0.17	0.28
Barmer	2.04	2.66	2.47	2.14	2.33	1.98	0.07	0.10	0.03	-0.18	0.23	0.45
Bharatpur	0.48	0.58	0.56	0.52	0.55	0.49	0.14	0.13	0.17	-0.19	-0.10	-0.10
Bhilwara	0.43	0.35	0.32	0.20	0.19	0.23	0.10	0.07	0.15	0.13	0.09	-0.05
Bikaner	3.64	4.58	5.63	4.47	5.81	2.77	0.56	0.38	0.79	-1.39	-1.61	2.06
Bundi	0.65	0.69	0.73	0.37	0.51	0.14	0.20	0.17	0.25	0.08	0.01	0.34
Chittorgarh	0.50	0.45	0.42	0.41	0.41	0.40	0.17	0.19	0.14	-0.08	-0.15	-0.12
Churu	15.22	21.29	19.68	13.33	17.29	10.14	0.63	0.39	0.91	1.26	3.62	8.62
Dungarpur	0.77	0.94	1.20	0.65	0.95	0.37	0.29	0.43	0.14	-0.17	-0.44	0.68
Ganganagar	1.53	2.18	2.18	1.86	3.00	0.61	0.59	0.55	0.54	-0.93	-1.38	1.02
Jaipur	0.22	0.37	0.35	0.61	0.16	1.15	1.15	0.12	2.35	-1.54	0.09	-3.15
Jaisalmer	8.07	10.23	10.23	29.26	23.64	37.48	3.50	4.90	2.61	-24.69	-18.31	-29.86
Jalor	1.47	2.15	2.04	11.06	1.84	21.88	1.08	0.11	2.21	-10.67	0.20	-22.06
Jhalawar	0.68	0.89	0.82	0.34	0.51	0.18	0.25	0.33	0.17	0.08	0.05	0.47
Jhunjhunu	2.51	3.55	3.32	2.50	3.96	1.09	0.35	0.44	0.27	-0.33	-0.85	1.96
Jodhpur	0.94	1.01	0.97	9.24	1.38	18.46	1.15	0.22	2.24	-9.44	-0.59	-19.73
Kota	0.70	1.07	1.03	0.43	0.63	0.12	0.18	0.20	0.15	0.09	0.24	0.76
Nagaur	0.36	0.49	0.48	0.38	0.57	0.19	0.22	0.17	0.29	-0.24	-0.25	0.00
Pali	0.64	0.75	0.69	0.38	0.52	0.25	0.23	0.22	0.25	0.04	0.01	0.20
S.Madopur	0.54	0.57	0.53	0.27	0.34	0.20	0.36	0.21	0.55	-0.09	0.02	-0.22
Sikar	0.28	0.37	0.35	0.27	0.37	0.18	0.12	0.11	0.14	-0.11	-0.11	0.02
Sirohi	1.66	1.70	1.58	0.34	0.54	0.14	0.13	0.16	0.11	1.19	1.00	1.32
Tonk	0.64	0.90	0.86	0.21	0.32	0.10	0.34	0.31	0.35	0.09	0.27	0.41
Udaipur	0.30	0.16	0.21	0.25	0.26	0.26	0.37	0.46	0.26	-0.32	-0.56	-0.31
Rajasthan	1.87	0.26	0.24	0.16	0.28	0.05	2.16	0.08	4.58	-0.45	-0.10	-4.39

