INTRODUCTION

The importance of agriculture in economic development is undeniable. By extension of the statement it can be said, the level of agricultural development is going to determine the level of overall development of the economy and levels of living of the people of India. The country's agriculture experienced near stagnation during the first half of the present century but has undergone a metamorphosis in many a facet during the planning era. The changes included the expansion of irrigation, introduction of HYV seeds, fertilizers, pesticides and new machinery. By all these positive changes, the country now has the strength and confidence to avoid hunger and misery in the country to a large extent.

However, in all that positive scenario there are certain inherent weaknesses. The regional and endowment inequalities have lead to varying levels of agricultural development. The resource poor regions like Rayalaseema continue to lag far behind in the levels of crop productivity and overall agricultural development as compared to rich regions. None the less, these poor regions must necessarily contribute optimally so as to reduce the inequalities in overall agricultural development. The present study is concerned with the estimation of growth rates of overall agriculture and assessment of the performance of the individual crops in Rayalaseema region so as to understand
the problems being faced by agriculture in resource poor regions.

From the review made (vide Chapter 2) some of the gaps of research on agricultural growth are obvious. The main gaps relevant to our study are (1) analysis of overall growth rates of agriculture at district and region level with both constant and current prices, (2) reassessment of the impact of the Green Revolution. The reassessment is necessary to examine the impact of Green Revolution with a subsequent base compared to the traditional base. This helps us in understanding the impact of Green Revolution when it is covering more area and more crops as compared to its confinement only to rice and wheat at the initial periods of Green Revolution, (3) examine whether crop productivity reached any stagnation levels with the presently available HYV seeds and cultural practices and (4) to know which are the affected crops due to the slowing down of the impact of the Green Revolution.

To analyse all these aspects in the present study the main objectives framed are: (1) To examine the overall agricultural growth in Rayalaseema region and its four constituent districts; (2) To examine the growth rates of area, production and productivity of 12 selected crops in four districts of the region and the region as a whole; (3) To find out the impact of the Green Revolution during initial years of its introduction and also at present; (4) To assess whether the
Green Revolution has reached any saturation levels in attaining higher yield levels with the currently available IIYV seeds and cultural practices and (5) To assess the contributing factors for the agricultural growth.

The study covers a period of 35 years starting from 1956-57 and ending with 1990-91. It includes 12 crops, which account for about 85.0 per cent of the total cropped area of the region. The crops included in the study are rice, jowar, bajra, ragi, redgram, greengram, horsegram, groundnut, castor, cotton, sugarcane and tobacco. The entire study period was divided into three sub-periods viz., (1) pre-Green Revolution period (1956-57 to 1970-71), (2) first decade of the Green Revolution (1971-72 to 1980-81) and (3) second decade of the Green Revolution (1981-82 to 1990-91). The results are also obtained for the overall period (1956-57 to 1990-91).

To measure the overall agricultural growth rates, both constant and current prices of the respective crops have been used. To assess the crop-wise performance, growth rates of area, production and productivity have been worked out for the 12 crops. For measuring growth, log linear equation was used and to know the factors helping in crop growth, multiple regression technique was adopted.

1. When the overall agricultural growth rate was computed at constant prices following are the results:
a. In Rayalaseema region, the overall agricultural growth rate was 1.45 per cent per annum between 1956-57 and 1990-91. During the pre-Green Revolution period, growth rate was negative at -0.23 per cent. During the first decade of the Green Revolution, the negative growth rate has increased to -1.62 per cent. Positive growth rate of 2.73 per cent was achieved during the second decade of the Green Revolution.

b. The growth rates registered in Chittoor and Cuddapah districts for the overall period of the study were nearly same as compared to Rayalaseema region (1.45 per cent). In Anantapur district, the growth rate was slightly higher at 1.86 per cent and in Kurnool the growth rate recorded was much below at 0.89 per cent.

c. During the pre-Green Revolution period, while Chittoor (2.39) and Cuddapah (1.19) achieved positive growth rates, Anantapur (-3.65) and Kurnool (-0.41) registered negative growth rates.

d. During the first decade of the Green Revolution, all the districts registered negative growth rates ranging between -1.13 and -2.48 per cent.

e. By second decade of the Green Revolution, the negative trend was arrested in all the districts
and achieved positive growth rates of 4.89 per cent by Cuddapah followed by Anantapur (3.93), Chittoor (1.70) and Kurnool (1.30).

