Chapter - 3

GROWTH RATE ANALYSIS
Chapter III

GROWTH RATE ANALYSIS

3.1 Introduction

It is now widely accepted that progress of an economy is adequately described by the growth rates of the economy over a period of time at national, State or district level. Moreover, there are some studies conducted by Mehra (1981), Hazell (1982, 1984), Ray (1983), Walker (1984), Pal and Sirohi (1989) which reveal that new technology has increased instability in crop production. The problem of growth and instability in agriculture has engaged the attention of research workers and planners in India since the celebrated work of Sen (1967) who first presented his paper as a technical keynote address on the occasion of 20th anniversary of Indian Society of Agricultural Statistics. Since then a number of attempts have been made to examine the nature and extent of instability in crop production.

3.2 Earlier studies

Sagar and Singh (1988) carried out a detailed growth analysis of pearl millet in India covering also the state where this crop is chiefly grown. Instability analysis as measured by coefficient of variation was also included in the study. Analysis was done on quinquennium basis starting from (1950-51 to 1954-55) to (1980-81 to 1984-85) decade basis from (1950-51 to 1959-60) to (1970-71 to 1979-80); and for hybrid era (1966-67 to 1985-86); before hybrid era (1949-50 to 1965-66) and for total available period (1949-50 to 1985-86). Results on compound growth rates in area, production and productivity of pearl millet were described for all the periods under study in respect of major pearl
millet growing States and India as a whole. Instability analysis revealed that there were large fluctuations in production and productivity, but less in area. The fluctuations were more in hybrid era as vouched by high coefficient of variation recorded during the last two quinquennial and decade. The instability was very high in Karnataka, Andhra Pradesh, Rajasthan, Maharashtra and Haryana. The major reason for high instability in area and production is that more than 90 per cent of the crop is cultivated under rainfed conditions. Due to erratic and uneven distribution of rainfall, the area is subjected to fluctuations.

In a study on the variation in yield of paddy in different districts of Assam State, Bora (1989) considered a period of 30 years from 1951 to 1980 and divided the whole period under study into three parts viz. 1951-60, the period of first two five years plans; 1961-70, the period which included the period of introducing high-yielding technology and 1971-80, the period in which the effect of high yielding technology could be truly assessed, so as to make a stage wise comparison of the progress in the production of paddy. In this study he compared the differences in yield of paddy in different years from 1951 to 1980 and in different districts in the state.

Bandyopadhyay (1989) conducted a study on growth and instability in the production of main cereals crop of rice in West Bengal and of wheat in Punjab-Haryana during the post independence period 1950-51 to 1984-85. Since the primary aim of his paper was to study the growth pattern and instability in production of main cereal crop during the post-green revolution period as compared with the experience of the pre-green revolution period, he divided the entire period into two sub-periods: (i) 1950-51 to 1966-67 and (ii) 1967-68 to 1984-85 for each district of West Bengal and Punjab-Haryana. In
order to study the growth pattern of rice and wheat production, he tried the
usual linear fit on annual data for each sub-period and estimated the average
linear growth rates. For instability analysis, he determined the convergence or
divergence in peaks and troughs and reported the increasing or decreasing
nature of instability. Analysis was carried out at the district level. He applied
F-test for testing the hypothesis that peak and trough trend lines are parallel.
Results yielded all F-values to be highly significant for all the districts of
both States except for Patiala of Punjab-Haryana for the first period where the
value was significant at 5 per cent level. Hence, the F-test confirmed that for
each sub-period in all the districts, peak and trough trend lines through rice
output in West Bengal and wheat output in Punjab-Haryana were not parallel.

Ali et al. (1989) made an attempt to examine the regional
disparity as well as the inter-district disparity in the distribution and growth
pattern of area, production and yield of rice in the rice zone of Madhya
Pradesh. The time-series data regarding area, production and average yield of
the crop for the period from 1961-62 to 1980-81 in different regions viz.,
Chhattisgarh Plains, Northern Hill and Bastar Plateau of the rice zone and
separately for their constituent districts along with the State of Madhya Pradesh
as a whole were studied using coefficient of variation and linear growth models.