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.6 Decomposition of instability in Annual growth rates of Sesamum output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	6.14	3.35	3.47	0.98	0.32	1.71	5.18	3.50	7.37	-0.01	-0.48	-5.61
Alwar	4.41	3.10	2.87	1.13	0.70	1.63	2.90	1.82	4.31	0.38	0.59	-3.07
Banswara	5.99	4.83	5.21	1.75	2.32	1.27	2.78	1.59	4.28	1.46	0.93	-0.33
Barmer	13.45	7.47	7.23	0.98	0.90	1.11	9.89	5.37	15.60	2.58	1.21	-9.48
Bharatpur	3.23	3.99	3.69	1.12	1.30	0.95	1.80	1.83	1.91	0.31	0.86	0.82
Bhilwara	2.89	1.39	1.37	0.66	0.68	0.65	1.21	0.39	2.19	1.02	0.32	-1.46
Bikaner	16.45	12.47	14.32	1.06	1.03	1.16	18.18	17.49	20.41	-2.79	-6.05	-7.24
Bundi	2.54	1.91	2.43	1.22	1.13	0.97	0.88	0.55	1.29	0.44	0.22	0.17
Chittorgarh	2.37	2.04	2.23	1.04	0.91	1.20	0.63	0.49	0.78	0.71	0.63	0.26
Churu	11.24	8.79	8.29	2.01	1.68	2.54	5.49	7.20	3.60	3.74	-0.08	2.15
Dungarpur	3.75	2.21	3.07	1.44	2.36	0.55	2.16	0.90	3.69	0.15	-1.06	-1.17
Ganganagar	19.01	20.39	19.03	2.37	1.86	1.93	5.26	7.06	3.29	11.39	11.47	13.81
Jaipur	8.20	2.65	2.68	1.10	0.35	1.99	3.68	2.79	4.93	3.42	-0.49	-4.24
Jaisalmer	6.74	4.32	5.58	5.84	4.36	7.74	1.51	0.99	2.18	-0.61	-1.03	-4.35
Jalor	8.48	6.04	6.28	0.47	0.54	0.44	7.43	6.44	9.12	0.58	-0.93	-3.28
Jhalawar	5.59	3.42	4.20	1.38	1.38	0.94	2.52	1.47	3.79	1.69	0.58	-0.53
Jhunjhunu	14.10	12.39	11.62	2.34	2.33	2.23	1.91	1.40	2.60	9.85	8.66	6.79
Jodhpur	10.86	9.84	9.09	0.53	0.23	0.90	9.22	7.39	11.95	1.12	2.23	-3.76
Kota	5.47	4.81	6.13	2.61	3.09	1.64	1.02	1.20	0.82	1.85	0.51	3.66
Nagaur	8.24	2.17	2.19	0.86	0.24	1.50	8.29	2.21	15.54	-0.92	-0.28	-14.85
Pali	9.35	6.13	5.91	0.45	0.22	0.73	6.56	5.05	8.75	2.34	0.86	-3.57
S.Madopur	6.08	2.72	2.51	1.67	0.85	2.69	3.00	1.12	5.14	1.40	0.75	-5.32
Sikar	6.21	4.28	4.04	1.05	1.10	0.96	1.91	1.35	2.54	3.26	1.83	0.54
Sirohi	5.95	4.45	4.90	0.45	0.41	0.54	5.01	4.59	5.88	0.49	-0.55	-1.51
Tonk	3.74	1.33	1.25	1.91	0.89	3.17	1.76	0.68	3.06	0.07	-0.24	-4.99
Udaipur	4.89	2.46	2.92	0.69	0.99	0.42	0.82	0.87	0.81	3.39	0.60	1.68
Rajasthan	2.94	1.10	1.25	0.30	0.09	0.55	10.82	10.45	11.91	-8.18	-9.43	-11.21

