Chapter I

INTRODUCTION
1.1. Introduction

Chillies crop is one of the important crops in condiments and species group. Andhra Pradesh state stands first in the country in terms of area and production of chillies crop during 2008-09. The crop is grown both under irrigated and rainfed conditions in both kharif and rabi seasons. The area under chillies production in Andhra Pradesh is 203,360 hectares during the year 2008-09 and occupied 1.5 percent in gross cropped area. The crop is extensively grown in Guntur, Khammam, Warangal, Prakasham and Kurnool districts in Andhra Pradesh. Guntur district accounted for the largest area of 63,628 hectares followed by Khammam (28,669 hectares), Warangal (22,534 hectares), Prakasham (17,773 hectares) and Kurnool (14,085 hectares) districts in the order of their importance in chillies production during the year 2008-09. These districts together accounted for 72.1 percent of the total area under chillies crop in the state.

The region wise distribution of these five districts indicate that Guntur and Prakasham districts belongs to Coastal Andhra region, Khammam and Warangal districts belongs to Telangana region and Kurnool district belongs to Rayalaseema region of Andhra Pradesh. Further, Kurnool district is the single largest district in the production of chillies in Rayalaseema region of the State. In this context, the present study has been undertaken to study the efficiency of chillies growing farmers in Kurnool district.

1.2. Importance of the Chillies crop

Chilli pepper (English) whose botanical name is Capsicum annuum (chilli peppers) and Capsicum frutescens are widely used as a condiment and spice all over
the world. Chilli peppers are native to South and Central America. They were introduced in South Asia in the 1500s and have come to dominate the world spice trade. India is now the largest producer of chillies in the world followed by China and Pakistan. World production of chillies during 2007-08 was estimated to be 20.98 lakh tones. The top-10 chilli growing countries are India, China, Pakistan, Ethiopia, Myanmar, Mexico, Vietnam, Peru, Ghana and Bangladesh and they together accounted for more than 85% of the world production in 2007. The lion's share is taken by India with 36% share in global production, followed by China 11% and Pakistan 6%. Chilli pepper is thought to be the most popular spice with over 20% of the worlds' population using it in some form or the other.

Chilli powder is a world renowned spice that is used in many cuisines and recipes of various cultures to add a tangy taste to them. Chillies were readily incorporated into the local South Asian cuisines perhaps because people were already familiar with pungent and spicy flavors. Mounds of red chilli powder and yellow turmeric powder give splashes of vibrant color to every food market in Bangladesh today. The fruits are consumed fresh, dried or processed (in powdered or crushed form) as a spice. In South Asia it is grinded or chopped and added to spice mixtures and dishes where it adds a hot flavor.

Chillies crop is one of the most important as well as cash crops in India. Farmers cultivate it with their innovative ideas on variety, fertilizer dose and agronomic practices. Chillies are produced seasonally but consumed throughout the year. It is a much simpler crop to cultivate with duration of 3-4 months. It can survive on different soil types and several climatic conditions. But the best output of this crop
is obtained when it is grown on deep, loamy, fertile soil with appropriate moisture
content. The soil is ploughed properly at the time of planting of the crop. Plants are
propagated by seed, often in nursery beds and then transplanted into fields later. The
pods are marketed both in green and red or natural form. Some chilies are dried and
sun-drying is common in Bangladesh, which often takes place on mats in fields and
by roadsides. These can be stored for months before selling or can be further
processed into sauces or as grinded powder form.

1.3. 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 is reviewed and
presented in chapter – 2 keeping in view the objectives and methodology of the
present study. The reviews of past studies are presented under the following heads.

- Studies related to growth rate analysis
- Studies related to costs and returns structure
- Studies related to marketing channels, marketing costs and margins
- Studies relating to market arrivals and prices and market integration
- Studies on export performance and changing pattern of exports
- Studies related to the problems of production, marketing and export

From the review of literature on the subject of the present study, it is clear 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 Andhra Pradesh.

