CHAPTER - IX

SUMMARY & FINDINGS
The importance of agriculture in the economic development of any country is borne out by the fact that it is the primary sector of the economy which provides the basic ingredients necessary for the existence of mankind and also provides most of the raw materials which when transformed into finished products serve as basic necessities of the human race. In addition to supplying food, agriculture must provide many of the raw materials for industry. However, agriculture is not only a supplier of goods for domestic and exports needs, but also a supplier of production factors such as capital and labour. The importance of agriculture in India can be judged mainly from its contribution to national income and employment. Agriculture continues to be a major source of income and employment for a vast majority of people in India. The agriculture sector in India supplies food to the fast growing population and raw material to the manufacturing industry. The agriculture sector with surplus labour is in a position to supply manpower required for the industrial sector in urban areas. The agriculture sector creates demand for industrial products with the advent of the green revolution, there has been a considerable increase in farm incomes in areas with relatively better irrigation facilities.

The second phase of green revolution [1980] appears to be the best period for Indian agriculture with significant acceleration in output growth and reduction in regional inequalities because of the introduction
of HYVs for other crops, spread of green revolution to eastern region and emphasis on water shed programs in dry areas. Since independence, considerable progress has been made in the sphere of agriculture development in the country in terms of increase in crop production and productivity, technological developments and crop diversification.

Land utilization decisions of farmers are motivated by the number of factors like Economical, Technological and Sociological factors, out of which only a few can be quantified. They are prices, area and yield in principle. Most of these factors govern farmer's decisions to make large changes in land utilization pattern. In a subsistence economy where the production is largely for consumption of the farmer's family and only a few of the inputs are purchased, prices have little effect on the production plan and thereby hectarage distribution. A high price for a crop at times may not tempt a farmer to put his land under that crop, since he may be deriving a number of benefits from a diversified pattern of his land utilization. If the crop production is governed by the weather conditions, traditional farmers may not shift his land under one crop which is more profitable and thereby run a risk and face uncertainty. On the other hand, price is the most important factor in the change of land utilization program of a farmer in a developed economy. In such an economy, an average farmer is expected to look at the future prices in order to plan the production program and adjust the hectareage under crops in such a way to maximize his profits.
Commercial crops play a significant role in Indian agriculture. The commercial crops account for 25 percentage of the cropped area in the country. The value of production is 40 percent in the total value of the agricultural production in India. Commercial crops not only contribute significantly to the national income but also contribute to the development of industrial sector.

Kurnool district was purposefully selected for our present study, since it is the major cotton producing district in the Rayalaseema region of Andhra Pradesh. The study is divided into 9 major parts: Introduction, Objectives and Methodology, Growth and Instability of Cotton, Impact of Irrigation on Cotton Cultivation, Impact of Technology on Cotton Cultivation, Supply response of Cotton Crop, Production Response of Cotton Crop, Profitability of Growing Cotton and Summary and Findings of the Study. Secondary data was collected for Andhra Pradesh and Kurnool district for the period of 1985 – 1986 to 2004 – 2005. Primary data was also collected through a well prepared schedule with regard to two cotton varieties viz. Bt and non-Bt.

To study the growth in cotton crop both linear and compound growth rates were estimated. The instability was studied by calculating the coefficient of variation of cotton area, production and yield. The linear growth rate in total cotton area was recorded as 1.76 percent. The annual average increase in total area is 1484.7 hectares. This increase is
not a significant increase in Kurnool district. Nearly 1.8 percent compound growth rate was recorded in cotton area. About 84.8 percent stability in total cotton cropped area was observed. With respect to the cotton production in Kurnool district an insignificant growth was noticed. The LGR and CGR in cotton production were 1.6 percent and 1.9 percent respectively. The instability in cotton production is moderate at 21 percent. Therefore the stability in cotton production is 79 percent. The recorded annual average growth in cotton yield in Kurnool district is 0.192 bales, this increase is an insignificant increase. Almost 20 percent of instability in cotton yield was observed by the study.

The compound growth rate of the cotton area under irrigation is 77.06 percent. The annual increase in cotton irrigated area over previous year is positive but not significant. Therefore the crop growers shifted their attitudes to grow cotton crop than the other crops in Kurnool district. The growth rate of production in cotton irrigated area is 127.13 percent. The annual average increase in cotton production over previous year is 2.27 bales. Almost 64.6 percent of instability in production was noticed in irrigated area. The compound growth rate in cotton yield is 70.87 percent, but the instability in cotton yield is 16.8 percent. An insignificant average annual increase in irrigated cotton yield was recorded.