Chatopadhyay (1991) studied the growth and instability in
agriculture taking the specific case of rice in West Bengal. Author
examined the extent and nature of growth that actually took place in rice
cultivation in the state and also investigated the extent of yield variability
consequent upon the introduction of new technology. Data of 35 years from
1950-51 to 1984-85 were utilized in his study which broadly suggested that
during the last three decades West Bengal's rice economy was subject to technological changes with positive effects on area, yield and production of rice.

Rao (1991) attempted to study some aspects of trends of crop growth, instability and contribution of various components to the growth of crop output in North Eastern India for the period from 1970-71 to 1985-86. Using a semi-log trend equation, he estimated the growth trend of the 22 principal crops for the combined data for North Eastern Region. He also analysed fluctuations in the yield per hectare of important crop groups with the help of mean, highest and lowest yield and coefficient of variation of yields for two sub-periods i.e. period I: 1970-71 to 1977-78 and period -II: 1978-79 to 1985-86. Following the seven factor additive decomposition model of Minhas (1966), he worked out the contribution of different components to the growth of agricultural crop output. Results of his study revealed that for major crops like rice, other pulses, rapeseed and mustard; sugarcane etc. stagnancy had set in. There was an accelerating trend in the production of potato and relatively minor crops like tur and groundnut. On the whole, principal crop groups exhibited less fluctuation in yield per hectare. The major contribution to the growth of crop output in agriculture came from area expansion, the contribution of yield increase was only one - third and the cropping pattern changes tended to lower the growth of crop output in the entire North Eastern Region.

Pal and Sirohi (1991) in their studies with adoption of high yielding varieties (HYVs) seeds and growth and instability in crop production in India, attempted to analyze the sources of change in instability in crop
production in Indian States for the past several years. Since the effect of HYVs on production instability was objective of the study they considered two time periods in 1950-51 to 1964-65 and 1967-68 to 1983-84 (pre and post green revolution periods respectively) and computed coefficient of variation to measure the magnitude of instability during these two periods. The decomposition analysis identified four sources of change in mean production. Contribution of each of these four sources to change in crop production in India during the period 1967-68 to 1983-84 over the period 1950-51 to 1964-65 was estimated for different crops. The analysis was carried out for fifteen individual crops as well as for aggregated production of cereals, pulses and oilseeds in India. Decomposition analysis for sources of change in variance of production was also carried out and the results on relative contribution of various sources were reported.

Dev (1991) carried out an inter-State analysis of foodgrains production in India taking weather, growth and instability into consideration. He first examined the unadjusted trend growth rates and weather-adjusted trend growth rates in foodgrains production for each of the seventeen major States and India as a whole.

Ali and Singh (1995) examined growth rates and variability in area, production and productivity of wheat crop in Chhattisgarh region and its constituent districts as well as the State of Madhya Pradesh as a whole using time series data from 1970-71 to 1989-90. As the study was to be carried out on decade basis, they divided the period of 20 years into two sub periods viz. Period-I (1970-71 to 1979-80) and period-II (1980-81 to 1989-90) and
employed standard statistical techniques of coefficient of variation and linear regression models for the purpose of analysis. Results on variability indicated that the fluctuations in area were less in period-II as compared to period-I in all the districts. Compared with period I, the variability in production and productivity of wheat decreased in period II in all the districts excepting Balaghat where it was found to in Result and Discussion.

Ray (1999) has pointed out that the subject of growth and instability in agriculture has acquired an added importance and has become the subject of more serious investigation after the introduction of new technologies both in India and abroad.

