Chapter IX

SUMMARY OF RESEARCH FINDINGS AND SUGGESTIONS
9.1. Introduction

Kurnool district stands fifth in Andhra Pradesh and first in Rayalaseema region of the State in terms of area and production of chilli crop. Most of the farmers growing chillies under assured irrigation systems either through canal irrigation or through bore-well irrigation in Kurnool district. However, they have been facing problems with seeds, pesticides, fertilizers and marketing of their produce. In this context, the present study has been undertaken to examine the production and marketing efficiency of chilli growing farmers in Kurnool district. The study estimated the differences in the input structure and returns structure of the chilli production among the farmers and estimated the benefit–cost ratios to examine the production efficiency in addition to the estimation of Linear and Cobb-Douglas production functions. The study also assessed the marketing problems including the effect of middlemen in the marketing process.

9.2. Objectives of the Study

The following are the objectives of the present study:

1. To review the existing literature on the efficiency of Chillies growing farmers;
2. To examine the social status of Chillies growing farmers;
3. To assess the economic status of Chillies growing farmers;
4. To analyze the pattern of resource allocation by Chillies growing farmers;
5. To determine the level of production efficiency of the chill growing farmers;
6. To determine the level of marketing efficiency of the chilli growing farmers.

9.3. Hypotheses of the Study

The following are the hypotheses of the present study:
1. To test whether there is any difference in the social status of Chillies growing farmers;
2. To test whether there is any difference in the economic status of Chillies growing farmers;
3. To test whether there is difference in the pattern of resource allocation by Chillies growing farmers;
4. To test whether there is any difference in the level of production efficiency of the chillies growing farmers; and
5. To test whether there is any difference in the level of marketing efficiency of the chillies growing farmers.

9.4. Period of the Study

The study covered a period of ten years from 2000-01 to 2009-10 in the case of secondary sources of data on area under chilli cultivation, production of chillies, productivity of chillies and export of chillies. However, the primary survey was conducted by the researcher during different time periods in different sample villages of the study area during the year 2009-10 to assess the socio-economic conditions of chilli growing farmers and to examine the efficiency of chilli growing farmers in Adoni Revenue Division of Kurnool District in Andhra Pradesh.

9.5. Sample Frame and Sample Size

The entire sample frame was divided into three revenue divisions, viz., Adoni, Kurnool and Nandyal. Of them, Adoni division was selected for the study based on the highest concentration of Chilli growing farmers. Adoni division was divided into 17 Revenue Mandals and three mandals namely Aspari, Kosigi and Adoni were selected as sample for the present study. Finally, 270 Chilli growing farmers were
selected as sample respondents for the survey at the rate of 90 chilli growing farmers from each selected mandal on simple random sampling method.

9.6. Review of Literature

There are number of theoretical and empirical studies on the various aspects of production, marketing and export of agricultural commodities in general, but the empirical studies on the various aspects of production, marketing and export of Chillies are very little. The most relevant literature on the subject reviewed shows that the studies on chilli production, marketing and exports are meager and the studies in the efficiency of chilli growing farmers are scanty. Hence, the present study has been undertaken, to determine the level of efficiency of the chilli growing farmers in Kurnool district of Andhta Pradesh.

9.7. Profile of the study area

The present section deals with the physical, economic and demographic profile of the Kurnool district and also the study area – Adoni, Kosigi and Aspari mandals of Adoni Revenue Division of Kurnool district. This district is bounded by Tungabhadra and Krishna rivers as well as Mahabubnagar district on the north, by Kadapa and Anantapur Districts on the south, by the Bellary district of Karnataka State on the west and by Prakasam District on the east.

The total Geographical area of the district is 17.658 lakh hectares. During the year 2007-08 the area covered by forest is 3.406 lakh hectares, which forms 19.2% to the total geographical area. The net area sown is 8.94 lakh hectares, forming 50% to the total geographical area. The total cropped area in the district is 10.35 lakhs hectares. The area sown more than once during the year is 0.98 lakh hectares. The
study area has lower forest coverage with 6.42% in Adoni Mandal, 1.31% in Kosigi Mandal, 1.80% in Aspari Mandal and Adoni revenue division covers just 3.36% of the geographical area, as against the district level of 19.29%. On the other hand, the net area sown on the study area covers larger part of geographical area than the aggregate level of the district. The coverage of net area sown is 70.74% in Adoni Mandal, 52.38% in Kosigi Mandal, 69.59% in Aspari Mandal and Adoni revenue division covers 68.40% of the geographical area, as against the district level of 50.60%. Area sown more than once is 1.90% in Adoni Mandal, 6.59% in Kosigi Mandal, 7.48% in Aspari Mandal and Adoni revenue division covers 7.86% of the geographical area, as against the district level of 8.0%. Hence, it is clear that the sample mandals in Kurnool district are predominantly agricultural based mandals and the majority of their population depends on agriculture. Cropping intensity is the ratio of Gross Area Sown to Net Area Sown and it is one of the indices used for assessing the efficiency of Agriculture Sector. Cropping intensity is 1.03 in Adoni Mandal, 1.13 in Kosigi Mandal, 1.11 in Aspari Mandal and 1.11 in Adoni Revenue Division, as against the district level of 1.16. Therefore, it is inferred that Kosigi Mandal has high cropping intensity than Adoni and Aspari Mandals in the study area.