2. When the overall agricultural growth rate was computed at current prices, the conclusions are:

a. Between 1956-57 and 1990-91, the aggregate agricultural growth rate was 10.70 per cent per annum in Rayalaseema region. During the pre-Green Revolution period, the growth rate was 15.64 per cent. During the first and second decades of the Green Revolution, the growth rates recorded were 3.36 and 11.53 per cent respectively.

b. All the four districts achieved growth rates of 10.00 per cent and above during the overall period. During the pre-Green Revolution period, all the districts accomplished the growth rates of above 13.0 per cent per annum. But during the first decade of the Green Revolution, the growth rates experienced were about 5.0 per cent and below. During the second decade of the Green Revolution, all the districts achieved growth rates of 10.00 per cent and above.
3. Based on the overall agricultural growth rates the following inferences may be drawn:
   
a. During the pre-Green Revolution period, the agriculture experienced limited interventions from external elements.
   
b. During the first decade of the Green Revolution, the new elements in the form of HYV seeds, fertilizers and pesticides disturbed the traditional cropping pattern.
   
c. During the second decade of the Green Revolution, the cropping pattern seem to have stabilized with commercial crops at the helm, which fact was borne by the study of the cropping pattern (vide Chapter 3).
   
4. Between 1956-57 and 1990-91, the negative growth rate of the area under rice was -0.44 per cent per annum in Rayalaseema region. Among the districts, except Kurnool (0.37) the other three viz., Anantapur, Cuddapah and Chittoor recorded negative growth rates ranging between -0.48 and -0.93 per cent. During the pre-Green Revolution period, the area growth rate was positive in the region. This turned to negative by the first decade of the Green Revolution and by second decade the negative growth rate has further increased.
5. Rice production growth rates were positive during the overall period in the region and also the districts ranging between 0.53 and 2.78. The growth rates of the region and the districts were higher than these during the pre-Green Revolution period. They were mostly negative during the first decade, but turned to positive by the second decade of the Green Revolution.

6. The rice productivity growth rate was 1.84 per cent in Rayalaseema region during the overall period. Among the districts, Kurnool (2.41) and Cuddapah (2.06) achieved higher growth rates and Anantapur (1.52) and Chittoor (1.46) recorded lesser growth rates as compared to the region.

7. All the four districts and as well as the region recorded positive growth rates of rice productivity ranging between 0.11 and 2.66 per cent during the pre-Green Revolution period. During the first decade of the Green Revolution, the productivity growth rates were negative in Rayalaseema region, Cuddapah, Kurnool and Chittoor districts (range -0.24 to -0.97) and only Anantapur accomplished a positive growth rate of 0.80 per cent. During the second decade of the Green Revolution, rice productivity growth rate was 2.68 per cent in Rayalaseema region. Among the districts, the range of the positive growth rates was between 3.59 and 2.12 per cent.
8. Growth rates of productivity during the last ten years of our study indicate that, rice productivity continue to improve and has not reached the stagnation levels with the available HYV seeds and/or cultural practices. This gives scope for further increase in rice productivity. However, the significant growth in productivity did not serve as an incentive for the area expansion under the crop, which may be borne out by reading the fact that the area under the crop recorded negative growth rate during this period.

9. Between 1956-57 and 1990-91, the area under jowar crop registered a negative trend rate of -2.36 per cent in Rayalaseema region. Among the districts, growth rate range was between -1.88 and -3.85. During the pre-Green Revolution period a small negative trend rate of -1.19 was recorded in Rayalaseema region. As compared to this the negative growth rates increased to -3.56 and -8.71 respectively during the first and second decades of the Green Revolution. The same trends emerge when we look at the growth rate figures recorded by different districts. This indicates that, the Green Revolution hurried the decelerating trend of the area under the crop.
10. The production growth rates of jowar are more or less concomitant with the growth rates in area indicating no significant impact of Green Revolution on jowar productivity. However, the Green Revolution appears to have helped in arresting the negative trend in the growth rates of productivity.

11. The growth rate of area under bajra crop was -3.76 in Rayalaseema region during the overall period. The rate of deceleration was -2.77 per cent before the Green Revolution. During the first decade it declined to -0.11 per cent, only to rise abnormally to -14.12 by second decade of the Green Revolution. More or less similar trends can be observed in the case of the constituent districts too. The area under the bajra crop was replaced by other crops. Due to this reason, the production growth rates were more or less similar to that of area growth rates.

12. The bajra productivity trend rate was negative at -1.33 per cent during the pre-Green Revolution period. The positive growth rates recorded were 2.95 and 3.57 per cent respectively during the first and second decades of the Green Revolution. Which mean, the Green Revolution helped and continue to help in raising the bajra productivity. Which means, the bajra
productivity did not reach any saturation levels. But the productivity growth seem to be no sufficient incentive even to retain the area under the crop.