3.3 Statistical techniques

Following analytical techniques were employed:

In order to quantify the growth of area, production and productivity of crops, compound growth rates were estimated by fitting to the time-series data in exponential function of the following form:

\[ Y = a \, b^t \]  \hspace{1cm} (1)

where,

\[ Y = \text{Index number of area / production / productivity as the dependent variable} \]

\[ t = \text{Time variable (year) as independent variable} \]

\[ a = \text{Intercept} \]

\[ b = \text{Regression coefficient} \]

Equation (1) can be expressed in logarithmic form as follows:

\[ \log y = \log a + t \log b \]
\[ \log y = A + B \, t \]

where,

\[ A = \log a \]
\[ B = \log b \]

Percent annual compound growth rate “\( r \)” can be computed as:

\[ r = (\text{Antilog of } b-1) \times 100 \]

For testing the significance of regression coefficient, “\( t \)” - test can be carried out using the following formula:

\[ t = \frac{\hat{b}}{SE(\hat{b})} \quad \text{with } n-2 \text{ degrees of freedom} \]

where,

\[ \hat{b} \quad = \text{estimated value of } b \]
\[ SE(\hat{b}) \quad = \text{standard error of } \hat{b} \]

3.4 Growth Trends for Kharif Crops

The crop growth rate of area, production and yield of Chhattisgarh plain, Northern Hills Baster, Plateau and whole Chhattisgarh State for Kharif season crop viz., rice, groundnut, jowar, kodo, maize, pea and sesamum are presented in Table3.1

The result of Chhattisgarh plain of area growth rate was revealed that almost all the crops registered significant positive growth rate except jowar and kodo. The highest expansion was observed under pigeon pea crop (1.92per cent). The highest declining trend for kodo (-5.74per cent) and lowest declining trend for jowar (-2.57per cent). While growth rate of area under Chhattisgarh plain was positive for rice, groundnut, maize, pigeon pea and sesamum where as
it was negative for jowar and kodo. The growth rate of production in Chhattisgarh zone was found to be positive for all selected Kharif crops except jowar and kodo showed negative trend in production mainly due to declining trend under area. Jowar and kodo exhibited declining production trend (-2.71 per cent) and (-4.43 per cent) respectively which was mainly due to declining trend under area and partially due to adoption of High Yielding Varieties, seed etc. The highest production growth rate were observed for groundnut (4.12 per cent) followed by pigeon pea (2.68 per cent), rice (2.43 per cent), maize (2.11 per cent) and sesame (2.91 per cent). The growth rate of productivity for this zone for all selected Kharif crops was statistically positively significant. The highest positive growth rate was found in maize (3.61 per cent) and the lowest (0.67 per cent) for jowar. Maize exhibited high yield performance for Chhattisgarh Plain which was mainly due its area and production enhancement. It can also be observed that rice crop recorded significant positive growth rate of production which was mainly due to higher productivity growth rate and partly due to inclination in area allocation. Moreover, this zone also recorded highest area distribution growth rate by 1.40 per cent under maize.

In Northern hill of Chhattisgarh exhibited almost same trend as of Chhattisgarh plain zone for area, production and yield for all Kharif crops, except jowar and kodo almost, all crops registered significant positive trend under area, production and yield. Area under Northern hill depicted significant and positive trend for rice (0.71 per cent), groundnut (2.61 per cent), maize (0.50 per cent), pigeon pea (5.50 per cent) and sesame (1.68 per cent) while highest declining trend was observed for jowar (-1.89 per cent) and followed by kodo (-0.81 per cent). Coming to the production aspect of various crops in
Northern hill, it was observed that except jowar all crops were exhibited positive production trend. It was observed that jowar recorded declining trend in production (-0.93 per cent), which was mainly due to declining area and lower productivity, growth rate. Moreover, kodo and maize exhibited non significant positive of growth rate of production which was mainly due to declining area (-0.81 per cent) for kodo and (0.50 per cent) for maize. Crop growth rate of productivity was significantly positive for all crops. The highest increase in rate was for sesamum (2.98 per cent) and the lowest in jowar (0.99 per cent). 1.80 per cent on the whole Northern hills had relatively high yield potential for sesamum followed by kodo (2.90 per cent), maize (2.26 per cent) groundnut (2.07 per cent), rice (1.80 per cent), pigeon pea (1.01 per cent) and jowar which was mainly due to production level of all crops were exhibited significant positive trend.