Adoni and Kosigi mandals have canals, but Aspari mandal does not have canal irrigation; Adoni and Aspari mandals have tanks, but Kosigi mandal does not have tank irrigation; Adoni and Aspari mandals does not have open wells, but Kosigi mandal have the open wells and lift irrigation has been practiced in Adoni and Kosigi mandals, but it is not practiced in Aspari mandal. In terms of its share in Net Area Sown, Net Area Irrigated is 18.57% in Adoni Mandal, 31.19% in Kosigi Mandal, 10.40% in Aspari Mandal, 16.79% in Adoni Revenue Division and 28.40% in Kurnool District. Further, in terms of area irrigated more than once as percent of Net
Area Irrigated is 2.68% in Adoni Mandal, 19.22% in Kosigi Mandal, 4.06% in Aspari Mandal, 11.56% in Adoni Revenue Division and 18.37% in Kurnool District. Irrigation intensity is the ratio of Gross Area Irrigated to Net Area Irrigated and it is one of the indices used for assessing the efficiency of Agriculture Sector. Irrigation intensity is 1.03 in Adoni Mandal, 1.19 in Kosigi Mandal, 1.04 in Aspari Mandal, 1.12 in Adoni Revenue Division and 1.18 in Kurnool District. Therefore, it is inferred that Kosigi Mandal has higher irrigation intensity than Adoni and Aspari Mandals in the study area.

The major types of soils in the study area are Black soils and Red soils. Black soils are also known as Regur soils. The colour of the soil is black because of the presence of certain salts. Black soils are generally thin and sandy in the study area of Kurnool district. Block soil does not contain adequate nitrogen but it contains sufficient phosphorous required for the growth of the plants. Black soils constitute 64.21% in Adoni Mandal, 30.95% in Kosigi Mandal, 74.12% in Aspari Mandal, 59.25% in Adoni Revenue Division and 61.42% in Kurnool District. Red soils contain huge concentration of iron oxides that are responsible for giving the reddish colour. They are less clayey and sandier and are poor in important minerals like lime, phosphorous and nitrogen. Red soil is mainly cultivated during the monsoon rainy season. Red soils constitute 15.50% in Adoni Mandal, 56.78% in Kosigi Mandal, 25.88% in Aspari Mandal, 30.77% in Adoni Revenue Division and 24.74% in Kurnool District. Therefore, it is obvious that while Black soil is predominant in Adoni and Aspari Mandals, the Red soil is predominant in Kosigi mandal of the study area.
Agricultural Census conducted once in every 5 years defines the area used for agricultural purpose by a farmer household as ‘Operational Holding’. Agricultural Census classified the operational holdings into five categories namely; (a) Marginal Holdings (less than a hectare), (b) Small Holdings (one hectare and above, but below two hectares), (c) Semi-medium Holdings (two hectares and above, but below four hectares), (d) Medium Holdings (four hectares and above, but below ten hectares) and (e) Large Holdings (10 hectares and above).

In the case of marginal farmers, 37.67% of farmers shared only 10.83% of land in Adoni Mandal; 40.86% of farmers shared only 13.84% of land in Kosigi Mandal; 23.76% of farmers shared only 5.80% of land in Aspari Mandal; 33.07% of farmers shared only 8.94% of land in Adoni Revenue Division and 40.30% of farmers shared only 11.85% of land in Kurnool District. Therefore, it is clear from the table that the shares of Marginal holdings are larger in terms of their number in the study area, but their shares are smaller in terms of their area coverage.

In the case of small farmers, 28.59% of farmers shared only 19.43% of land in Adoni Mandal; 31.52% of farmers shared only 26.40% of land in Kosigi Mandal; 29.58% of farmers shared only 14.62% of land in Aspari Mandal; 29.50% of farmers shared only 18.86% of land in Adoni Revenue Division and 28.58% of farmers shared only 21.26% of land in Kurnool District. Therefore, it is clear that the shares of Marginal holdings are larger in terms of their number in the study area, but their shares are smaller in terms of their area coverage.

In the case of Marginal and Small farmers together, 66.26% of farmers shared only 30.26% of land in Adoni Mandal; 72.38% of farmers shared only 40.24% of land
in Kosigi Mandal; 53.34% of farmers shared only 20.42% of land in Aspari Mandal; 62.57% of farmers shared only 27.80% of land in Adoni Revenue Division and 68.88% of farmers shared only 33.11% of land in Kurnool District. Therefore, it is clear that the shares of Marginal and Small farmers together are larger in terms of their number, but their shares are smaller in terms of their area coverage in the study area.

In the case of Semi-Medium, Medium and large farmers together, only 33.74% of farmers shared 69.74% of land in Adoni Mandal; only 27.62% of farmers shared 59.76% of land in Kosigi Mandal; only 46.66% of farmers shared 79.58% of land in Aspari Mandal; only 37.43% of farmers shared 72.20% of land in Adoni Revenue Division and only 31.12% of farmers shared 66.89% of land in Kurnool District. Therefore, it is clear that the shares of Semi-Medium, Medium and large farmers together are smaller in terms of their number, but their shares are larger in terms of their area coverage in the study area.

It is clear from the above analysis that the shares of Marginal and Small holdings together constitutes larger than 60% in terms of their number, but their shares are smaller than 40% in terms of their area coverage in the study area. On the other hand, the shares of Semi-Medium, Medium and large holdings together constitutes smaller than 40% in terms of their number, but their shares are larger than 60% in terms of their area coverage in the study area. Therefore, the distribution of the number and area of operational holdings reveals that there are glaring inequalities in the distribution of agricultural land among the farmers in the study area.
average of 1454 kgs/hectare during the period from 2000-01 to 2008-09. Further, it is observed that the area under chilli cultivation has been showed a declining trend during the period of study. However, it is observed that the performance of chilli crop is very poor during the years 2002-03 and 2005-06 in terms of area under chilli cultivation, Chilli production and its productivity. The major cause for significant decline in the area under chilli cultivation, Chilli production and its productivity during the years 2002-03 and 2005-06 may be due to unfavorable weather conditions in major chilli growing areas of the country.