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.7 Decomposition of instability in Annual growth rates of Mustard output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	5.03	9.15	8.69	3.56	6.28	0.66	0.31	0.44	0.20	1.15	2.44	7.82
Alwar	1.15	2.24	2.06	0.44	0.70	0.18	0.63	1.18	0.08	0.09	0.35	1.80
Banswara	4.72	8.92	8.34	10.73	7.33	15.11	0.95	0.31	1.60	-6.96	1.29	-8.37
Barmer	5.07	10.49	9.76	5.59	10.77	0.44	0.30	0.50	0.10	-0.82	-0.79	9.21
Bharatpur	0.88	1.68	1.55	0.35	0.54	0.17	0.44	0.73	0.16	0.09	0.41	1.22
Bhilwara	3.47	5.37	5.04	3.22	4.86	1.37	0.34	0.50	0.18	-0.09	0.02	3.49
Bikaner	1.06	0.57	0.53	0.41	0.49	0.32	0.81	0.43	1.28	-0.16	-0.35	-1.07
Bundi	8.87	18.28	16.92	7.36	13.97	0.82	0.27	0.43	0.11	1.23	3.88	15.99
Chittorgarh	6.18	9.96	9.40	5.80	9.44	1.36	0.30	0.44	0.17	0.08	0.07	7.86
Churu	4.29	7.51	6.98	3.65	5.70	1.60	0.24	0.43	0.04	0.41	1.38	5.34
Dungarpur	3.40	5.97	5.57	2.29	2.87	1.69	1.98	0.44	3.67	-0.86	2.65	0.22
Ganganagar	0.70	0.46	0.42	0.81	0.36	1.31	0.24	0.09	0.40	-0.35	0.00	-1.29
Jaipur	1.17	2.02	1.87	1.10	1.94	0.29	0.36	0.54	0.19	-0.29	-0.47	1.40
Jaisalmer	4.84	6.93	7.11	4.85	6.59	1.57	0.26	0.48	0.05	-0.27	-0.14	5.49
Jalor	0.69	1.09	1.04	0.79	1.38	0.23	0.36	0.54	0.19	-0.46	-0.83	0.62
Jhalawar	13.21	23.68	22.11	10.69	17.73	3.95	1.19	1.80	0.63	1.33	4.15	17.53
Jhunjhunu	2.88	5.95	5.50	2.23	4.25	0.21	0.27	0.31	0.22	0.39	1.40	5.07
Jodhpur	1.68	3.05	2.95	1.14	2.01	0.19	0.45	0.48	0.42	0.10	0.55	2.34
Kota	2.87	5.14	4.83	2.08	3.42	0.66	0.89	0.92	0.91	-0.09	0.80	3.27
Nagaur	3.41	6.87	6.35	2.64	4.90	0.15	0.67	1.01	0.27	0.11	0.95	5.92
Pali	1.82	1.56	2.08	1.73	2.02	1.52	0.60	0.54	0.72	-0.51	-0.99	-0.16
S.Madopur	1.67	3.12	3.05	0.73	1.30	0.16	0.44	0.77	0.09	0.50	1.05	2.80
Sikar	2.79	5.56	5.15	1.59	2.96	0.22	0.63	1.03	0.24	0.58	1.57	4.69
Sirohi	1.14	1.30	1.48	0.69	0.75	0.69	0.28	0.44	0.12	0.17	0.12	0.67
Tonk	1.80	3.17	3.13	1.54	2.80	0.28	0.21	0.22	0.20	0.06	0.15	2.65
Udaipur	3.41	6.46	6.31	2.98	5.31	0.67	0.44	0.47	0.42	-0.02	0.68	5.22
Rajasthan	0.67	1.21	1.14	1.21	1.69	0.82	3.02	5.90	0.56	-3.56	-6.37	-0.24

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.8 Decomposition of instability in Annual growth rates of Gram output during 1970-2000

	Variation in growth raets of output			Variation in growth raets of area			Variation in growth raets of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	2.29	3.17	3.44	0.84	0.85	0.82	0.93	1.34	0.55	0.52	0.97	2.07
Alwar	2.02	1.75	1.64	0.80	0.45	1.24	0.55	0.67	0.45	0.67	0.63	-0.05
Banswara	0.51	0.69	0.71	0.25	0.32	0.18	0.22	0.22	0.23	0.04	0.15	0.29
Barmer	47.85	34.51	42.43	34.36	43.46	23.81	0.14	0.24	0.04	13.35	-9.19	18.57
Bharatpur	2.99	1.34	1.25	1.46	0.92	2.16	0.23	0.11	0.38	1.30	0.31	-1.29
Bhilwara	0.81	1.03	0.95	0.40	0.37	0.43	0.30	0.33	0.28	0.11	0.32	0.24
Bikaner	1.84	1.21	1.21	1.38	1.28	0.92	1.32	0.13	2.67	-0.86	-0.20	-2.38
Bundi	0.38	0.13	0.16	0.23	0.06	0.37	0.11	0.16	0.06	0.04	-0.09	-0.28
Chittorgarh	1.19	0.76	0.79	0.44	0.45	0.45	0.18	0.22	0.15	0.58	0.09	0.20
Churu	3.61	2.93	2.76	0.74	0.75	0.79	4.47	6.17	2.94	-1.60	-4.00	-0.97
Dungarpur	8.43	15.80	14.76	0.68	0.38	1.03	0.84	0.68	1.09	6.91	14.74	12.64
Ganganagar	0.72	1.12	1.03	0.24	0.08	0.42	0.51	0.77	0.28	-0.03	0.27	0.34
Jaipur	1.03	1.13	1.04	0.48	0.38	0.63	0.48	0.50	0.48	0.08	0.25	-0.06
Jaisalmer	22.45	1.98	2.45	3.31	1.48	3.99	0.80	1.52	0.04	18.34	-1.02	-1.58
Jalor	9.22	8.67	11.01	8.06	9.71	6.14	3.07	0.49	6.10	-1.92	-1.53	-1.23
Jhalawar	0.68	0.54	0.54	0.22	0.16	0.27	0.30	0.14	0.50	0.17	0.25	-0.23
Jhunjhunu	5.76	9.80	9.05	2.59	1.79	3.63	2.51	2.74	2.45	0.66	5.27	2.97
Jodhpur	14.68	7.79	19.50	15.00	20.98	7.66	0.94	0.33	1.68	-1.26	-13.52	10.16
Kota	0.32	0.35	0.33	0.31	0.28	0.22	0.11	0.10	0.13	-0.10	-0.02	-0.02
Nagaur	6.94	5.66	5.82	4.76	6.17	2.84	0.64	1.06	0.23	1.54	-1.57	2.75
Pali	3.40	3.62	3.81	2.68	2.85	2.22	0.55	0.83	0.30	0.16	-0.06	1.29
S.Madopur	1.20	1.26	1.20	0.52	0.34	0.77	0.55	0.47	0.67	0.12	0.46	-0.23
Sikar	3.22	5.08	4.69	1.00	1.31	0.75	1.12	1.73	0.56	1.09	2.04	3.38
Sirohi	3.41	1.02	1.10	1.24	1.00	1.56	0.23	0.23	0.25	1.95	-0.22	-0.71
Tonk	0.86	1.09	1.02	0.26	0.21	0.32	0.38	0.52	0.26	0.22	0.36	0.44
Udaipur	1.25	0.83	0.84	0.70	0.27	1.15	0.43	0.41	0.47	0.13	0.15	-0.79
Rajasthan	0.48	0.48	0.45	5.97	0.14	12.77	0.42	0.16	0.73	-5.91	0.17	-13.05