Another interesting fact has been observed that between Chhattisgarh plain and northern hill pigeonpea was the crop registered highest significant positive growth of area 5.50 per cent resulting highest production with 6.74 per cent. But production growth rate were highest for maize crop in Chhattisgarh plain mainly due to increased area allocation. Moreover, it can also be observed that in both zone jowar and kodo were the crops recorded continuous declination in production solely due to declination in area as well as yield potential of the crop. It can also be observed that maize was alone crop registered high growth rate by 1.40 per cent, 2.11 per cent and 3.61 per cent respectively in Chhattisgarh plain while in northern hills this crop recorded 0.50 per cent, 0.68 percent and 2.26 per cent for area, production and productivity respectively.
In the Baster plateau, area under the different crops over 33 years for Bastar plateau registered significant positive growth rate except crop kodo which shows significant negative growth rate (-1.28 per cent) for area. The highest positive growth rate was found in groundnut (11.58 per cent) and the lowest positive growth rate was found for maize (1.12 per cent). The growth rate of production in Baster plateau, during the period 1974-75 to 2004-05, was found to be positive for almost all the crops except jowar. This crop registered (-1.39 per cent) declining trend of production solely due to area declining trend (-1.28 per cent). All Kharif crops exhibited significant positive trend of production. On the whole Baster Plateau relatively had high production level for groundnut (13.50 per cent) mainly due to area expansion of the crop (11.58 per cent). The highest production growth rate was observed for groundnut followed by sesamum (10 per cent), pigeon pea (3.45 per cent), kodo (4.33 per cent), rice (3.46 per cent) and maize (2.16 per cent). The key factor being higher production in Baster plateau for selected Kharif crops were area expansion as well as productivity along with state policy viz., HYV fertilizer etc. Productivity parameter for Baster plateau also exhibited increasing trend, under selected crops, all crops showed significant positive growth rate kodo recorded highest productivity (0.86 per cent) followed by sesamum (4.61 per cent) maize (4.12 per cent), pigeon pea (3.99 per cent), groundnut (2.75 per cent), rice (2.64 per cent) and jowar (1.28 per cent).

Table 3.1 also reveals that Chhattisgarh state as a whole exhibiting significantly positive growth rate in context of area, production and productivity except jowar and kodo.
For Kharif season, coming to the crops level situation, recent scenario is that rice, groundnut, maize, pigeonpea and sesamum has been increasing production trend, which was mainly due to the significant area allocation as well as productivity and adoption of high yield variety etc.

Among the crops groundnut recorded highest growth rate of area with 2.93 per cent. Production growth rate in the state were significantly positive for Kharif season crops. Production growth rate were followed same pattern as of area growth rate. It can also be observed that this crop recorded maximum production growth (5.24 per cent which was mainly due to maximum area (2.93 per cent) coverage. while jowar and kodo recorded declined area allocation as well as productivity growth rate where the factor responsible for negative growth rate of production by 0.57 per cent for jowar and 2.30 per cent for kodo. Productivity in this zone ranges from 1.84 per cent for maize and 5.24 per cent for groundnut. In Chhattisgarh as a whole state rice crop exhibited convergent trend of production growth rate. Production growth rate were 2.74 per cent, 5.2 per cent, 1.84 per cent, 3.95 per cent and 4.11 per cent for rice, groundnut, maize, pigeonpea and sesamum respectively.