The annual compound growth rate of Area, Production and Productivity of Chilli Crop in India shows that the area under chilli cultivation has been declined at an annual compound growth rate of (-) 1.2%, but the annual compound growth rate of chilli production has been increased at an annual compound growth rate of 3.7% and the annual compound growth rate of Chillie Productivity has been increased at an annual compound growth rate of 4.9%. Therefore, it is clear that the positive growth rate of chilli production is mainly due to increase in the productivity of chilli crop and not due to increase in the area under its cultivation.

The spatial distribution of chilli crop production in India indicate that the lion’s share is taken by Andhra Pradesh, which alone commands around 56% of the chilli production in India with coverage of only 27% of the area under chilli cultivation. This indicates that the productivity of chillies is very high in Andhra Pradesh. The productivity of chillies in Andhra Pradesh is 2982 Kgs/Hectare and it is more than the double of the all India average of 1463 Kgs/Hectare. This shows that the chilli growing farmers in Andhra Pradesh have higher efficiency in chilli production than the chilli growing farmers in other states of India.
9.10. Growth Performance of Chilli Crop in Andhra Pradesh

Andhra Pradesh is the largest producer, consumer and exporter of chillies in India. Andhra Pradesh has the largest area under chilli cultivation and it also produces the highest quantity of chillies in India due to its highest productivity of chillies. Chilli production is spread throughout the length and breadth of the state. Chilli crop is cultivated in both Kharif and Rabi seasons in Andhra Pradesh. The farmers in Andhra Pradesh cultivate chilli crop during both kharif and rabi seasons. Chilli is an irrigated crop, but some farmers in Andhra Pradesh cultivate it under reinfed conditions also during kharif season.

The area under chilli cultivation during kharif season is minimum at 128 thousand hectares in 2005-06 and maximum at 199 thousand hectares in 2003-04 with an average of 170 thousand hectares during the period of study. Similarly, the area under chilli cultivation during rabi season is minimum at 43 thousand hectares in 2008-09 and maximum at 54 thousand hectares in 2000-01 and 2001-02 with an average of 170 thousand hectares during the period of study. The total area under chilli cultivation during both kharif and rabi seasons is minimum at 172 thousand hectares in 2005-06 and maximum at 250 thousand hectares in 2003-04 with an average of 219 thousand hectares during the period of study.

The annual compound growth rate of the area under chilli cultivation in Andhra Pradesh show that the area under chilli cultivation in Andhra Pradesh has been decreased at an annual compound growth rate of 1.7% during kharif season and has been decreased at an annual compound growth rate of 1.4% during rabi season, but it has been decreased at an annual compound growth rate of 1.7% during both seasons together also. Therefore, it is clear that the annual compound growth rate of
area under chilli cultivation in Andhra Pradesh has been declined during the period of study.

The irrigated area under chilli cultivation in Andhra Pradesh is minimum at 127 thousand hectares in 2005-06 and maximum at 178 thousand hectares in 2007-08 with an average of 157 thousand hectares during the period of study. The percentage share of irrigated area under chilli cultivation in the total area under chilli cultivation in Andhra Pradesh is minimum at 62% in 2003-04 and maximum at 83.25% in 2008-09 with an average of 72% during the period of study. The annual compound growth rate of the area under chilli cultivation in Andhra Pradesh show that while the area under chilli cultivation in Andhra Pradesh has been decreased at an annual compound growth rate of 1.7%, the irrigated area under chilli cultivation in Andhra Pradesh has been increased at an annual compound growth rate of 1.6%. However, the annual compound growth rate of the percentage share of irrigated area in the total area under chilli cultivation in Andhra Pradesh has increased at a higher rate of 3.3% during the period of study. Therefore, it is clear that the annual compound growth rate of irrigated area under chilli cultivation in Andhra Pradesh has been increased during the period of study.

The production of chilli crop in Andhra Pradesh is minimum at 309 thousand tonnes in 2002-03 and maximum at 662 thousand tonnes in 2003-04 during kharif season with an average of 536 thousand tonnes during the period of study. Similarly, the production of chilli crop in Andhra Pradesh is minimum at 100 thousand tonnes in 2002-03 and maximum at 191 thousand tonnes in 2009-10 during rabi season with an average of 139 thousand tonnes during the period of study. Further, the total production of chilli crop in Andhra Pradesh is minimum at 409 thousand tonnes in
2002-03 and maximum at 831 thousand tonnes in 2009-10 with an average of 675 thousand tonnes during the period of study. The annual compound growth rate of the production of chillies in Andhra Pradesh show that while the production of chillies in Andhra Pradesh has been increased at an annual compound growth rate of 5.6% during kharif season, the production of chillies in Andhra Pradesh has been increased at an annual compound growth rate of 4.8% during rabi season. However, the production of chillies in Andhra Pradesh has been increased at an annual compound growth rate of 5.4% during both seasons together. Therefore, it is clear that the annual compound growth rate of the production of chillies in Andhra Pradesh has been increased at a higher rate during kharif season than during rabi season of the period of study.

The productivity of chilli crop in Andhra Pradesh is the minimum at 1758 kgs/hectare in 2002-03 and maximum at 4090 kgs/hectare in 2009-10 during kharif season with an average of 3182 kgs/hectare during the period of study. Similarly, the productivity of chilli crop in Andhra Pradesh is the minimum at 1831 kgs/hectare in 2002-03 and maximum at 3815 kgs/hectare in 2008-09 and 2009-10 during rabi season with an average of 2824 kgs/hectare during the period of study. Further, the general productivity of chilli crop in Andhra Pradesh is the minimum at 1831 kgs/hectare in 2002-03 and maximum at 4023 kgs/hectare in 2009-10 with an average of 3103 kgs/hectare during the period of study. The annual compound growth rate of the productivity of chillies in Andhra Pradesh show that while the productivity of chillies in Andhra Pradesh has been increased at an annual compound growth rate of 7.5% during kharif season, the productivity of chillies in Andhra Pradesh has been increased at an annual compound growth rate of 6.9% during rabi season. However, the productivity of chillies in Andhra Pradesh has been increased at an annual
compound growth rate of 7.2% during both seasons together. Therefore, it is clear that
the annual compound growth rate of the productivity of chillies in Andhra Pradesh
has been increased at a higher rate during kharif season than during rabi season of the
period of study.