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Table 6.9 Decomposition of instability in Annual growth rates of Cotton output during 1970-2000

	Variation in growth rates of output			Variation in growth rates of area			Variation in growth rates of yield			Correlated change in area, yield and output		
	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2	Total Period	Period 1	Period 2
Ajmer	1.63	0.32	0.36	0.27	0.11	0.46	0.78	0.39	1.15	0.58	-0.18	-1.25
Alwar	3.41	1.58	1.58	2.60	1.68	2.47	0.57	0.07	0.81	0.25	-0.16	-1.70
Banswara	0.76	0.91	0.90	0.31	0.03	0.59	2.00	0.94	3.32	-1.55	-0.06	-3.00
Barmer	1.80	2.71	2.81	2.39	2.81	1.19	0.66	0.18	0.90	-1.25	-0.29	0.72
Bharatpur	8.81	8.35	7.78	7.71	6.79	8.13	1.33	0.47	2.04	-0.23	1.09	-2.39
Bhilwara	1.36	0.59	0.64	0.60	0.21	1.08	1.54	0.42	2.79	-0.78	-0.04	-3.23
Bikaner	3.85	4.24	3.96	1.85	2.39	1.17	2.19	0.99	2.80	-0.20	0.86	-0.01
Bundi	3.98	1.54	1.42	3.97	1.53	6.75	1.02	0.08	1.84	-1.02	-0.07	-7.17
Chittorgarh	1.49	0.87	0.82	0.94	0.48	1.51	1.50	0.48	2.61	-0.95	-0.09	-3.30
Churu	19.94	23.78	27.07	11.23	8.71	14.89	5.09	5.21	5.37	3.63	9.86	6.80
Dungarpur	2.09	0.55	0.51	1.35	0.41	2.33	0.86	0.07	1.49	-0.12	0.08	-3.30
Ganganagar	0.97	0.19	0.18	0.19	0.09	0.30	1.39	0.11	2.60	-0.61	-0.01	-2.72
Jaipur	6.98	1.93	1.78	4.92	1.88	8.37	0.63	0.07	0.99	1.43	-0.02	-7.58
Jaisalmer	16.49	0.13	0.13	7.20	1.71	10.87	1.56	2.59	0.48	7.72	-4.17	-11.21
Jalor	1.41	0.56	0.51	0.58	0.47	0.74	0.54	0.07	0.74	0.29	0.02	-0.97
Jhalawar	3.05	0.64	0.65	2.04	0.22	3.79	4.59	0.94	8.93	-3.58	-0.52	-12.08
Jhunjhunu	13.14	13.66	13.94	11.41	12.47	10.53	1.01	0.19	1.65	0.72	1.00	1.76
Jodhpur	1.01	0.68	0.62	0.45	0.41	0.46	0.50	0.08	0.77	0.05	0.19	-0.61
Kota	13.94	11.74	12.50	11.99	7.66	17.05	1.71	0.09	3.98	0.25	4.00	-8.54
Nagaur	0.94	0.51	0.51	0.57	0.44	0.75	0.77	0.07	1.33	-0.40	0.00	-1.57
Pali	1.75	1.31	1.36	0.72	0.46	1.06	1.34	0.86	1.95	-0.31	-0.01	-1.66
S.Madopur	33.46	19.45	18.49	15.34	4.77	28.06	0.86	0.23	1.51	17.26	14.45	-11.09
Sikar	5.07	1.53	1.70	2.99	1.82	4.26	0.63	0.07	0.99	1.46	-0.36	-3.55
Sirohi	1.41	0.80	0.74	0.80	0.79	0.84	0.95	0.06	1.81	-0.34	-0.05	-1.90
Tonk	1.51	0.19	0.20	0.73	0.32	1.23	0.52	0.07	0.77	0.26	-0.20	-1.80
Udaipur	1.73	1.14	1.07	0.80	0.36	1.28	1.48	0.34	2.62	-0.55	0.44	-2.83
Rajasthan	1.06	0.13	0.12	2.40	0.63	4.21	1.38	0.12	2.58	-2.72	-0.62	-6.67