13. Moderate negative trend rates were recorded in the pre-Green Revolution period in ragi area in the region and also in three of the four districts. These moderate negative trend rates comparatively slowed down during the first decade of the Green Revolution. But the deceleration rates have became very substantial during the second decade of the Green Revolution. Which means, the Green Revolution only contributed for the speedier decline of the area under the crop.

14. Based on the ragi productivity trend rates in the region and the districts it can be said that, it was stagnant during the pre-Green Revolution period and has turned to moderate positive growth rate during the first decade of the Green Revolution. However, this positive growth rate improved to considerable level during the second decade of the Green Revolution. This indicates the positive contribution of HYV technology in raising ragi productivity.

15. The growth rates indicate that during the Green Revolution period, the redgram has replaced some other
crops in a significant way. But yet, the Green Revolution seems to have not contributed in any noticeable manner in raising the productivity of redgram.

16. There was a declining trend in area, production and productivity in greengram indicating no positive impact of Green Revolution on the crop. In fact, the negative growth rates of the area, production and productivity of the crop were higher during the last decade of the Green Revolution either compared to the pre-Green Revolution or the first decade of the Green Revolution.

17. The area under horsegram declined at a trend rate of -4.77 per cent in Rayalaseema region between first and terminal years of our study. During the pre-Green Revolution period, the negative trend rate was -2.66 per cent and this increased to -4.96 per cent by the first decade of the Green Revolution. By second decade, the negative trend rate has abnormally increased to -20.96. All the districts too experienced more or less similar trend values. Production growth rates were concomitant with area growth rates. All this indicate that, the Green Revolution has only hurried the declining rate of area under the crop. During the Green Revolution period, the rate of negative trend in productivity seem to have been arrested to a small extent.
18. The area under groundnut crop, which was growing at a considerable positive rate during the pre-Green Revolution period (2.40) has started declining at a moderate trend rate (-0.45) during the first decade of the Green Revolution in Rayalaseema region. By the second decade of the Green Revolution, this moderate negative trend rate turned to positive and registered very substantial growth rate of 6.65 per cent in the region. More or less similar trends were observed in the case of districts. Which means, the Green Revolution only speeded up the process of replacing other dry crops by groundnut.

19. During the pre-Green Revolution period, the groundnut productivity in Rayalaseema region was declining at a considerable rate (-2.17) and by the first decade of the Green Revolution, the declining rate has further increased to -2.66 per cent. But by the second decade of the Green Revolution, the negative trend was arrested and a positive growth rate of 1.51 per cent was achieved. The trends are similar in districts with some exceptions. This indicates the fact that, though HYV seeds arrived late on the scene and still did help the groundnut crop in achieving higher productivity and did not reach any stagnation levels. This aspect appears more significant if another important hidden factor is
also considered. The area under the groundnut was expanding at a faster rate in recent years, wherein the addition to the area might be from the marginal lands. Even after expanding to the marginal lands, achieving the positive growth rate from a base of negative trend was really significant.

20. The negative trend of the area under castor crop was arrested to a considerable extent during the Green Revolution as compared to the pre-Green Revolution period.

21. The castor productivity growth rate was negative at -0.47 per cent during the pre-Green Revolution period in Rayalaseema region. This has turned to positive and achieved a significant growth rate of 4.75 per cent by the first decade and further consolidated to 8.03 per cent by the second decade of the Green Revolution. The districts too broadly experienced similar trends. All this indicates that the HYV technology helped the crop in a significant way. This also suggests that, the castor crop has not reached any plateau regarding the productivity.

22. During the overall period, the area under cotton experienced a negative trend rate of -4.04 per cent in the region. In pre-Green Revolution period, the negative
growth rate of area was -1.97 per cent. The rate has further increased to -2.14 by first decade and to -5.67 by second decade of the Green Revolution indicating a gloomy future for cotton raising. In fact, area under cotton decreased at an enormous rate of -23.44 in Chittoor district during the first decade of the Green Revolution. This lead to complete disappearance of the crop from the district which indicates that, the Green Revolution only hurried the negative growth rates of area under the crop.

23. The productivity growth rate of cotton crop was negative at -1.16 per cent during the pre-Green Revolution period. This negative growth turned to positive and achieved a significant growth rate of 7.16 per cent only to become moderate (0.71) by the second decade of the Green Revolution. This overtly indicates stagnation in cotton productivity with the presently available HYV seeds in Rayalaseema region. But it may be noted that during the second decade of the Green Revolution itself two constituent districts viz., Cuddapah (7.12) and Kurnool (7.45) recorded significant positive growth rates allowing no significant conclusion.