The major chilli producers in Andhra Pradesh are Guntur, Khammam, Warangal, Prakasham, Kurnool, Krishna, Mahabubnagar and Nalgonda districts. The percentage shares of the important districts in Andhra Pradesh in the area under chilli cultivation shows that the contribution to the area under chilli cultivation is the highest at 32% by Guntur district followed by Khammam (15%), Warangal (11%), Prakasham (8%), Kurnool (7%), Krishna (4%), Mahabubnagar (3%), Nalgonda (3%), Karimnagar (3%) and all other districts in Andhra Pradesh together contribute about 14% area under chilli cultivation in Andhra Pradesh. The contribution of the nine important districts together to the area under chilli cultivation constitutes nearly 86 per cent of the total area under chilli cultivation in Andhra Pradesh.

Similarly, the percentage shares of the important districts in Andhra Pradesh in terms of chilli production shows that the contribution to the chilli production is the highest at 41% by Guntur district followed by Khammam (17%), Warangal (10%), Prakasham (8%), Kurnool (4%), Krishna (4%), Mahabubnagar (3%), Nalgonda (3%), Karimnagar (1%) and all other districts in Andhra Pradesh together contribute about 9% of chilli production in Andhra Pradesh. The contribution of the nine important districts together to the chilli production constitutes nearly 91 per cent of the total chilli production in Andhra Pradesh.
The productivity of chilli production in different districts of Andhra Pradesh shows that Guntur district has the highest productivity at 4941 Kgs/Hectare followed by Khammam (4556 kgs/hectare), Krishna (3668 kgs/hectare), Warangal (3524 kgs/hectare), Prakasham (3385 kgs/hectare), Nalgonda (2956 kgs/hectare), Mahabubnagar (2602 kgs/hectare), Kurnool (2422 kgs/hectare) and the productivity of chilli production is the lowest at 1967 kgs/hectare in Khammam district of Andhra Pradesh during the year 2008-09. It is also noted that the productivity of chilli crop in Andhra Pradesh state as a whole is 3803 kgs/hectare and only Guntur and Khammam districts have higher productivity of chilli crop than the state average.

From the above, it is concluded that Kurnool district stands number five position in terms of both area under chilli cultivation and chilli production, but it stands number eight position in terms of productivity of chillies per hectare. The productivity of chillies in Kurnool district is 2422 Kgs/Hectare, which is just 64% of the productivity of chillies in Andhra Pradesh (3803 Kgs/Hectare) and it is less than half of the productivity of chillies in Guntur district (4941 Kgs/Hectare). This shows that the chilli growing farmers in Kurnool district have lower efficiency in chilli production than the chilli growing farmers in the top seven districts of Andhra Pradesh in terms of area under chilli cultivation, production of chillies and productivity of chilli crop.

9.11. Socio-economic conditions of Chilli growing farmers

The study found that most of the sample chilli growing farmers are in the middle age group and have enough experience in the production of chillies. Since the computed chi-square value (2.594) is lower than the Chi-Square Table Value for $\alpha = 0.05$ (12.5916) at 6 degrees of freedom, it is concluded that there is no significant
The study found that most of the sample chilli growing farmers are in the lower educational status (either illiterate or school level) and hence they have lower capacity to understand and adopt the modern technologies of chilli production such as high yielding varieties of seeds, fertilizers and pesticides from time to time in the production process. Since the computed chi-square value (3.337) is lower than the Chi-Square Table Value for $\alpha = 0.05$ (9.48773) at 4 degrees of freedom, it is concluded that there is no significant difference in the distribution of sample chilli growing farmers based on their educational status among the three sample mandals.

The study found that most of the sample chilli growing farmers have small family size and hence they have lower family labour for use in the process of chilli production and they have to depend on hired labour during the critical production process such as sowing and harvesting. Since the computed chi-square value (4.789) is lower than the Chi-Square Table Value for $\alpha = 0.05$ (15.5073) at 8 degrees of freedom, it is concluded that there is no significant difference in the distribution of sample chilli growing farmers based on their family size among the three sample mandals.

The study found that most of the sample chilli growing farmers have small family labour size and hence they have to depend on hired labour during the critical production process such as sowing and harvesting. Since the computed chi-square value (9.778) is lower than the Chi-Square Table Value for $\alpha = 0.05$ (15.5073) at 6 degrees of freedom, it is concluded that there is no significant difference in the
distribution of sample chilli growing farmers based on their family labour size among the three sample mandals.

The study found that most of the sample chilli growing farmers have small and medium land holding sizes and hence they have sufficient land for cultivating chilli crop. Since the computed chi-square value (8.448) is lower than the Chi-Square Table Value for $\alpha = 0.05$ (15.5073) at 6 degrees of freedom, it is concluded that there is no significant difference in the distribution of sample chilli growing farmers based on their land holding size among the three sample mandals.

The study found that most of the sample chilli growing farmers have owned houses and hence they have sufficient facilities for living and also may have storing facility for chilli crop. Since the computed chi-square value (20.475) is higher than the Chi-Square Table Value for $\alpha = 0.05$ (5.99147) at 2 degrees of freedom, it is concluded that there is a significant difference in the distribution of sample chilli growing farmers based on their house ownership among the three sample mandals. Further, it is observed that the sample farmers with rented houses are more in number in Adoni mandal than the other two mandals mainly due to the higher urbanization in Adoni mandal.