Total Period is 1970-71 to 1999-2000
Period 1 is 1970-71 to 1984-85
Period 2 is 1985-86 to 1999-2000

Summary of Conclusions

The main purpose of the study was to analyze the levels and growth of agricultural productivity in Rajasthan and in its various districts. A brief picture of the growth rates, productivity levels and variability of annual growth rates have been analyzed for the nine major crops covered in the present study. An attempt has also made to give a picture regional concentration of total agricultural output as well as its constituents.

The instability in agricultural production has increased in the post green revolution period on account of rise in the sensitivity of output to variations in rainfall because of the inadequacy of irrigation. Although weather induced instability in farm output can be reduced considerably, it can not be eliminated altogether because of biological nature of agricultural activity and the inherent limitation, under the existing state of knowledge, to cope with the vagaries of nature.

The level of agricultural output and its growth depends on the interaction of the several institutional, technological and environmental factors. It has not been possible to fully analyze the factors that are responsible for high levels of growth in certain area and lack of growth in elsewhere. Nevertheless, some patterns seem to be clearly emerging from this study Firstly, we discover that the areas with high productivity level in agricultural output are significantly associated with high rainfall and

assured levels of irrigation. On the other hand the lowest productivity areas belong to arid and semi arid zones. In these areas where rainfall is very low and unpredictable, and assured irrigation is almost non existent.

Coming to the growth of agricultural output, one finds greater variation in the growth rates. In most of the crops variation is due to growth rates in yield. Growth rate in area is a cause of variations in few crops and in few areas where growth in assured irrigation has enabled. Benefits from new technology and register considerable increase in output in those areas where growth in assured irrigation facilities has enabled. For example the dry areas where the initial productivity levels were low and irrigation has been introduced for the first time the highest rates of growth have been recorded.

Productivity variation has become wider after the green revolution period. Though it is a wheat revolution but use of pesticides, development in irrigation facilities, use of modern inputs like fertilizer, machinery and advanced varieties of crops make the output to more sensitive towards the weather conditions, market prices. Because of expensive inputs, risk factor is greater and economic condition of the farmers also has significant effect. The average level of productivity is rise in all the crops except Cotton and inter district variation in each crop has also increased during the study period.

There are some changes in levels of productivity found these are crops wise given:

Productivity levels of Bajra, Jawar and Sesamum shown poor picture most of the districts during 1970-73 belongs to low productivity level. In all these cases districts belong to medium productivity level. None of district belongs to higher productivity level category in 197073. The three crops are rainfed and mostly grown in the dry region of the state does not show any during the three decades.

In case of Maize and Mustered mostly districts fall under medium category, maze shows good growth in productivity and number of districts comes under higher productivity level. But growth in districts in mustered is not so good only eight districts have been able move to higher level. Productivity level of wheat and barley recorded good trend under both crops most of the districts under both the crops recorded in 1997-2000 under higher productivity level. One of the best trends is recorded in productivity level of Gram. During 1970-73 all districts belongs to medium and low category. None of the district fall under highest productivity level. But in 1997-2000 six districts reach to the higher productivity level. All these districts have assured irrigation system.