In the state of Andhra Pradesh the annual increase in cotton area is significant. The instability in cotton area was recorded as 91.3 percent.
The estimated growth rates of cotton area, LGR and CGR are 3.13 percent and 3.49 percent respectively. In case of cotton production a significant annual increase was observed by both linear and exponential models. Only 12 percent of instability was noticed in cotton production. The growth rates of cotton production are 3.57 percent and 4.4 percent. An insignificant increase in cotton yield was recorded in the State. 16.8 percent of variation (instability) was observed in cotton yield. A low growth rate in cotton yield was recorded in Andhra Pradesh.

It is inferred that the significant increase in cotton production was due to significant increase in area under cotton crop, but not due to increase in cotton yield. The impact of green revolution in cotton yield was not observed. The effect of HYV seeds is totally absent. Hence it is suggested that cotton yield may be increased by the supply of effective HYV seeds.

The impact of irrigation on cotton cultivation was studied in the second chapter. The effect of rainfall and irrigated area on cotton area, production and yield was estimated by the multiple regression model. Both the linear and log-linear models were fitted using OLS method. From the estimated regression equations, the rainfall and irrigated area’s effect on total cotton area is positive and significant. About 98 percent of variation in total cotton area was observed by these two variables. This aggregate effect is observed to be a significant effect. It is noticed that the total cotton area may be increased significantly by raising the irrigated
cotton area. The irrigated cotton area may be increased through the increase in ground water and surface water flows. Proper harvesting of rainfall may raise the ground water.

The established relationship between cotton production and the two independent variables, rainfall and irrigated area reveals that the irrigated area's effect on cotton production is positive and significant. The effect of rainfall on production is positive but not significant. It is also noticed that the aggregate effect of these two variables is significant ($R^2$ value), proved by F-test statistic. It is concluded that the irrigated area significantly influenced the cotton production. Therefore to raise the cotton production more area may be brought under irrigation. The increase in irrigated area is possible, by taking appropriate measures like construction of check dams, irrigation projects, proper canal systems restricting the wastage of rain water, deepening of tanks, construction of new tanks etc.

The net effect of irrigated area on cotton yield is positive but not significant. An insignificant negative effect of rainfall on cotton yield was observed. The aggregate effect of these two variables is also insignificant. From the above it is noticed that the cotton yield was not influenced by the two water sources. But it may be influenced by new technology. It is also proved by the value of intercept term. Therefore raising the other factors like HYV seeds, fertilizers and pesticides, farm mechanization, plant protection methods etc. may increase the cotton yield.
The technological effect on cotton cultivation in Kurnool district was studied in Chapter Five. The forty years period was taken and divided into two sub-periods, viz sub-period I and sub-period II consisting 20 years each. Here the area and time were considered as explanatory variables and cotton production is an explained variable. The study was carried out for both the periods and total period also. A multiple regression was carried out.

During the period I the cotton production was positively and significantly responded by the factors area and time. The collective effect of these variables was significant on cotton production. The time factor was treated for the technological changes in agriculture. The estimated results reveal that, the effect of technology on cotton production was noticed. During sub-period II, the effect of area on cotton production was positive and significant but the time factor shows an insignificant negative effect on cotton production. This reveals that the technological effect on cotton production in Kurnool district is negative. It expresses the misutilisation of new technology or over utilization of new technology. The aggregate effect of these two variables, area and time, is 77.7 percent and 85 percent respectively in both the models. This collective effect was found to be significant. During the total period of forty years, the combined effect of two variables on cotton production is significant. The two independent variables area and time expressed significant positive relationship with cotton production. Hence, the cotton production in
Kurnool district was positively responded by new technology. Finally it may be concluded that the new technology on cotton production in Kurnool district was significant. Unfortunately during the period II, the technological effect on cotton production is negative. This is because of over utilization or under utilization of new technology in Kurnool district.

The supply response of cotton crop was studied by utilizing the Nerlovian partial adjustment model, explained in the methodology. Initially a simple model was estimated and it is found out that the current area under cotton crop was influenced by the lagged price and lagged area. This relation was estimated by the multiple regression equation. From the estimated coefficients, the lagged price and lagged area show a positive and significant effect on current area. The current area under cotton crop is significantly influenced by lagged price and lagged area. The aggregate effect of these variables is nearly 50 percent. This combined effect was observed to be a significant one. The Nerlovian Partial Adjustment Model (equation 15) was estimated. The coefficient of lagged price is negative. An insignificant negative price effect was noticed. A positive and significant effect of irrigated area on current area was observed. The two lagged variables $A_{t-1}$ and $Y_{t-1}$ established only a positive relation. The effect of rainfall on current year cotton area is positive. Almost 88 percent of variation in cotton area was recorded by these selected independent variables. It is inferred that the lagged prices are not encouraging the cotton growers. Since the price effect is absent in
supply response model, the irrigated area effect is significant. Therefore the cotton area allocation is depending on irrigation facilities. It is suggested that providing attractive prices or better marketing conditions may raise the cotton area. The elasticities reveal that the farmers are more responsive to price changes in the case of cotton crop in Kurnool district.