The study found most of the sample chilli growing farmers have tap water facilities, but outside the premises of their houses. The percentage of sample chilli growing farmers with water supply through hand pumps is the highest in Kosigi mandal followed by Aspari mandal and Adoni Mandal. On the other hand, the percentage of sample chilli growing farmers with water supply through wells is the highest in Aspari mandal followed by Adoni mandal and Kosigi Mandal. Therefore, it
is clear that the sample chilli growing farmers depends largely on tap water for drinking purpose in the study area. Since the computed chi-square value (28.0302) is higher than the Chi-Square Table Value for $\alpha = 0.05$ (21.0261) at 12 degrees of freedom, it is concluded that there is a significant difference in the distribution of sample chilli growing farmers based on the availability of drinking water facilities among the three sample mandals.

The study found that the bottom 20% of the farmers shares 11% of their total income in Aspari mandal, 10.7% in Adoni mandal and 10.3% of their total income in Kosigi mandal of the study area. On the other hand, the top 20% of the farmers shares 30.7% of their total income in Aspari mandal, 30.6% in the total income in both Adoni and Kosigi mandals. As the farmers in the sample belong to homogenous group in all the three mandals of the study, there is no much variation in the average incomes of the farmers among the mandals in the study area. However, they have inequalities within the mandal. The average per capita income ranges between Rs. 73,444 to Rs.2,33,222 in the case of Aspari. Similarly, average per capita income ranges between Rs. 65,000 to Rs.2,22,078 in the case of Kosigi mandal, and average per capita income ranges between Rs. 62,444 to Rs.2,02,867 in the case of Adoni mandal. It is therefore, inferred that the farmers in the Adoni mandal have lower per capita incomes than that of Kosigi and Aspari mandals. In other words, it is inferred that the farmers in the Aspari mandal have higher per capita incomes than that of Kosigi and Adoni mandals.

The Lorenz Curves of individual mandals indicates that there are income inequalities among the sample chilli growing farmers in all the sample mandals. However, once all the three Lorenz Curves of the sample mandals put together in a
single Chart shows that all the three Lorenz curves have the similar conditions and hence they have overlapped each other and it seems to be a single curve rather than three separate curves. This is mainly due to the fact that these three mandal farmers have similar income inequalities with little differences.


In order to assess the economic performance of chilli growing farmers in Kurnool district, the study estimated the average Benefit-Cost Ratios and the average Profit Ratios for the sample farmers. In order to have comparable estimates, the quantities of all variables have been converted into per acre values. The prices of the inputs that were prevailing at the time of their use in the year 2009-10 were considered for working out the cost of cultivation. A net income per acre was calculated by deducting cost of cultivation per acre from gross income per acre. Benefit-Cost ratios and Profit Ratios were worked out by using the following formulae.

**Benefit-Cost Ratio = Gross Income/Cost of Cultivation**

**Profit Ratio = (Net Income/Cost of Cultivation)*100**

To assess and compare the performance of chilli growing farmers in the selected sample mandals of Kurnool district, the chilli growing farmers were further divided into three categories, namely, farmers with one acre of chilli cultivation, farmers with two acres of chilli cultivation and farmers with three acres of chilli cultivation.

It is observed that the average production cost of chilli growing farmers per acre in the sample area of Kurnool district is Rs.40746. The mandal wise analysis indicate that the average production cost of Chilli growing farmers per acre is the
highest at Rs.42184 in Aspari mandal followed by Rs.40828 in Kosigi mandal and the lowest at Rs.39226 in Adoni mandal. The acreage wise analysis shows that the average cost of chilli cultivation per acre is Rs.46883 for farmers with one acre of chilli cultivation, it declined to Rs.37497 for farmers with two acres of chilli cultivation but it marginally increased to Rs.37858 for farmers with three acres of chilli cultivation. Therefore, it is inferred that the average cost of chilli cultivation per acre declines as the area of chilli cultivation increases.

It is observed that the average gross income of chilli growing farmers per acre in the sample area of Kurnool district is Rs.70646. The mandal wise analysis indicate that the average gross income of Chilli growing farmers per acre is the highest at Rs.74611 in Aspari mandal followed by Rs.71837 in Kosigi mandal and the lowest at Rs.65490 in Adoni mandal. The acreage wise analysis shows that average gross income of chilli cultivation per acre is Rs.79408 for farmers with one acre of chilli cultivation, it declined to Rs.67495 for farmers with two acres of chilli cultivation and it further declined to Rs.65036 for farmers with three acres of chilli cultivation in the sample area of Kurnool district. Therefore, it is inferred that the average gross income of chilli cultivation per acre declines as the area of chilli cultivation increases.

It is observed that the average net income of chilli growing farmers per acre in the sample area of Kurnool district is Rs.29900. The mandal wise analysis indicate that the average net income of Chilli growing farmers per acre is the highest at Rs.32427 in Aspari mandal followed by Rs.31008 in Kosigi mandal and the lowest at Rs.26264 in Adoni mandal. The acreage wise analysis shows that average net income of chilli cultivation per acre is Rs.32525 for farmers with one acre of chilli cultivation, it declined to Rs.29998 for farmers with two acres of chilli cultivation and it further
declined to Rs.27177 for farmers with three acres of chilli cultivation in the sample area of Kurnool district. Therefore, it is inferred that the average net income of chilli cultivation per acre declines as the area of chilli cultivation increases.