It has been observed that different pictures have been seen in the study period in cotton(area production and yields).

The positive impact of new technology on the growth of wheat is observed with the stagnant growth in area and positive growth in out put in just because of growth in yield per hectare. It has been examined that growth of production of Jowar, Maize, Barley, sesamum, mustered, gram and cotton has been mainly due to growth of area under these crops.
Only Ganganagar district in case of Jowar shows negative growth in production due to negative growth in yield only. It has been observed that growth of production of Bajra, wheat, some districts in sesamum and some in Gram has been mainly because of growth of area under these crop. Growth rate in yield is positive for all the districts for all eight crops except cotton. Except Churu in case of Gram, Bikaner and Churu in case of Maize, Dungarpur in case of Jowar and Barmer in case of Bajra. These districts shows negative growth rate in yield. Mustered presents a good picture of growth rate in production and its components. It shows very high growth rate in production which is mostly mostly due to hihg growth rate in area. Growth of area in most of the districts under Barley, maize, sesamum and gram and more than fifty per cent districts under Bajra, Jowar and cotton on more than fifty per cent districts shows negative growth rate.

It has been observed that area, production and yield of the crops has different pictures. It is not possible to present the analysis on aggregate basis for all the crops. Therefore it has been decided to present the analysis for individual crop.

Growth rate of area under the Bajra, wheat and mustered has been increasing at an increasing rate. Growth rate in area under the crop is increasing in most of the districts may be increasing at decreasing rate in the Bajra, wheat, mustered and cotton. All districts incase of mustered have shown positive growth either increasing or decreasing. Only eight districts show negative growth in case of wheat all other districts shows positive growth rate. Eleven districts with increasing rate and seven districts at decreasing rate. Growth rate is positive at declining rate in most of the districts in Bajra where positive at increasing rate in cotton. This may be due to assured irrigation by canal system development or by the tube wells or these districts are located in relatively humid zones. Growth rate of average area under the Jowar, Maize and Sesamum is negative at increasing rate. In all these cases one third to fifty per cent districts have shown positive growth rate remaining districts shows negative growth rate may be increasing or decreasing. In Jowar and Maize most of the districts shows negative growth rate at increasing rate but sesamum shows a mixed picture for all four category.

Growth rate in area under Barley is negative at a decreasing rate. 90 per cent of districts shows negative growth rate most of the districts can be categorized under the same category i.e. negative growth at increase rate. Growth rate at average level area under Gram is positive

at increasing rate and most of the districts shows negative growth rate at declining rate.

Average growth rate of production is positive at increasing rate in Bajra and sesamum, positive at decreasing rate in Maize, Wheat, mustered, Negative at decreasing rate in gram, negative at increasing rate in Jowar, Barley and cotton. Growth in production of Bajra, wheat, sesamum and mustered have shown mostly same picture first and second category cover, either all or most of the districts. Let we take individual cases growth of production in Bajra and wheat growth is positive at increasing rate in most of the districts it means first category is very large. On the other hand in the case of sesamum and mustered, second category is very large and mostly districts shows positive growth at declining rate. Growth in production of Jowar, maize and gram showing negative growth rate are present in a significant numbers but positive growth showing districts are large in number. In case of production of maize second category is dominant it means most of the districts shows positive growth at increasing rate. In case of gram first category in large, but in case of Jower we can see a mixed picture no clear dominance of any category. Growth rates under Barley and cotton production are negative in most of the districts.

Growth in yield does not have such type of complication as in growth of area and production. Cotton shows negative growth rate in all the districts and most of the districts shows negative growth rate at increasing rate. All remaining eight major crops have shown more or less same trend. Except some districts, which are very, few in number all the districts shows positive growth. In case of bajra and Barley first category is large and in remaining crops namely Jowar, maize, wheat , sesamum, mustered and gram the second category is very large in numbers. This trend shows that irrigation facilities imposed in the most of the districts in some places canal system is developed and where it not possible tube wells are set to assure irrigation.

BIBLOGRAPHY:

Ashok Parikh, "Statewise Growth-Rate in Agricultural Output - An Econometric Analysis", Artha Vijnana, Vol.VIII, No.1, March 1966.

Bhalla,GS and Gulmain Singh: Four Decade of agricultural development; Economic and poltical weekly;March,29,1997.