As far as yield growth position are concerned in Chhattisgarh state, almost all major crops of Kharif season shows increasing significantly positive trend. The key factor for increases in production for all the crops in the state is maximum coverage (area) and productivity. it can also be observed that due to increased area allocation 0.41 per cent as well as higher productivity 2.07 per cent rice crop also exhibited convergent i.e. increasing production growth rate 2.74 per cent in Chhattisgarh state. Where as declining in area growth rate resulting declination in production in Chhattisgarh by 1.57 per cent and 2.30 per
cent for jowar and kodo recorded respectively. On the whole, the state had relatively high yield potential for kodo (3.49 per cent) followed by maize (3.40 per cent), sesame (3.38 per cent), groundnut (2.19 per cent) and rice (2.07 per cent).
Table 3.1: Compound Growth Rates (%) of Area, Production and Productivity of various crop in Kharif for Chhattisgarh Plain and Northern Hills.

<table>
<thead>
<tr>
<th></th>
<th>Chhattisgarh Plain</th>
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<th>Northern Hills</th>
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<tr>
<td></td>
<td>A</td>
<td>P</td>
<td>Y</td>
<td>A</td>
</tr>
<tr>
<td>Rice</td>
<td>0.26*</td>
<td>2.43*</td>
<td>1.62*</td>
<td>0.71*</td>
</tr>
<tr>
<td>Groundnut</td>
<td>2.25*</td>
<td>4.12*</td>
<td>1.81*</td>
<td>2.61*</td>
</tr>
<tr>
<td>Jowar</td>
<td>-2.57*</td>
<td>-2.70*</td>
<td>0.67*</td>
<td>-1.89*</td>
</tr>
<tr>
<td>Kodo</td>
<td>-5.74*</td>
<td>-4.43*</td>
<td>2.96*</td>
<td>-0.81*</td>
</tr>
<tr>
<td>Maize</td>
<td>1.40*</td>
<td>2.11*</td>
<td>3.61*</td>
<td>0.50*</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>1.92</td>
<td>2.68*</td>
<td>1.15*</td>
<td>5.50*</td>
</tr>
<tr>
<td>Sesamum</td>
<td>0.71</td>
<td>2.91*</td>
<td>2.59*</td>
<td>1.68*</td>
</tr>
</tbody>
</table>

* Significant at 5 per cent level

A = Area, Y = Productivity, P = Production

Table3.1 (Cont.): Compound Growth Rates (%) of Area, Production and Productivity of various crop in Kharif for Bastar Plateau and Chhattisgarh State.

<table>
<thead>
<tr>
<th></th>
<th>Bastar Plateau</th>
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<tr>
<td></td>
<td>A</td>
<td>P</td>
<td>Y</td>
<td>A</td>
</tr>
<tr>
<td>Rice</td>
<td>0.91*</td>
<td>3.46*</td>
<td>2.64*</td>
<td>0.41*</td>
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<tr>
<td>Groundnut</td>
<td>11.58*</td>
<td>13.58*</td>
<td>2.75*</td>
<td>2.93*</td>
</tr>
<tr>
<td>Jowar</td>
<td>-1.28*</td>
<td>-1.39*</td>
<td>1.28*</td>
<td>-1.74*</td>
</tr>
<tr>
<td>Kodo</td>
<td>1.33</td>
<td>4.33*</td>
<td>6.86*</td>
<td>-3.53*</td>
</tr>
<tr>
<td>Maize</td>
<td>1.12*</td>
<td>2.16*</td>
<td>4.12*</td>
<td>0.97*</td>
</tr>
<tr>
<td>Pigeonpea</td>
<td>2.47*</td>
<td>5.45*</td>
<td>3.99*</td>
<td>2.64*</td>
</tr>
<tr>
<td>Sesamum</td>
<td>5.48*</td>
<td>10.00*</td>
<td>4.61*</td>
<td>1.50*</td>
</tr>
</tbody>
</table>

* Significant at 5 per cent level

A = Area, Y = Productivity, P = Production
3.5 Growth Trends for Rabi Crops

The results of crop growth rate of area, production and productivity for Chhattisgarh plain, Northern Hills, Baster Plateau and Chhattisgarh State as a whole for Rabi season crops viz., gram, lathyrus, linseed, mustard and wheat are presented in Table-3.2