As both the cost of production per acre and the gross income (Benefit) per acre have declined as the acreage of chilli cultivation increases in the study area, it is necessary to estimate the Benefit-Cost Ratios in order to make meaningful comparisons. It is observed that the average Benefit-Cost Ratio of chilli growing farmers per acre in the sample area of Kurnool district is 1.73. The mandal wise analysis indicate that the average Benefit-Cost Ratio of Chilli growing farmers per acre is the highest at 1.77 in Aspari mandal followed by 1.76 in Kosigi mandal and the lowest at 1.67 in Adoni mandal. Hence, the chilli growing farmers in Aspari and Kosigi mandals are termed as better performers than the chilli growing farmers in Adoni Mandal of the study area in Kurnool district. The acreage wise analysis shows that average Benefit-Cost Ratio of chilli cultivation per acre is 1.69 for farmers with one acre of chilli cultivation, it increased to 1.80 for farmers with two acres of chilli cultivation, but it declined to 1.72 for farmers with three acres of chilli cultivation in the sample area of Kurnool district. Therefore, it is inferred that the farmers with two acres of chilli cultivation have the higher Benefit-Cost Ratio than farmers with one acre and three acres of chilli cultivation in the study area. This also indicates that the optimum size of area for chilli cultivation is two acres and hence the farmers with two acres of chilli cultivation are categorized as the best performers or efficient performers in the study area of Kurnool district.

The Profit Ratio is another alternative method for Benefit-Cost Ratio for assessing the comparative performance of Chilli growing farmers, when both the cost
of production per acre and the gross income (Benefit) per acre have declined as the acreage of chilli cultivation increases in the study area. It is observed that the average Profit Ratio of chilli growing farmers per acre in the sample area of Kurnool district is 73.38%. The mandal wise analysis indicate that the average Profit Ratio of Chilli growing farmers per acre is the highest at 76.87% in Aspari mandal followed by 75.95% in Kosigi mandal and the lowest at 66.96% in Adoni mandal. Hence, the chilli growing farmers in Aspari and Kosigi mandals are termed as better performers than the chilli growing farmers in Adoni Mandal of the study area in Kurnool district. The acreage wise analysis shows that average Profit Ratio of chilli cultivation per acre is 69.38% for farmers with one acre of chilli cultivation, it increased to 80% for farmers with two acres of chilli cultivation, but it declined to 71.79% for farmers with three acres of chilli cultivation in the sample area of Kurnool district. Therefore, it is inferred that the farmers with two acres of chilli cultivation have the higher Profit Ratios than farmers with one acre and three acres of chilli cultivation in the study area. This also indicates that the optimum size of area for chilli cultivation is two acres and hence the farmers with two acres of chilli cultivation are categorized as the best performers or efficient performers in the study area of Kurnool district.

9.13. Production Performance of Chilli Growing Farmers

The units of Seeds (S) represent the number of pockets with a weight of 250 grams each. The unit of Land represents the Acres (A), the units of Labour (L) represents the number of person days and Investment (I) on modern inputs such as fertilizers, pesticides and manure is measured in terms of rupees in thousands are the four inputs used to estimate the production. The estimated linear production function for the data representing Chilli growing farmers of Kurnool district indicated that the collective influence of all four inputs together is represented by the value of the
coefficient of determination ($R^2$). As per the value of the coefficient of determination, it is inferred that all four factor inputs together influence 94% of variations in the quantity of output in the case of Aspari Mandal, 94.1% of variations in the quantity of output in the case of Kosigi Mandal and 96% of variations in the quantity of output in the case of Adoni Mandal. The Durbin-Watson statistic (1.790 in Aspari mandal, 1.294 in Kosigi mandal and 1.810 in Adoni mandal) indicates that the problem of multi-co-linearity is within the reasonable limits.

The results of the regression shows that for every one acre increase in input, the quantity of output of Chillies increases by 15.578 quintals in Aspari mandal, 10.078 quintals in Kosigi mandal and 9.579 quintals in Adoni mandal and this increase is also statistically significant at less than 5% level of probability as per the 't' test. Similarly, an increase of one person day of labour leads to an increase in the output of chillies by 59 kgs in Aspari mandal, 67 kgs in Kosigi mandal and 21 kgs in Adoni mandal; an increase of investment in modern inputs leads to an increase in the output of chillies by 635 kgs in Aspari mandal, a decline in the output of chillies by 264 kgs in Kosigi mandal and an increase in the output of chillies by 43 kgs in Adoni mandal; but an increase in the quantity seeds by one packet of 250gms, output of chillies will decline by 1.53 quintals in Aspari mandal, does not generate any significant influence on output of chillies in Kosigi and Adoni mandals.

In order to estimate the production elasticities of inputs used by of chilli growing farmers in Kurnool district, Cobb-Douglas form of production function was used in the present study. The estimated Cobb-Douglas (log linear) production function for the data representing Chilli growing farmers of Kurnool district indicate that the collective influence of all four inputs together is represented by the value of
the coefficient of determination ($R^2$), which is the square of the coefficient of correlation. As per the value of the coefficient of determination, it is inferred that all four factor inputs together influence 95.8% of variations in the quantity of output in the case of Aspari Mandal, 96.1% of variations in the quantity of output in the case of Kosigi Mandal and 96.8% of variations in the quantity of output in the case of Adoni Mandal. The Durbin-Watson statistic (1.769 in Aspari Mandal, 1.124 in Kosigi Mandal and 1.661 in Adoni Mandal) indicates that the problem of multi-co-linearity is within the reasonable limits.

The results of the regression show that the production elasticities of land (1.081) and labour (0.428) are positive and statistically significant at one percent level of probability in Aspari Mandal. It is also clear that while the production elasticity of investment (0.874) is positive, the production elasticity of seeds (-1.375) is negative and they are insignificant. Therefore, it is clear that the farmers have used their land and labour efficiently than the investment and seeds in the production process of chillies in Aspari Mandal.