1.4. Need for the Study

Scarcity of resources has led to production economists to think about the reallocation of existing resources to have more output with given level of input combinations or to produce a prescribed level of output with the minimum cost without changing the production technology. But there is a lack of information about the efficient use of inputs in chillies production. Similarly, the measurement of the productive efficiency in agricultural production is an important issue because it gives pertinent information for making sound management decision in resource allocation. Except for a few descriptive studies, econometric analysis has yet to be conducted to examine the production function for chilli cultivation and its potential for future improvement. Considering the above facts, the present study entitled “A study on the Economic Efficiency of Chilli growing Farmers in Kurnool District” has been undertaken, to determine the level of efficiency of the chilli growing farmers in the production and marketing of chillies in Kurnool district of Andhra Pradesh.

1.5. Statement of the Problem

Indian species are costly and renowned all over the world. Chilli, one of the hot spices, suits the taste and preference of a majority of consumers around the world. Though the origin of chilli can be traced to South America, it is now grown in many parts of the world. The origin of commercial chilli cultivation in India can be traced back to the 19th century. During the era of Portuguese trade with India. Today India has emerged as the World's largest producer of Chilli production.
Andhra Pradesh state stands first in the country in terms of area and production of chillies crop during 2008-09. Similarly Kurnool district stands first in the Rayalaseema region of the State. 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 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 chillies growing farmers in Kurnool district. The study tried to estimate the differences in the input structure and returns structure of the chilli production among the farmers and tried to estimate the benefit–cost ratios for examine the production efficiency in addition to the estimation of Linear and Cobb-Douglas production functions. The study also tried to examine the marketing problems including the effect of middlemen in the marketing process.

1.6. 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 chillies growing farmers; and
6. To determine the level of marketing efficiency of the chillies growing farmers.

1.7. 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.

1.8. Period of the Study

The study covers for a period of ten years from 2000-01 to 2009-10 with secondary sources of data covering 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.

1.9. Sample Frame and Sample Size

All villages in chillies growing mandals of Kurnool district, which is an important chili growing area in the Rayalaseema region of Andhra Pradesh, were become the sample frame for the present study. The sample villages were selected by using stratified random sampling technique. The entire sample frame was divided into three revenue divisions in the first strata. They are Adoni, Kurnool and Nandyal. Of
them Adoni division was selected for the study based on highest concentration of Chilli growing farmers.

In the second strata, Adoni division was divided into 17 Revenue Mandals and three mandals were selected for the study as sample. They are Aspari, Kosigi and Adoni. In the third strata, the selected mandals were divided into villages and the sample villages from each selected sample mandal were selected on the basis of concentration of chilli growing farmers. Aspari mandal has 20 revenue villages, Kosigi mandal has 28 revenue villages and Adoni mandal has 46 revenue villages. Out of 94 revenue villages in the three selected sample mandals nine villages at the rate of three villages from each revenue mandal have been selected as sample villages.

Finally, 270 Chilli growing farmers were selected as sample respondents for the survey at the rate of 30 chilli growing farmers from each selected village on simple random sampling method. The 2001 population census data shows that there were 12624 cultivators in Aspari Mandal, 6767 cultivators in Kosigi mandal and 14788 cultivators in Adoni mandal of Kurnool district. Together, total cultivators in the sample mandals were 34179 persons or 6835 cultivating households (assuming five persons per households). Hence, the sample households constitute about 4% of the cultivating households in the sample mandals. Further, about one-third of the cultivators only produce chillies and hence the sample size becomes 12% of the chilli-growing farmers in the sample mandals. Data were collected by visiting each farmer personally and by interviewing them with the help of a pre-tested interview schedule. The reference period for the survey was 2009-10.
1.10. Data Sources and Data Collection Methods

The present study depends on both secondary and primary data. The secondary data were collected to review the actual trends in the area under chilli cultivation, production of chillies and productivity of chillies in the World, India, Andhra Pradesh and in Kurnool district. The principal sources of secondary data for this study are:

2. Spices Board of India, Ministry of Commerce and Industry, Government of India (http://www.indianspices.com/)
3. Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India (http://dacnet.nic.in/eands/)
5. Chief Planning Office, Kurnool District, Government of Andhra Pradesh

The primary data were collected by the researcher through sample survey with the help of a well-designed and pre-tested questionnaire. The researcher has personally conducted field survey and the output of this survey constitute the critical component of the data analysis. During the field survey, targeted respondents among the chilli-growing farmers have been contacted and their views and experiences on various aspects relevant to the study have been captured with the help of structured questionnaires and open-ended interviews.
The data thus obtained from both secondary and primary sources were used for estimating different statistical parameters to test the assumed hypotheses through the statistical methods discussed below.

1.11. Statistical Methods Used

The study used simple statistical methods like ratios, percentages and descriptive statistics such as averages, standard deviation and coefficient of variation. The study also used the annual compound growth rates, cross tables and regression analysis for analyzing the collected data on various aspects relating to chilli crop. Simple statistical tests are used to test the accuracy of estimates with regard to annual compound growth rates (t test), cross tables (Pearson Chi-Square test), coefficients of determination, \( R^2 \), (F test) and regression parameters (student t test) to test the efficiency of chilli growing farmers wherever possible in the data analysis of the study. Further, bar charts and pie charts have been used to make the comparisons easier in the study. However, the specific analytical tools used were as follows:

1.11.1. Annual Compound Growth Rates

Annual compound growth rates of area under chilli cultivation, production of chillies, productivity of chillies per hectare (yield) and exports of chilli were computed for a period of 9 or 10 years depending upon the availability of data. The exponential form of the function \( Y_t = ab^t \) was used for estimating the annual compound growth rates. In the present study, annual compound growth rates in were estimated by specifying the following relationship.

\[ Y_t = ab^t \]
Where $Y_t$ is a variable representing an area under chilli cultivation or production of chillies or productivity (yield) of chillies or export of chillies in year $t$; $t$ is the year which takes value 1, 2, 3, ...........n; $a$ and $b$ are the parameters to be estimated.

The above equation was transformed into log linear form and written as;

$$\log Y = \log a + t \log b$$

The above equation was estimated by using ordinary least squares (OLS) technique and with the help of the method of curve estimation through SPSS. Annual compound growth rate ($g$) was then estimated by the following identity:

$$g = (b - 1)100$$

Where, ‘$g$’ is the estimated annual compound growth rate in per cent per annum and ‘$b$’ is the antilog of $\log b$. The standard error of the annual compound growth rate was estimated and tested for its significance by using $t$ test.

1.11.2. Cross Tables

The primary data collected through survey were entered in SPSS and generated ‘Cross Tables’ for different socio-economic variables based on their relationships and they were tested by using Pearson Chi-Square test.

1.11.3. Economic Performance of Chilli Growing Farmers

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 formulas.

\[
\text{Benefit-Cost Ratio} = \frac{\text{Gross Income}}{\text{Cost of Cultivation}}
\]

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.

\[
\text{Profit Ratio} = \left(\frac{\text{Net Income}}{\text{Cost of Cultivation}}\right) \times 100
\]

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.

1.11.4. Empirical model to assess the influence of inputs on production

In order to estimate the influence of inputs used by chilli growing farmers on the production of chillies in Kurnool district, the linear form of production function
was used in the present study. The linear form of production function has well-known
properties that justify its wide application in economic literature. It is also easy to
estimate and mathematically manipulate. However, it is also argued that if interest
rests on an analysis of the general structure of the underlying production technology,
the linear specification provides an adequate representation of the production
technology. In addition, its simplicity and widespread use in agricultural economics
outweigh its drawbacks. In consideration of the above fact, linear type functional form
had been tried in this study.