It can be seen that area growth rate of all the Rabi season crops registered significantly negative trend except crop mustard. Among the crops gram recorded highest expansion in area (2.34 per cent) under Chhattisgarh plain. As far as growth positions of production are concerned under Chhattisgarh plain, it can be seen that the entire crop registered statistically significantly positive trend. Similar trend also observed for productivity growth rate for Rabi season crops under zone. Among the crops wheat shows highest productivity growth rate (5.20 per cent)

The growth rate of area indicated negative trend for all selected Rabi season crops, whereas it was positive for gram (2.34 per cent). The highest decline was found in mustard (-1.79 per cent) and lowest (-0.65 per cent) was found in wheat. Despite of declining trend of area, Chhattisgarh Plain, registered positive growth rate of production for almost all Rabi crops, mustard recorded declining trend of production (-0.10 per cent) the highest in area in growth rate was found in gram (5.03 per cent) and the lowest in wheat (1.35 per cent). The increased area (2.34 per cent) and better yield performance (4.28 per cent) were the factor due to which gram has recorded highest positive growth rate of production in Chhattisgarh Plains. All Rabi crops exhibited significant
positive growth rate for yield. The highest positive growth rate was found in wheat (5.20 per cent) and the lowest in mustard (1.65 per cent).

In Northern hilly almost all Rabi crops exhibited positive trend of area expansion, production are productivity enhancement, lathyrus was the only crop recorded declining trend of area (-0.68 per cent). Although significant expansion in area allocation was observed for linseed, mustard and wheat while, gram were positive but non-significant while lathyrus continuing its declination under area coverage. The area occupied by linseed (4.08 per cent) followed by wheat (3.12 per cent), mustard (1.25 per cent) and gram (1.07 per cent). The crop linseed and wheat shows depicted dominancy in northern hill region in context of area coverage and production. Coming to the production level situation it can be noted that significantly positive production growth rate was observed for Rabi season crop except lathyrus under northern hilly region whereas Linseed crop exhibited highest production growth rate for northern hill region (5.91 per cent ). It can be noticed that all crops registered statistically significant positive growth rate. The highest positive growth rate was found in linseed (5.91 per cent) and the lowest in lathyrus (0.97 per cent). The main factors behind highest level of production are increased area (4.08 per cent) and yield (1.27 per cent) while in case of wheat the main factors behind higher production was its yield performance (3.35 per cent). The yield performance was significantly positive for all Rabi season crops during last 33 years. The productivity ranges 3.35 per cent in gram and the lowest per cent in wheat 0.04 per cent.

Although, it can also be observed that the main Rabi season crops viz., lathyrus (Tiwda) shows continuous declining trend in the area
allocation from Chhattisgarh plain to northern hill. Whereas crop linseed, wheat and mustard area coverage trend was changes negative to positive from Chhattisgarh plain to Northern hilly region. Now, coming to performance of production growth rate from Chhattisgarh plain to northern hill, it can be observed that enhancement in production continuous in both the zones exceptionally mustard was the alone crop exhibited declination in production mainly due to area declination. Almost same pattern is followed by yield level of the crops in both the zones. In Rabi season all the crops depiction significantly positive growth rate for productivity, gram was alone crop registered maximum production 5.03 per cent in Chhattisgarh plain increased area growth rate 2.34 per cent and 4.28 per cent for productivity. While in northern hill linseed was the crop recorded maximum production 5.91 per cent which was mainly due to area converge and better yield growth rate.