The results of the regression show that the production elasticities of land (0.623) and labour (0.588) are positive and statistically significant at one percent level of probability in Kosigi Mandal. It is also clear that the seeds not included in the equation and the production elasticity of investment (-0.283) is negative and it is insignificant. Therefore, it is clear that the farmers have used their land and labour efficiently than the investment and seeds in the production process of chillies in Kosigi Mandal.
The results of the regression show that the production elasticities of land (0.654) and labour (0.225) are positive and statistically significant at one percent level of probability in Adoni mandal. It is also clear from the table that the seeds not included in the equation and the production elasticity of investment (0.091) is also positive, but it is insignificant. Therefore, it is clear that the farmers have used their land and labour efficiently than the investment and seeds in the production process of chillies in Adoni mandal.

Finally, it can be concluded that the chilli growing farmers have used their lands and labour efficiently to produce chillies, but they are unable to use the seeds and investment on modern inputs such as fertilizers, pesticides and manure efficiently in the production process. Inappropriate use of seeds and investment on modern inputs led to negative and insignificant production elasticities with respect to these inputs. Hence, there is a need for proper training to the chilli growing farmers in the appropriate use of seeds and modern inputs in the production of chillies in Kurnool district.


The costs of chilli production are grouped into three categories, viz., material cost, labour cost for nursery and labour cost for main field of chilli cultivation. The study found that the material cost accounts for the highest share of 63.1%, followed by Labour cost for main field (33.5%) and Labour cost for nursery (3.4%) in the case of the sample as whole. In the case of Aspari mandal, the material cost accounted for 64.3 per cent, labour cost for raising seedling accounted for 3.3 per cent and labour cost on main field accounted for 32.4 per cent of the total cost incurred by Aspari farmers. But the material cost incurred by Kosigi (62.7%) and Adoni (62.2%) farmers
was slightly lower than Aspari farmers and the labour cost for raising seedling was 3.4 per cent both in Kosigi and Adoni mandals. Labour cost incurred in the main field operations by the Kosigi farmers was relatively high at 33.9 percent and the highest in Adoni at 34.4 per cent. On the other hand, the farmers in Kosigi and Adoni mandals incurred lower material cost in relation to Aspari farmers.

Among the material cost incurred, cost of fertilizer was the major item that accounted for 26.6 per cent of the total cost followed by the cost on pesticides (PPC), which accounted for 20.5 per cent. Among the labour cost incurred in the main field, harvesting constituted the highest share of 10.7 per cent of the total cost in overall sense, 10.8% in Aspari, 10.7% in Adoni and 10.5% in Kosigi mandals. The cost on planting of seedlings constitute about 4.2% in overall case, 4.5% in Kosigi, 4.4% in Adoni and 3.8% in Aspari mandals. The cost on spraying pesticides (PPC) constitute about 3.9% in overall case, 4.1% in Kosigi, 4.0% in Adoni and 3.5% in Aspari mandals. Similarly, the cost on fertilizer application constitute about 3.7% in overall case, 4.0% in Kosigi, 3.6% in Adoni and 3.5% in Aspari mandals. Further, the cost involved in transportation and spreading of Farm Yard Manure constitute about 3.4% in overall case, 3.5% in Adoni, 3.3% in Kosigi and 3.2% in Aspari mandals.

The study found that Labour cost of main field is the highest individual cost item in the cost of inputs in the cultivation of chillies in all sample mandals of Kurnool district. The cost on fertilizers is the second highest component, the cost on pesticides is the third highest component and the cost on farm yard manure constitutes the fourth highest component in the cost structure of chilli cultivation in Kurnool district.
Therefore, it is clear that due to considerable increase in the prices, mainly of fertilizer, seeds and plant protection chemicals (PPC), material cost incurred by farmers in raising chilli crop increased considerably. Most of the farmers felt that due to the reduction in the subsidies on fertilizer as the main reason for rise in fertilizer prices. Added to this, due to the entry of many seed companies, labour charges in the seed production became a costly affair leading to rise in the prices of seeds. Now, unlike during previous decades, most of the farmers have been taking up plant protection measures. However, due to improper use of chemicals, many crop pests have become resistant, necessitating the application of more and more chemicals. This ultimately led to rise in the material cost.

Due to increase in irrigated area and introduction of high yielding varieties of chilli crop, most of the farmers in the study area have been using Farm Yard Manure on larger scale. This higher rate of FYM further created demand for it, resulting in an increase in its price, rising material cost upwards. In command area, where irrigation facilities are almost assured, the cropping intensity is high. In such areas, there is a heavy demand for skilled agricultural labour. Due to many other socio-economic factors, the cost of living even in rural areas has also been rising steadily. All these factors have resulted in considerable rise in the labour wage rates. Therefore, in raising commercial crops like chilli, which are labour intensive, labour cost incurred is nearly 37 per cent of the total cost of production.


The total human labour utilization was marginally higher in Aspari mandal at 220 person-days followed by kosigi mandal (211 person-days) and Adoni mandal (188 person-days). The overall total human labour utilization is 206 person-days. The
total bullocks used are more in Aspari mandal (58 pair days) followed by Adoni (54 pair days) and Kosigi (53 pair days).

Application of seeds was constant at 15 pockets of 250g each in all the sample mandals. The quantity of Farm Yard Manure used is more in Adoni district (10 tonnes) followed by Aspari (9 tonnes) and Kosigi mandals (9 tonnes). The application of fertilizers in terms of nitrogen (N, P, K) is more in Kosigi mandal followed by Aspari and Adoni mandals. However, it is clear from the results that all the sample farmers have excess application of fertilizer with respect to phosphorus as farmers had felt that it improves the quality chilli crop.