Bhalla,GS and Gulmain Singh: Four Decade of agricultural development, Sage Publications,New Delhi.

Bhalla,GS and D S Tygy: Indian agricultural development[Book]

Bhalla,GS and Y.K. Allah, Performance of Indian Agriculture, A District-wise study,1979. [Book]

B.S. Minhas and A. Vaidyanathan, "Growth of Crop Output in India, 1951-4 to 1958-61: An Analysis by Component Elements", Journal of the Indian Society of
Agricultural Statistics, Vol. XVII, No.2, December 1965 pp.230-252.

Buta Ram 1989: Growth and Variability in Pulses (Gram and Tur) Production: District-wise Study of Hariyana. Madhya Pradesh and Rajasthan (1960-61 to 1984-85), Dissertation CSRD, JNU

C.H. Hanumantha Rao: Technological Change and Distribution of Gains in Indian Agriculture, The Macmillan Company of India Ltd. Delhi, 1975.

Cummings,RW, and SKRay[1969]Foodgrain prodaction relative contribution of weather and New technology, Economic and poltical weekly;September27,Riview of Agriculture.

Dandeker,VM:[1980] Introduction to Seminar on data base and Methadology for the study ofgrowth rate in agriculture, Indian Agricultural Journal of Agricultural Economy vol.56 no.2 April-June,1980.

G.S. Bhalla and Y.K. Alagh: Performance of Indian Agriculture: A Districtwise Study, Planning Commission, Government of India; Sterling Publishers Pvt. Ltd. NMew Delhi, 1979

ICAR (1998): Declining crop productivity in Hariyana and Punjab: Myth and reality? Report of fact finding Cpmmitee, Indian Council of Agricultural Reasearch, New Delhi.

Krishinaji,N:Measuring Agricultural Growth, , Indian Agricultural Journal of Agricultural Economy vol.56 no.2 April-June,1980.

Mahendradev S: Growth and instability in foodgrain prodection:An inter state analysis: Economic and poltical weekly;September,26,1987.

Mahendradev S: Regional Veriation in Agricultural Performance in last two decades, Indian Journal of Agricultural Economics, Vol.53. No.1,January- March.

Malik, JR.1997, Growth of Agriculture in independent India:50 years and After, RBI Occasional pepers, Vol.18, No. 2&3 June-Sepumber, pp.145-172.

Mukherji,Cand A Vaidyanathan,Growthand flactuaction in foodgrains Yields per hectare-A Statewise analysis: , Indian Agricultural Journal of Agricultural Economy vol.56 no.2 April-June,1980.

Rao,VM, Methodological issues in measuring Agriculturat growth;Lessonsof resant Indian rearches; , Indian Agricultural Journal of Agricultural Economy vol.56 no.2 April-June,1980.

Rao,V.M.and Jeromi, Mordenisetion Indian Agricultural Development Policy, Periority tasks and critical policy study No. 21, Development research group, Depaartment pf Ecpnomic analysis and policy, RBI 2000

Reddy,VN:Growth rates: Economic and poltical weekly;May,13,1978,Spatial articales.

Pradhan,NC(1993)Growth and instability in Utter-Pradesh [dissertation]CSRD,JNU

Rao, CHH and Ashok Gulati (1998): Indian Agriculture: Emerging Prospects and Policy Reforms, EPW

Ray,S K, CHH Rao, Subbarao,K,:Unstable agriculture and droughts,Vikash Publishing house,pvt. Limited,New Delhi.

Ray S K,An empirical investigation of the nature and couses for growth and instability in Indian agriculture:1950-80;Indian Agricultural Journal of Agricultural Economy,Octomber-Dcember 1983.

RBI (1984):Report of the Commitee on Agricultural Producitivity in Eastern India, Mumbai.

Swant,SD,Invstigation of the hypoththesis of Declearation in Indian Agriculture, , Indian Agricultural Journal of Agricultural Economy vol.56 no.2 April-June,1980.

Sriniwasan,TN,Trends in agricultural India 1949-50to1977-87, Economic and poltical weekly;Spatial number,august 1979.

Vaidyanathan A, Indian Agricultural development Policy, EPW, May 13,2000.

Vidya Sagar, "A Component Analysis of the Growth of Agricultural Productivity in Rajasthan: 1956-61 to 1969-74", Indian Journal of Agricultural Economics, Vol.XXXII, No.1, January-March 1977.