To satisfy the V objective of the study, Cagan's Adaptive Expectation Hypothesis was used. Data for a period of twenty years was considered. Initially a relationship has been established that the cotton production is depending on current area, lagged price and current rainfall. From the estimated relationship the current cotton production was positively and significantly influenced by current area. The effect of rainfall and lagged price was observed to be negative. The aggregate effect of these three variables on cotton production is significant. The adaptive expectation model analyzed the relative impact of input factors on cotton production in Kurnool district. The expected prices are incorporated in the original model. The modified model (equation no.23) was estimated. By estimated coefficients of the modified model the aggregate effect of selected variables on current cotton production is significant. An insignificant positive effect was recorded on cotton production the two-rain fall variables' effect is negative. A significant positive effect of current area was recorded on current cotton production. It is inferred that its area mainly influenced the cotton production. A negligible price effect
was recorded. From the coefficient of expectation it is observed that the cotton growers are in over expectation about future cotton prices in Kurnool district. Where as, in the entire state, the growers are influenced by very recent year cotton prices for their future price expectation. Cotton production in Kurnool district is mainly area responsive, but not price responsive. It may be suggested that the cotton production can be increased by providing minimum support price, better marketing conditions etc.

To satisfy the last objective of the study, the profitability of cotton cultivation in Kurnool district, the cost and return structure, input-output structure at mean levels, input – output relations and marginal value of productivities of the two cotton varieties, Bt and non Bt were analyzed with appropriate statistical tools.

The Table 8.1 reveals that the Bt cotton variety is profitable than the non-Bt variety with respect to gross returns, net returns and benefit – cost ratio. In case of gross cost Bt variety’s gross cost is less than non-Bt variety. Therefore one can say that Bt variety is more profitable to non-Bt variety to cotton growers. From the input- output structure at mean level, the average cost of input variables labour, manure, fertilizers and pesticides is less in Bt variety than in case of non-Bt variety. Where as the average cost of land rent and miscellaneous expenses is more in case of Bt variety than non-Bt variety. The average yield and net returns are more in case of Bt variety. The t – test statistic reveals that the mean
differences of yield, land rent, fertilizers and pesticides and miscellaneous expenses is significant. Therefore it is concluded that there exists a remarkable difference between two cotton varieties. The cost of Bt variety is comparatively less than the non-Bt variety. It is suggested that the Bt cotton variety is advisable to grow in Kurnool district, regarding the input-output structure. The estimated relationship of inputs with cotton yield reveals that the two varieties of cotton cultivation are operating under increasing returns to scale. Therefore the cotton cultivation is profitable to its growers in Kurnool district. The collective effect of the selected variables is significantly influencing the cotton yield.

From the analysis of marginal value of productivities it is suggested that increasing the two variables manure, fertilizers and pesticides may raise the yield of two cotton varieties. Since, the MVP value is greater than one, the analysis on profitability of cotton cultivation expresses that the Bt cotton variety is profitable than the non-Bt variety in Kurnool district.

The growth rates of area and production are positive and the growth rate of yield is less than one. The stability in cotton production is less, followed by the yield and area. In case of irrigated area in Kurnool district, the highest instability was recorded in cotton production followed by area and yield. The production growth rate is more, followed by area and yield. Considering Andhra Pradesh as a whole, the same
trend was recorded with the growth rates of irrigated area in Kurnool district.

The impact of rainfall and irrigated area on total area and cotton production is significant. But it is not so, in case of cotton yield. Between the two explanatory variables rainfall and irrigated area, a cotton crop was positively and significantly influenced by irrigated area. Raising the factors other than irrigation may increase the cotton yield.

Observing the technological changes in cotton cultivation in Kurnool district the cotton production was significantly influenced by two variables, area and time in case of total period. The technological influence was noticed on cotton production. The same trend was observed during sub – period I. During the sub – period II the effect on new technology on production is negative due to misutilization or over utilization of technology. So proper utilization of new agriculture technology may raise the cotton yield significantly.

From the supply response analysis, it is concluded that the cotton area is influenced by irrigation facilities but not prices. By providing better marketing conditions, minimum support prices, providing new technology at cheaper rates to the cotton growers, the production may be raised.

From the production response analysis the aggregate effect of the selected variables on cotton production is significant. The cotton
production is mainly responded by its area but not prices. It may suggest that attractive prices may encourage the farmers to raise the production.

From the analysis of cost and return structure, input – output structure at mean level, input – output relations and the marginal values of productivities of two selected varieties, it is found that Bt cotton variety is more profitable than non Bt variety.