In total, Aspari farmers required 220 person days to raise chilli crop in one acre of land followed by 211 person days in Kosigi mandal and 118 person days in Adoni mandal. On an average 206 person days were required for raising chilli crop in one Acre of land. Among different field operations of Chilli production, harvesting of chilli fruits, which was spread well over one month, requires the maximum labour force. On the average, 31.8 % of total labour force required for harvesting of chilli production. The farmers in Aspari mandal required 33.5 per cent of labour force followed by Kosigi (31.1%) and Adoni (31.0%) mandals. Next major operation, which required more of human labour was transplanting the seedlings in the main field. On the average, 12.6 % of total labour force required for transplanting of chilli seeds. It requires 13.3 % in Kosigi mandal, 12.8 per cent in Adoni mandal and 11.9 per cent in Aspari mandal. The other major operations, which required more of human labour, were land preparation, fertilizer application, FYM application and spraying of plant protection chemicals (PPCs).
Common constraints encountered by the Chilli farmers in adoption of technology are as follows:

- Non-availability of FYM
- Difficulties in growing green manure crops
- Non-availability of biofertilizers
- Non-availability of soil testing facilities
- High cost of chemical fertilizers
- Non-availability of water
- Lack of knowledge and poor advisory services
- Non-availability of improved seeds
- Soil conditions
- Non-availability of credit facilities

Marketing of Chilli Products

The second largest chilli business player in India is Byadgi in Haveri district of Karnataka. A close bond exists between Byadagi Chilli Market and Andhra Farmers. Just as Andhra Pradesh is famous for its Guntur chillies, Byadagi in Karnataka is famous for its brand of chillies. Every year, transactions up to Rs 300 crore happen at Byadagi. Fair price, immediate payment and accurate measures are some of the reasons why traders and farmers from all over Karnataka and Andhra Pradesh, which is around 450 km away from the study area, come to Byadagi chilli market. Interestingly, hotels and brokers' shops at Byadagi bear the name boards both in Kannada and Telugu. It is a testimony to the intermingling of people from two different states, their languages, culture and trade. The present study conducted a
The producers of chilli crop uses their production for self consumption, to sell as chilli fruit in the local vegetable markets, weekly markets, Rythu Bazars and to give them to relatives and friends on the one hand and to process them as dry chillies for sale in the dry chilli market. The responses of chilli growing farmers indicate that more than 75% of the farmers produced chillies only for selling in the dry chilli Market and they are willing to sale their entire production in the dry chilli Market. The remaining 25% farmers may use their chilli production for self consumption, sale in local vegetable markets, weekly markets, Rythu Bazars and to give them to relatives and friends.

The highest number of chilli growing farmers sale their chilli production to the commission Agents, followed by Wholesale Traders, Direct Sale and to the lowest number of farmers sale to Village Traders. The highest number of chilli growing farmers sale their chilli production to the commission Agents because they will provide better credit facilities, better price for the product, immediate cash after sale and the have long-term practice. Majority of the sample farmers opined that availability of credit facilities from commission agents is the main reason for their preference to sale to commission agents.

The second highest number of chilli growing farmers sale their chilli production to the Wholesale Traders because they will provide better credit facilities, better price for the product, immediate cash after sale, there is no commission charge
and they have long-term practice. Majority of the sample farmers opined that immediate cash after sale, better price for the product and availability of credit facilities from Wholesale Traders are the main reasons for their preference to sale to Wholesale Traders.

The average price per quintal received by the majority of chilli growing farmers in Kosigi Mandal is above Rs.6000, but the majority of farmers in Adoni and Aspari Mandals received between Rs.4000 and Rs.6000. However, the lowest number of farmers received the average price below Rs.4000 in all sample mandals. The basic reason for the higher price received by Kosigi mandal farmers is the better quality of chillies produced by them.

The problems encountered by chilli growing farmers in the market are Fluctuating Prices, involvement of too many Middlemen, inadequate finance, lack of transport facilities, and absence of grading facilities in the market. Out of 270 sample farmers, 92 felt that there are fluctuating prices, 71 felt that there is involvement of too many Middlemen, 47 felt that lack of transport facilities, 34 felt that inadequate finance and only 26 felt that the absence of grading facilities in the market.

The average Marketing Costs spent by chilli growing farmers in the market are transportation cost, packaging cost, loading cost, unloading cost, weighting charges and other marketing charges. The average transportation cost is the highest at Rs.240 per quintal for the farmers in Kosigi mandal followed by Rs.210 per quintal for the formers in Aspari mandal and it is the lowest at Rs.180 per quintal for the farmers in Adoni mandal. The average packaging cost is the highest at Rs.60 per quintal for the farmers in Adoni mandal followed by Rs.50 per quintal for the formers in Aspari.
mandal and it is the lowest at Rs.40 per quintal for the formers in Kosigi mandal. The average loading cost is the highest at Rs.21 per quintal for the farmers in Adoni mandal followed by Rs.18 per quintal for the formers in Kosigi mandal and it is the lowest at Rs.15 per quintal for the formers in Aspari mandal. It is clear from the table that the average unloading cost (Rs.8 per quintal), the average weighting charges (Rs.4 per quintal) and other marketing charges (Rs.10 per quintal) are common to all farmers in all sample mandals, because they sell in the same chilli market at Byadagi in Haveri district of Karnataka state.

9.17. Suggestions

To overcome the production and marketing problems of the farmers, the researcher suggested the following necessity measures:

1. The Government should supply better quality seeds, enough fertilizer and sufficient pesticides to the chilli growing farmers.

2. The Government should open cold storages for storing in the area of study.

3. The farmers should be trained compulsorily from experts for seed treatment and spreading pesticides.

4. Water facility should be provided for throughout the year by canals and by giving continuous power supply.

5. The market centres should regulate the influence of middlemen and commission agents in the market centers.

6. The government should cover the chilli growing farmers under crop Insurance scheme.

7. The government should construct compulsory warehouses in every mandal.

8. There is need for creation of market facility for chilli growing farmers within Kurnool district.
9. There is need for introduction of Drip and Sprinkler Irrigation systems in the area of study.

10. It is necessary to avoid the implementation of NREGS during the periods of sowing and harvesting of chilli crop and facilitate the chilli growing farmers to get hired labour during that period.