The linear production function model can be specified as:

\[ Y_i = \beta_0 + \beta_1 A_i + \beta_2 L_i + \beta_3 S_i + \beta_4 I_i + \varepsilon_i \]

Where the subscripts \( i \) refers to the \( i^{th} \) observation where \( i = 1, 2, 3 ... n \) (chilli
growing sample farmers)

\( Y_i \) = Production of chilli crop by \( i^{th} \) farmer,

\( A_i \) = Acres of land used for chilli cultivation by \( i^{th} \) farmer,

\( L_i \) = The number of person days used as labour by \( i^{th} \) farmer,

\( S_i \) = The number of pockets of Chilli Seeds used by \( i^{th} \) farmer,

\( I_i \) = The amount of Investment used for purchase of modern inputs like fertilizers,
pesticides and manure by \( i^{th} \) farmer, and \( \varepsilon_i \) = A stochastic error term in the
production function. The parameter \( \beta_0 \) represents a constant term of the function and
the parameters \( \beta_1, \beta_2, \beta_3 \) and \( \beta_4 \) represents the production coefficients of land, labour,
seeds and investment on modern inputs respectively and they were estimated by using
SPSS program.
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.

1.11.5. Empirical model to test the production elasticities of inputs

In order to estimate the production elasticities of inputs used by chilli growing farmers in Kurnool district, Cobb-Douglas form of production function was used in the present study. The Cobb-Douglas form of production function has well-known properties that justify its wide application in economic literature. It is a homogeneous function that provides a scale factor enabling one to measure the return to scale and to interpret the elasticity coefficients with relative ease. It is also easy to estimate and mathematically manipulate. At the same time, the Cobb-Douglas production function makes several restrictive assumptions. It is assumed that the elasticity coefficients are constant, implying constant share for the inputs. The elasticity of substitution among factors is unity in the Cobb-Douglas form. Moreover, this being linear in logarithm, output is zero if any of the inputs is zero and output expansion path is assumed to pass through the origin.

However, it is also argued that if interest rests on efficiency measurements and not on an analysis of the general structure of the underlying production technology, the Cobb-Douglas specification provides an adequate representation of the production technology. In addition, its simplicity and widespread use in agricultural economics outweigh its drawbacks. In consideration of the above fact, Cobb-Douglas type functional form had been tried in this study.
The Cobb-Douglas stochastic production frontier model can be specified as:

\[
\log Y_i = \beta_0 + \beta_1 \log A_i + \beta_2 \log L_i + \beta_3 \log S_i + \beta_4 \log I_i + \epsilon_i
\]

Where \( \log \) represents common logarithm of the variable, the subscripts \( i \) refers to the \( i^{th} \) observation where \( i = 1, 2, 3 \ldots n \) (chilli growing sample farmers)

\( Y_i \) = Production of chilli crop by \( i^{th} \) farmer,

\( A_i \) = Acres of land used for chilli cultivation by \( i^{th} \) farmer,

\( L_i \) = The number of person days used as labour by \( i^{th} \) farmer,

\( S_i \) = The number of pockets of Chilli Seeds used by \( i^{th} \) farmer,

\( I_i \) = The amount of Investment used for purchase of modem inputs like fertilizers, pesticides and manure by \( i^{th} \) farmer, and \( \epsilon_i \) = A stochastic error term in the production function. The parameter \( \beta_0 \) represents a constant term of the function and the parameters \( \beta_1, \beta_2, \beta_3 \) and \( \beta_4 \) represents the production elasticities of land, labour, seeds and investment on modern inputs respectively and they were estimated by using SPSS program. 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 modem inputs such as fertilizers, pesticides and manure is measured in terms of rupees in thousands.