24. Between 1956-57 and 1990-91, the growth rate of area under tobacco was 3.78 per cent in Rayalaseema region.
Due to the substantial positive growth rate achieved by Kurnool in area, Rayalaseema region too recorded significant positive growth rate of area during pre-Green Revolution period. However, by the first decade of the Green Revolution area under tobacco registered very high negative growth rates in the region as well as in all the districts. In fact, the decline was so high that, tobacco completely disappeared from Chittoor and Cuddapah districts. However, by the second decade of the Green Revolution, the negative growth rate of area in the other two districts was arrested.

25. The productivity growth rates of tobacco are higher during the Green Revolution period as compared to the pre-Green Revolution period, implying positive contribution of Green Revolution in achieving positive growth rates in productivity.

26. The growth rates of area under sugarcane were significantly high during the pre-Green Revolution period ranging between 3.77 and 9.10 per cent in the region and the districts. By first and second decades of the Green Revolution, the growth rates of area are divergent ranging between -13.41 and 11.97 per cent among different districts. However, the growth rate of area was 0.92 and 0.86 per cent respectively during
the first and second decades of Green Revolution in Rayalaseema region. This indicates that, the Green Revolution did not allow the sugarcane area to expand at the same rate as it was doing during the pre-Green Revolution period.

27. The growth rates of sugarcane productivity are similar between the pre-Green Revolution period and the first and second decades of the Green Revolution (around -1.00 per cent) indicating no positive impact of HYV seeds on sugarcane productivity. Though 80.00 per cent of the area under sugarcane in Chittoor district is being raised with HYV, the productivity growth rate was negative at -1.93 during the last decade of the Green Revolution. This clearly points out the failure of HYV technology in raising the sugarcane productivity.

Based on the multiple regression results of overall period explaining the influence of different factors, the following conclusions emerge.

28. The influence of price was positive and statistically significant on rice production in Rayalaseema region and all the four constituent districts. This apart, area's contribution was also there on positive side in the region and in Anantapur and Chittoor districts.
29. The influence of area and yield are positive and statistically significant on jowar production in the region and in Anantapur, Cuddapah and Kurnool districts. In Chittoor district significant influence of area on positive side and south-west monsoon rainfall on negative side was recorded.

30. In Rayalaseema region and Kurnool district, area and south-west monsoon had statistically significant influence on bajra production. In the case of the other three districts, only area exerted significant positive influence.

31. Irrigation and north-east monsoon rainfall had positive and statistically significant influence on ragi production in Rayalaseema region. Within the constituent districts, the effects of area, price, yield and irrigation are positive and significant, while south-west monsoon rainfall proved to be significant negative factor.

32. Area's influence was positive and significant on redgram production in Rayalaseema region and in the four constituent districts. Apart from area, price, yield and both the monsoons have influenced in the districts.

33. Greengram production in Rayalaseema region was influenced positively and at statistically significant rates by area and yield. In Cuddapah, area alone recorded
significant positive influence, while in other districts yield too influenced positively along with area.

34. Area alone influenced (positively) horsegram production at a significant rate in Rayalaseema region. Same is the case with two constituent districts viz., Chittoor and Kurnool. In Cuddapah, apart from area, yield too had the impact of significance. South-west monsoon rainfall's impact alone was positive and significant in Anantapur district.

35. The impact of area and north-east monsoon rainfall was positive and yield's was negative (all significant) on groundnut production in Rayalaseema region. In constituent districts, area, south-west monsoon rainfall and irrigation had the positive and significant influence and yield and irrigation recorded negative influence.

36. Castor production in Rayalseema region and Anantapur district was positively influenced by area and south-west monsoon rainfall. In case of Cuddapah and Kurnool the impact came from area and yield. However in Chittoor, no factor found to establish significant influence.

37. The area and irrigation influenced cotton production positively in Rayalaseema region. In all the four constituent districts, the influence of area and yield
was positive. Along with these two, irrigation, and south-west monsoon rainfall in Anantapur and irrigation in Kurnool have also influenced positively (all significant).

38. The tobacco production in Rayalaseema region is being positively influenced by area. Among the districts, no variable impact was significant in Anantapur and Chittoor. Area in Cuddapah and area and both the monsoons in Kurnool influenced the tobacco production positively.

39. The sugarcane production was positively influenced in Rayalaseema region by area and yield. In the constituent districts, area alone influenced in Anantapur, Chittoor and Cuddapah, while no variable influenced significantly in Kurnool.