From perusal of table 3.2, it can be observed that most of crop of Rabi season registered significant positive growth rate for area, production and yield in Bastar plateau which exhibited increasing significantly positive trends in area for gram and mustard, linseed and a declining trend for mustard and wheat. The Bastar Plateau depicted increasing significant growth rate area for gram (1.29 per cent) linseed (1.27 per cent) and non significant but positive growth rate for mustard (0.06 per cent ) while lathyrus and wheat depicting declining trend for area -2.01 per cent and -0.59 per cent respectively. As regards as production growth rate pattern in Bastar plateau are concern, it can be noticed that compound growth rate of production for all Rabi crops recorded significant positive trends. The highest growth rate of production recorded for gram (5.22 per cent) and lowest in mustard (1.31 per cent). The main factors behind
increased production for crop gram (5.27 per cent) and linseed (2.45 per cent) are area expansion as well as productivity. Productivity depicted same trend as of production for selected Rabi season crops i.e. productivity growth rate were significantly positive for all Rabi crops. The highest positive yield growth rate was found in wheat (6.06 per cent) and lowest in mustard (1.69 per cent).

As regards production growth rate pattern in Bastar plateau were concern, it can be seen that production of all the crops registered significant positive growth rate which was mainly due to significant production improvement and partly due to expansion in area. Gram shows highest production growth rate 5.27 per cent.

The Chhattisgarh as whole state exhibited significant positive growth rate area, production and yield of all crops. From perusal of table, it can be noted that area growth rate was significantly positive for gram 2.27 per cent ,positive but non significant growth rate for wheat 0.03 per cent while lathyrus ,linseed and mustard were the crops recorded declination in area by 1.05 per cent ,2.09 per cent and 0.37 per cent respectively . Despite fluctuating growth rate of area allocation this zone recorded significant positive growth rate of production enhancement for all Rabi season crops. The highest production was recorded by gram 4.97 per cent and lowest by mustard. This inclination in production under Rabi season crops was mainly due productivity level of the crops. Productivity growth rate for crops wheat 5.18 per cent, for gram 4.65 per cent and for lathyrus 2.78 per cent.

It can be observed that on the aggregate level of entire state of Chhattisgarh the gram crop recorded highest production growth rate 4.97 per cent. So far as growth position are concerned, it can be see that almost all crops
shows significant positive production growth rate. Productivity trend also adopted same trend as in case of area expansion and production improvement for Chhattisgarh state. Productivity of the crops in this zone ranges from 1.71 for mustard and 5.18 per cent for wheat.

Zone wise analysis also reveals that from Bastar plateau to Chhattisgarh as a whole state, area growth rate were fluctuating for all crops while contrary to this production and productivity growth rate remain significantly positive.

Among both the zones, gram was the crop recorded maximum production 5.27 per cent mainly due to productivity growth rate 5.93 per cent and partly due to area coverage 1.29 per cent in Baster plateau. Moreover, among both the gram having maximum area growth rate 2.27 per cent in the Chhattisgarh state resulting highest production growth rate. While highest productivity was recorded by wheat 6.06 per cent in Baster plateau.
Table 3.2: Compound Growth Rates (%) of Area, Production and Productivity of various crop in Rabi for Chhattisgarh Plain and Northern Hilly Region

<table>
<thead>
<tr>
<th>Districts</th>
<th>Chhattisgarh Plain</th>
<th>Northern Hills</th>
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<tbody>
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<td>A</td>
<td>P</td>
</tr>
<tr>
<td>Gram</td>
<td>2.34*</td>
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<td>Lathyrus</td>
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<td>Linseed</td>
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</tr>
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<td>Mustard</td>
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<td>-0.10</td>
</tr>
<tr>
<td>Wheat</td>
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<td>1.35*</td>
</tr>
</tbody>
</table>

* Significant at 5 per cent level

A = Area, Y = Productivity, P = Production

Table 3.2(Cont): Compound Growth Rates (%) of Area, Production and Productivity of various crop in Rabi for Zone Bastar Plateau and Chhattisgarh State

<table>
<thead>
<tr>
<th>Districts</th>
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<th>Chhattisgarh State</th>
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<tbody>
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<tr>
<td>Gram</td>
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<td>Mustard</td>
<td>0.06</td>
<td>1.31*</td>
</tr>
<tr>
<td>Wheat</td>
<td>-0.59</td>
<td>1.30*</td>
</tr>
</tbody>
</table>

* Significant at 5 per cent level

A = Area, Y = Productivity, P = Production