1.11.6. Gini Coefficient

The study also tries to examine the inequalities in the incomes earned by the sample farmers in different sample villages and sample mandals of the study area. For this purpose the study used a popularly known inequality index, i.e., Gini Coefficient. The Gini coefficient is a measure of statistical dispersion developed by the Italian statistician Corrado Gini and published in his 1912 paper "Variability and
Mutability. It is commonly used as a measure of inequality of income or wealth. The Gini coefficient is usually defined mathematically based on the Lorenz curve (below). It can be thought of as the ratio of the area that lies between the line of equality and the Lorenz curve (marked 'A' in the diagram) over the total area under the line of equality (marked 'A' and 'B' in the diagram); i.e., $G = A/(A+B)$.

![Lorenz Curve Diagram](image)

The Gini coefficient can range from 0 to 1; it is sometimes multiplied by 100 to range between 0 and 100. A low Gini coefficient indicates a more equal distribution, with 0 corresponding to complete equality, while higher Gini coefficients indicate more unequal distribution, with 1 corresponding to complete inequality. When used as a measure of income inequality, the most unequal society will be one in which a single person receives 100% of the total income and the remaining people receive none ($G=1$); and the most equal society will be one in which every person receives the same percentage of the total income ($G=0$).
Gini Coefficients have been worked out based on the distribution of income earned through sale of chillies among the Chilli growing farmers in the sample area specified in the study. The method employed was:

\[ G = \frac{\sum_{i=1}^{n} (2i - n - 1)X_i}{n^2 \mu} \]

Where ‘i’ is the rank of a farmer based on his income through sale of chillies when arranged in ascending order; ‘n’ is the number of farmers; \( X_i \) is the average per capita income through sale of chillies in \( i^{th} \) village; ‘\( \mu \)’ is the average per capita income through sale of chillies for all sample farmers of the study. The sample Gini coefficient defined above has been multiplied by \( n/(n-1) \) in order to become the unbiased estimator for the population coefficient.

1.11.7. **Scope and Limitations of the Study**

The scope of the present study is confined to study the economic efficiency of 270 chilli growing farmers of nine selected villages from three selected mandals in Adoni revenue division of Kurnool district. All sample farmers (270) are growing chillies in lands with irrigation facilities either through canal irrigation or through bore-well irrigation.

Therefore, the major limitation of the study is that the results of this study cannot be generalized owing to the differences in the agrarian structure, soil type, cultivation practices, sources of irrigation, rain-fed conditions and the like from one region to another region. Another limitation of the study is that it was conducted through survey method by personal interviews with a pre-tested schedule and hence the study suffers from certain degree of selection bias (in the selection of sample
respondents in the village) and recall bias. However, the efforts have been made to reduce these biases to the extent possible by rechecking.

11.8. Chapter outline of the Study

The thesis of the study consists of nine chapters as follows:

Chapter–1 is an introductory chapter and it covers the concepts, importance and need for the study on efficiency of chilli growing farmers. It also provides the statement of the problem, objectives, hypotheses, period, sample frame and sample size, sources of data and data collection methods, statistical tools used, scope and limitations of the present study.

Chapter–2 concentrates on the Review of Literature on the subject related to the efficiency of chilli growing farmers and other related studies. This chapter also identifies the gaps in the literature and provides necessary inputs to the present study.

Chapter–3 provides a brief profile of the study area, i.e., Kurnool District and profiles of the sample mandals within the study area. These profiles are useful to understand the agricultural conditions and general infrastructural facilities available in the study area.

Chapter–4 examines the trends in the area, production and productivity of chillies and importance of Chillies in terms of area under chilli production, growth of chilli production and the productivity of chillies in the World, India and Andhra Pradesh.
Chapter-5 tries to assess the socio-economic conditions of chillies growing farmers of the study area, which affects on the efficiency of farmers.

Chapter-6 examines the production performance and efficiency of chillies growing farmers of the study area through empirical estimations.

Chapter-7 describes the problems of input availability and assesses input use efficiency of chillies growing farmers of the study area.

Chapter-8 examines the involvement and role of middlemen in the marketing of chilli production and assesses marketing efficiency of chillies growing farmers of the study area.

Finally, the study concludes with a chapter on summary of research findings and suggestions.
1.13. References


